

ABEKS, 2002. Taiga Net Website. Arctic Borderlands Ecological Knowledge Society: <http://www.taiga.net> *BIBLIOGRAPHY; POPULATION; subsistence; PEOPLE; CLIMATE; WATER QUALITY; VEGETATION; MINING; mammals; caribou; birds; waterfowl; fish*
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Many people have contributed to Taiga Net.

ABO, 2002. Alaska Bird Observatory Website. Alaska Bird Observatory: <http://www.alaskabird.org/> *POPULATION; birds; waterfowl; goose; duck; sandhill crane; songbirds; migration; habitat selection*

ACAT, 2002. Alaska Community Action on Toxics Website. Alaska Community Action on Toxics: <http://www.akaction.net> *CONTAMINANTS; MILITARY; POL (petroleum/oil/lubricants = hydrocarbons); radiation; POPs (persistent organic pollutants); metals; remediation; mapping; traditional food*

The mission of Alaska Community Action on Toxics (ACAT) is to protect human health and the environment from the toxic effects of contaminants. We are dedicated to achieving environmental justice. We work to ensure responsible cleanup of contaminated sites and empower community involvement in cleanup decisions. We strive to stop the production, proliferation, and release of toxic chemicals.

ACIA, 2001. Report from the Arctic Climate Impact Assessment Modeling and Scenarios Workshops. *Proceedings Arctic Climate Impact Assessment Modeling and Scenarios Workshops*, Stockholm, Sweden, ACIA Secretariat, Fairbanks Alaska, p. 34 *REFERENCE; CLIMATE; risk assessment; modeling; management; infrastructure; engineering; vegetation*
Executive Summary

The Modeling and Scenarios Workshop meeting was held to help set the foundation for the Arctic Climate Impact Assessment (ACIA). The group was charged with the task of making specific recommendations regarding the models and scenarios to be used in the ACIA, particularly for chapters dealing with terrestrial, marine, infrastructure and other impacts. The meeting lasted two and a half days and included invited presentations as well as breakout discussions for developing recommendations. The final plenary session allowed for presentations by the breakout groups and resulted in the following conclusions.

The Arctic is recognized as the area of the world where climate change is likely to be largest, and is also an area where natural variability has always been large. Current climate models predict a greater warming for the Arctic than for the rest of the globe. The

impacts of this warming, including the melting of sea ice and changes to terrestrial systems, are likely to be significant. The projections of future changes are complicated by possible interactions involving stratospheric temperature, stratospheric ozone, and changes in other parts of the Arctic system. For this reason, current estimates of future changes to the Arctic vary significantly. The model results disagree as to both the magnitude of changes and the regional aspects of these changes. The large range of future predictions requires special consideration and synthesis in order for the impacts assessment work of ACIA to proceed in a coordinated manner.

It is proposed that a central ACIA resource be established to provide an interface between the climate model scenario data and the individual impact scientists. It was the opinion of the workshop participants that unless such a facility is established, the ACIA process is likely to fail. Climate models Atmosphere-Ocean General Circulation Models (AOGCMs), regional climate models (RCMs), and statistical downscaling methods all have value for estimating future climate change impacts to the Arctic. Current AOGCMs differ significantly with respect to both the magnitude and distribution of future changes, as demonstrated by the Coupled Model Intercomparison Project 2 (CMIP/2) results, and by the information collected by the Intergovernmental Panel on Climate Change (IPCC) Data Distribution Centre (DDC). However, these models can still guide our understanding of what may happen in the Arctic in the coming decades. On average, the models indicate a 2 to 6 degrees C warming of the Arctic by the year 2070, with considerable uncertainty around these estimates and large model-to-model differences. Although many emission assumptions exist for the future, the range of projected Arctic temperature responses is similar to the range of responses observed due to model-to-model differences.

Scenarios

Two types of scenarios exist for assessing climate impacts: scenarios for future emissions of greenhouse gases and aerosols; and scenarios of the future physical environment. In agreement with IPCC's approach, appropriate emission scenarios will be assumed and AOGCMs will be used to project the resultant changes to the physical environment. No new emission scenarios need to be developed for ACIA. The scenarios developed by CMIP/2 (a 1% per year increase of CO₂) and IPCC [IPCC Scenarios 92 (IS92) and Special Report on Emissions Scenarios (SRES)] are useful for assessing model-to-model differences. To stay coordinated with the current IPCC efforts, the group has agreed to work from IPCC SRES scenario B2, which offers what may be considered a likely scenario for the future. Results will be analyzed and summarized for the scenarios chapter of the ACIA assessment. A growing number of groups have been working on AOGCMs and are producing IPCC B2 scenario runs. While it is recognized that some models may be more appropriate for Arctic use, it is currently difficult to establish criteria determining which AOGCMs should or should not be used. As a starting point, it is proposed that ACIA follow the selection of models made by IPCC in their climate scenario database. Currently, model results from seven different modeling groups are available in the IPCC database.

Ozone and UV Modeling

With respect to modeling ozone and UV levels, the World Meteorological Organization (WMO) has taken a lead. Their next assessment is due to be completed in 2002. They have not yet defined the scenarios to be used in that assessment, but coordination needs to be established between the activities of ACIA and the activities of WMO. Current 3-D models able to include the impacts of climate change indicate that the Arctic may experience continued depletion of ozone for the next twenty years. This depletion will likely be followed by a slow recovery period.

Time Slices

The time slices for special consideration will be centered around 2020, 2050 and 2080. These time scales are also being given special attention by IPCC. Results from models will have to be examined for some number of years around these times to represent average values as well as the characteristic variability. Characterizing the changes in extreme events will require using historical data and daily model output in addition to the monthly output typically archived. A record length of ten to thirty years will be examined for each time slice.

Regional Models

Regional models will be needed to address all the spatial and temporal scales of relevance to Arctic impacts. The finer spatial and temporal scales will be particularly important for assessing extreme events as well as very local impacts. A number of regional models exist for specific areas of the Arctic, but there is currently no working coupled ocean-ice-atmosphere regional model for the Arctic as a whole. This lack was recognized as a serious gap in our current ability to assess climate change impacts in the Arctic. A number of groups would like to work on developing an appropriate model and may get support in the future.

Statistical Downscaling

For some small regions of the Arctic, a considerably finer grid-scale (e.g., 50 m by 50 m) will be needed to assess terrestrial impacts, such as impacts to vegetation and infrastructure. This scale can only be achieved by statistical downscaling from global or preferably regional models. Areas of longterm ecological monitoring, as near Abisko, Toolik Lake and Svalbard, would benefit from such efforts.

Understanding Uncertainties

Uncertainties for climate change predictions are recognized to be large. These uncertainties stem from our assumptions about the future, from the models themselves and from inherent limitations in our ability to predict climate. There is currently considerable uncertainty in predictions for The Arctic at a number of levels: different scenarios, different models and different runs from a single model. Unfortunately, agreement within runs of one model or between different models does not necessarily imply a high degree of certainty in the results. Tools need to be developed to synthesize the results and their associated uncertainties for the impacts communities. The scenarios working group will address these issues using a number of different methods.

Parameters for Impacts Use

A large number of parameters on a range of spatial and time scales will be useful in addressing the range of impacts studies being considered. In addition, both the mean values as well as knowledge of the frequency of extreme events are of use to the impacts communities. A table has been developed to attempt to outline the range of parameters and scales of use. It is recognized that obtaining and using all of these parameters for the full spatial and time scales requested will be intractable. It is likely that a subset of this list of parameters will need to be developed. The subset should be defined by the impacts communities. Some parameters, such as cloud cover or other data, will need to be requested directly from the modeling groups. A small subset of parameters will be gathered from the various modeling groups and these data will be made available for impacts studies.

Linkages to Impacts Communities

In general, there is an immediate need to develop linkages between the modeling communities and the impacts communities. The needs of the impacts communities require more attention to ensure that the authors of ACIA impact sections get the data and appropriate information they need in an efficient manner. To make ACIA successful, a resource of this type is needed for dedicated use. It is proposed that a central resource

be established to provide an interface between the climate model scenario data and the individual impact scientists. More detailed specifications for such a resource need to be worked out, but two persons working full time will likely be required.

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Leggett, J., W.J. Pepper, and R.J. Swart, 1992: Emissions scenarios for the IPCC: an update, in *Climate Change 1992. The Supplementary Report to the IPCC Scientific Assessment*, J.T. Houghton, B.A. Callander, and S.K. Varney (ed.), University Press, Cambridge, UK, 200 pp.

Adams, L., Singer, F., and Dale, B., 1995. Caribou calf mortality in Denali National Park, Alaska. *Journal of Wildlife Management* 59 (3), 584-594. *POPULATION; mammals; caribou; mortality; predation; wolf; grizzly bear*

Calf mortality is major component of caribou population dynamics, but little is known about the timing or causes of calf losses, or of characteristics that predispose calves to mortality. During 1984-87, we radiocollared 226 calves (less than or equal to 3 days old) in the Denali Caribou Herd (DCH), an un hunted population utilized by a natural complement of predators, to determine the extent, timing, and causes of calf mortality and to evaluate influences of year, sex, birthdate, and birth mass on those losses. Overall, 39% of radio-collared calves died as neonates (less than or equal to 15 days old), and 98% of those deaths were attributed to predation. Most neonatal deaths (85%) occurred within 8 days of birth. Few deaths occurred after the neonatal period (5, 10, and 0% of calves instrumented died during 16-30, 31-150, and greater than 150 days of age, respectively). Survival of neonates was lower ($P = 0.038$) in 1985, following a severe winter, than during the other 3 years. In years other than 1985, calves born during the peak of calving (approx 50% of the total, born 5-8 days after calving onset) experienced higher (P less than 0.001) neonatal survival than did other calves. Grizzly bears, wolves, and unknown large predators (i.e., grizzly bears or wolves) accounted for 49, 29, and 16% of the neonatal deaths, respectively. The rate of bear-caused mortalities declined (P less than 0.001) with calf age, and bears killed few calves greater than 10 days old. Wolf predation was not related (P greater than 0.05) to calf age and peaked 10 days after onset of calving. Grizzly bear and wolf predation on neonates during the calving season was a limiting factor for the DCH.

Adams, L., and Dale, B., 1998. Timing and synchrony of parturition in Alaska caribou. *Journal of Mammalogy* 79 (1), 287-294. *POPULATION; mammals; caribou; reproduction; nutrition; precipitation; snow*

Timing of parturition of caribou varies with in populations, but the relative influences of nutritional condition of females during the autumn breeding season and during gestation on that variation is not known. We determined timing of parturition of caribou in Denali National Park, Alaska, during 1984-1995, which had wide variation in snowfall that influenced nutritional condition and productivity of females. The first young were observed each year between 4 and 15 May. Annual median dates of parturition for radiocollared females during 1987-1995 varied from 13 to 21 May. Synchrony of births did not vary significantly among years. Females [?]

Adams, P.C., 1999. The dynamics of white spruce populations on a boreal river floodplain, Duke University, Ph. D., 178 p *VEGETATION; alder; poplar; white spruce; black spruce; succession; flooding; forestry; modeling; climate; herbivory*

Contents: Ch. 1. Introduction -- Ch. 2. Fluvial processes of the Tanana River that impact floodplain primary succession -- Ch. 3. White spruce establishment and age structure on the Tanana River floodplain -- Ch. 4. Patterns of white spruce growth on the Tanana River floodplain -- Ch. 5. Summary and conclusions -- Appendix I -- Literature cited -- Appendix II -- Biography.

Summary: "Studies of forest development on river floodplains in interior Alaska have asserted that succession is linear and directional. Beginning with the invasion of willows on newly formed silt bars, subsequent fluvial depositional builds terraces of increasing height and distance from the river on which successive communities of alder, balsam poplar, white spruce, and eventually black spruce develop. This classical model assumes that primary succession is a deterministic autogenic process in which early successional species facilitate the establishment of late successional through environmental modification. I focused on the dynamics of white spruce establishment and growth in this successional environment. My primary objective was to describe boreal floodplain white spruce forests and the major environmental and biotic constraints on their development. I examined factors affecting the age, growth and spatial structure of white spruce populations across successional sere. Ecosystem processes on the Tanana River floodplain are closely linked to fluvial processes, and these in turn are directed by climate. Patterns of deposition and erosion resulting in the building and removal of successional terraces are functions of the climate controlled river discharge fluctuations, and are neither continuous nor directional. White spruce occurs as seedlings, saplings, and seed-producing trees throughout the primary successional sequence, and its age structure reflects past variation in recruitment and mortality rates. Successful seedling establishment is episodic and correlated with a combination of interacting environmental and biotic factors, including silt deposition accompanying floods, seed production and dispersal, and herbivory of seedlings by snowshoe hares. Both herbivory and low light under canopies [occur and] these factors [cause] changes through succession because of interactions with the developing vegetation. Radial growth patterns of mature floodplain white spruce trees differ from those of nearby upland trees in their reduced sensitivity to climate variability because of the high water table on the floodplain. Although elements of the classic facilitation model of succession are consistent with some of my results, much of the spatial and temporal variability in patterns of white spruce establishment and growth can be attributed to episodic environmental and biotic factors throughout the succession"

ADEC, and USEPA, 1983? Suspended solids in mainstem drainages downstream from placer mines, Fairbanks and vicinity, Alaska, August 3-17, 1983 : a working paper. Alaska Dept. of Environmental Conservation, Environmental Quality Monitoring and Laboratory Operations; US Environmental Protection Agency, Juneau, Alaska. *MINING; WATER QUALITY; sediment; surface water*

For two weeks in August, 1983, a joint Alaska Department of Environmental Conservation - US Environmental Protection Agency investigation of several mainstem drainages accessed by road was conducted in the vicinity of Fairbanks, Alaska. The purpose was to examine the effects of suspended solids effluent from placer mines on mainstem drainages.

ADEC, 1989. Fish Lake drainage water quality survey, Tanana, Alaska. Alaska Dept. of Environmental Conservation, Juneau? *INCOMPLETE (need abstract); WATER QUALITY; MINING; surface water*

2002. [Modified] Statewide Contaminated Sites Database Report. State of Alaska, Department of Environmental Conservation, Fairbanks. *CONTAMINANTS; waste (hazardous); waste*

(human); waste (solid); POPs (persistent organic pollutants); POL (petroleum/oil/lubricants = hydrocarbons); PAHs (byproducts of combustion = hydrocarbons); radiation; SOIL; WATER QUALITY; ground water; surface water; monitoring; management; MILITARY; MINING; remediation; engineering; risk assessment

2002. Alaska Underground Storage Tank: UST and LUST Search. Alaska Department of Environmental Conservation: <http://www.dec.state.ak.us/spar/stp/ust/search/> CONTAMINANTS; POL (petroleum/oil/lubricants = hydrocarbons); MILITARY; MINING; INFRASTRUCTURE

2002. Site Information Listing. Alaska Department of Environmental Conservation: http://www.state.ak.us/dec/dspar/csites/ind_list.htm CONTAMINANTS; waste (hazardous); waste (human); waste (solid); POPs (persistent organic pollutants); POL (petroleum/oil/lubricants = hydrocarbons); radiation; SOIL; WATER QUALITY; ground water; surface water; monitoring; management; MILITARY; MINING; remediation; engineering; risk assessment

ADF&G, 2001. [Subsistence] Articles and Presentations. Alaska Department of Fish and Game; Division of Subsistence: <http://www.state.ak.us/adfg/subsist/geninfo/publctns/articles.htm> PEOPLE; BIBLIOGRAPHY; subsistence; traditional food; management; economics; population; fish; mammals; birds; distribution

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2001. Gene Conservation Laboratory Publications. Alaska Department of Fish and Game: <http://www.cf.adfg.state.ak.us/geninfo/research/genetics/publish/publish.htm> BIBLIOGRAPHY; POPULATION; genetics; fish; salmon; chinook; chum; coho; sockeye; burbot; inconnu [sheefish]; whitefish; pike

2002. ADF&G Wildlife Notebook Series. Alaska Department of Fish and Game: <http://www.state.ak.us/adfg/notebook/notehome.htm> POPULATION; mammals; black bear; grizzly bear; caribou; sheep; moose; mountain goat; marine mammal; bat; rodents; lemming; pika; porcupine; shrew; vole; birds; raptor; american dipper; goose; chickadee; raven; eagle; eider; grouse; gull; duck; loon; osprey; owl; sandpiper; phalarope; ptarmigan; sandhill crane; sparrow; swan; tern; woodpecker; yellowleg; beaver; coyote; lynx; marmot; marten; mink; muskrat; fox; squirrel; river otter; weasel; wolf; wolverine; fish; blackfish; arctic char; grayling; burbot; chinook; chum; coho; dolly varden; pike; inconnu [sheefish]; trout; whitefish; frogs; toads
This series of websites presents basic information about many species of animals found in Alaska.

2002. Atlantic Salmon; A White Paper. Alaska Department of Fish and Game: http://www.state.ak.us/adfg/geninfo/special/AS/docs/AS_white2002.pdf POPULATION; fish; salmon; fish farming

This paper presents information on the status and potential effects of Atlantic salmon farming on the Pacific Coast, as well as recommendations for farming operations. The study finds that risks to wild Pacific Salmon due to marine based Atlantic salmon farming operations are intolerably high and suggests the phasing out of these farms.

Threats, due to accidental and intentional escapements, include colonization, diseases, interbreeding, predation, habitat destruction, and competition.

2002. INFORMATION SHEET: Yukon River Salmon Fisheries. Alaska Department of Fish and Game: <http://www.cf.adfg.state.ak.us/region3/finfish/salmon/forecast/YR02.pdf> *POPULATION; fish; salmon; chum; chinook; coho; sockeye; subsistence; PEOPLE*

This information sheet reviews the 2001 season and describes the anticipated management of the 2002 season.

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This database includes Fishery Data Series, Fishery Manuscripts, Fishery Management Reports, and Special Publications reports published in the above series from 1987 through the present. New reports are added as published. To locate reports of interest, enter a search phrase below. Search results will include a link for additional information about a report and/or a link to an Adobe PDF file of the full report. If you have any questions, please contact the webmaster at the address indicated at the bottom of this page. Contact sfpub@fishgame.state.ak.us to obtain a free year-end CD for the current year's reports.

2002. Alaska Fishery Research Bulletin. Alaska Department of Fish and Game: <http://www.state.ak.us/adfg/geninfo/pubs/afrb/afrbhome.htm> *BIBLIOGRAPHY; POPULATION; fish; population; genetics; distribution; migration; nutrition; reproduction; economics*

The Alaska Fishery Research Bulletin (AFRB) has been published by the Alaska Department of Fish and Game since 1961, initially as the Informational Leaflet and then as the Fishery Research Bulletin. In 1994 it was changed from presenting monographs to its current journal format: articles, issues & perspectives, notes, and letters. The AFRB first became available on the Internet in 1995 and can be found online.

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2002. Wildlife Conservation Publications and Reports. Alaska Department of Fish and Game: <http://www.state.ak.us/adfg/wildlife/geninfo/pub/reports.htm> *BIBLIOGRAPHY; POPULATION; birds; songbirds; waterfowl; raptor; mammals; caribou; moose; wolf*

2002. Salmon Fisheries. Alaska Department of Fish and Game: <http://www.cf.adfg.state.ak.us/geninfo/finfish/salmon/salmhome.htm> *POPULATION; fish; salmon; chinook; chum; coho; sockeye; distribution; management; subsistence; economics; history*

ADHSS, 1997. Health Risks in Alaska Among Alaska Natives; Alaska Behavioral Risk Factor Survey, 1991-1993. Alaska Department of Health and Social Services; Division of Public Health, Alaska Native Health Board, Juneau.

<http://www.anhb.org/sub/epi/documents/brfss/PREINTRO.html> PEOPLE; health (condition); behavior (habits and lifestyles); risk assessment; behavior (habits and lifestyles)

Overview

Behaviors linked to health problems are referred to as behavioral risk factors, and include such things as tobacco and alcohol use, being overweight, lack of physical activity and not using safety belts. Behavioral risk factors are associated with the leading causes of death in the United States and Alaska. Many chronic diseases and premature deaths could be prevented through modification of these behavioral risk factors. Data on behavioral risk factors are necessary for assessing risk for chronic diseases, formulating intervention strategies, justifying resources to support these strategies and proposing new policies or legislation. Surveillance of behavioral risk factors allows us to monitor trends in health related behavior and to measure progress toward reaching state and national health objectives.

The Behavioral Risk Factor Surveillance System is the primary method for states to monitor health risk behaviors. In cooperation with the Centers for Disease Control and Prevention (CDC), the Behavioral Risk Factor Surveillance System was implemented in Alaska in 1990. In 1991, the Alaska Behavioral Risk Factor Surveillance System became part of an ongoing national surveillance system, conducting telephone surveys monthly. This is the first report summarizing health risk behaviors for the Alaska Native population, based on the first three years of BRFSS data available in Alaska. Combined survey results from January 1991 to December of 1993 are presented. Of the total sample of 4,604 respondents, 927 are Alaska Native.

These data represent Alaskan adults, aged 18 and older with telephones. Prevalence estimates for the Alaska Native population are compared to the general population in Alaska. In this report prevalence estimates are rounded to the nearest whole percent. 2002. Epidemiology Publications. Alaska Department of Health and Social Services; Division of Epidemiology: <http://www.epi.hss.state.ak.us/publications.asp> PEOPLE; health (condition); health (comparative); atherosclerosis; diabetes; cancer; heart disease; alcohol; tobacco; respiratory infection; hepatitis; botulism; influenza; virus; tuberculosis; hearing loss; otitis media; contaminants; metals; arsenic; lead; mercury; POPs (persistent organic pollutants); POL (petroleum/oil/lubricants = hydrocarbons); accidents; mortality; suicide; BIBLIOGRAPHY

Adkins, J.N., 1939. The Alaskan earthquake of July 22, 1937, University of California, Ph. D., 46 p SOIL; geology

Adler, A., Boyko, E., Schraer, C., and Murphy, N., 1994. Lower prevalence of impaired glucose tolerance and diabetes associated with daily seal oil or salmon consumption among Alaska Natives. Diabetes Care 17 (12), 1498-1501. PEOPLE; health (condition); biochemistry; diabetes; health (effects); traditional food; dietary advisory; salmon

OBJECTIVE--To examine the association of seal oil and salmon consumption with impaired glucose tolerance (IGT) and non-insulin-dependent diabetes mellitus (NIDDM) among Alaska Natives.

RESEARCH DESIGN AND METHODS--Screening was performed on 666 Yup'ik Eskimos and Athabaskan Indians > or = 40 years old in 15 villages. Self-administered questionnaires were used to obtain partial food frequency data. A case was defined as IGT or NIDDM, either newly discovered or known. Newly discovered cases (11 patients with NIDDM and 17 with IGT) were determined by random blood glucose testing followed

by a 2-h 75-g oral glucose tolerance test (OGTT) for those with values ≥ 6.72 mmol/l or for subjects with unconfirmed histories of glucose intolerance. Known cases included 26 patients with NIDDM and 1 with IGT. Control subjects had random blood glucoses < 6.72 or normal OGTT results.

RESULTS--Compared with less-than-daily consumption, both daily seal oil (odds ratio [OR] 0.2, 95% confidence interval [CI] 0.1-0.8) and daily salmon consumption (OR 0.5, CI 0.2-1.1) were associated with a lower prevalence of glucose intolerance, controlling for age, ethnicity, body mass index, and sex. The effects were similar when limited to newly discovered cases: OR 0.3, CI 0.1-1.3 for seal oil and OR 0.4, CI 0.1-1.3 for salmon.

Consumption of seal oil at least five times per week was required to reduce risk.

CONCLUSIONS--Consumption of seal oil and salmon, high in omega-3 fatty acids, appears to lower the risk of glucose intolerance and is a potentially modifiable risk factor for NIDDM in Alaska Natives.

1996. The negative association between traditional physical activities and the prevalence of glucose intolerance in Alaska Natives. *Diabetic Medicine* 13 (6), 555-560. *PEOPLE; health (condition); biochemistry; diabetes; health (comparative);*

The once low prevalence of non-insulin-dependent (Type 2) diabetes (NIDDM) in Eskimos and Indians has risen approximately fourfold over the past 30 years, suggesting the presence of a non-genetic factor affecting NIDDM prevalence. At the same time, traditional physical activities required of a subsistence (self-sufficiency) lifestyle have diminished. Since physical activity has been shown to prevent NIDDM in other populations, we performed a case-control study of physical activity and glucose intolerance in 666 Yup'ik Eskimos and Athabaskan Indians at least 40 years old in 15 villages in the Yukon Kuskokwim Delta in Alaska. Self-administered questionnaires were used to determine whether subjects participated in a number of traditional activities and/or their modern counterpart (for example, dog sledding and riding motorized vehicles). Intensity values and a score were defined for the activities. Cases included known or newly discovered impaired glucose tolerance or NIDDM. Newly discovered cases were defined by oral glucose tolerance testing of those individuals were screening blood glucose values of at least 6.7 mmol per liter by random capillary blood glucose testing. Cases included 11 newly discovered (1 with a history of IGT) and 26 known cases of NIDDM, and 17 newly discovered and 1 known cases of IGT. The results showed that, compared to a reference group with low-level physical activity, moderate level physical activity (odds ratio, OR, 0.7, 95% confidence interval [CI] 0.4-1.3) and high level activity (OR 0.2, CI 0.1-0.6) were associated with a lower prevalence of glucose intolerance, adjusted for age, ethnicity, body mass index, and sex.

ADNR, 1912-present. Alaska's Mineral Industry - Annual Minerals Reports. Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys:

<http://www.dggs.dnr.state.ak.us/minrep.html> *MINING; gold; economics*

INTRODUCTION

This summary of Alaska's mineral industry activity for 2001 is made possible by information provided through phone interviews and replies to questionnaires mailed by the Alaska Division of Geological & Geophysical Surveys. The final report will be available later in the year after further compilation of information, particularly placer mining and industrial mineral data. This report is part of a cooperative venture between the Division of Geological & Geophysical Surveys (DGGS) and the Division of Mining, Land, & Water (DMLW) in the Department of Natural Resources (DNR) and the Division of Community & Business Development (DCBD) in the Department of Community & Economic Development (DCED). The estimates used in this summary are generally conservative due to incomplete data.

Table 1 shows the estimated value of the mineral industry in Alaska per year from 1981 to 2001, as divided between exploration and development investments and the value of the mined products. These preliminary values totaled \$992 million in 2001, compared with \$1,283 million in 2000, due to reduced expenditures for exploration (\$22.1 million in 2001 versus \$34.9 million in 2000), for development (\$83.2 million in 2001 versus \$141.7 million in 2000), and a large decline in the value of production (\$886.9 million in 2001 versus \$1,106 million in 2000). The decline in the value of metal production reflects substantial reductions in the average prices of most metals, which offset near-record production amounts.

The low metal prices also affected the ability of companies to raise capital for exploration, not only in Alaska but globally, and this trend is likely to continue into the year 2002. Compared to the past several years, exploration activity was more evenly distributed throughout Alaska. The eastern interior region saw a sharp reduction in activity, while the Seward Peninsula and southeastern Alaska experienced a rebirth in activity. Gold remained the major exploration commodity, but polymetallic and platinum-group-element (PGE) exploration increased from recent levels.

The decline in the amount expended on development in 2001 resulted mainly from the completion of the \$105 million Mill Optimization Project at Red Dog Mine in northwestern Alaska early in the year, and also from the completion of the adit into the Liese orebody at Pogo Mine in the eastern interior region. Permitting and road and pit development at True North Mine west of Fort Knox Mine near Fairbanks was completed by mid year. Throughput at the mill at Greens Creek Mine near Juneau set a record in 2001, but metal production was down due to milling of lower grade ore. Production at Red Dog Mine was comparable to that of the previous year, as finetuning of the mill continued well into the last quarter of the year. Production in 2002 at Red Dog is expected to increase by about 8 percent. At Fort Knox Mine, blending of the True North gold ore with the regular Fort Knox ore led to record production in 2001, and with a full year of operation, gold production is expected to increase in 2002. The number of placer gold mines and the amount of placer gold produced continued the steady decline since 1997.

1998. ALASKA INTERAGENCY WILDLAND FIRE MANAGEMENT PLAN. Alaska Department of Natural Resources: <http://www.dnr.state.ak.us/forestry/pdfs/98AIFMP.pdf> *VEGETATION; wildfire; management*

EXECUTIVE SUMMARY

Interagency Fire Management Plans (IFMPs) for thirteen geographic areas of the state were prepared under the oversight of the Alaska Interagency Fire Management Council between 1980 and 1988 to provide a coordinated and cost effective approach to fire management on all lands in Alaska. All fire management decisions by land manager/owner(s) are based on values warranting protection, protection capabilities, firefighter safety and/or land and resource management needs. Before the IFMPs, existing policy required the immediate suppression of all wildfires. This policy was costly, of questionable effectiveness, and had a negative effect on the diversity and productivity of the fire-dependent ecosystems in some regions of Alaska. In addition, during periods of high fire activity it was not possible to provide immediate and effective suppression on many fires because of the shortage of personnel, equipment, supplies or aircraft. It was recognized that an improved system was needed for establishing priorities and levels of suppression.

Prior to 1998, it was necessary to refer to three documents to understand fire management in Alaska. The three documents included: (1) Alaska Interagency Fire Management Plan, Tanana/Minchumina Planning Area; (2) the interagency fire management plan for the local area; and (3) the 1984 amendment entitled, "The Alaska Interagency Fire Management Plan. This 1998 amendment called the Alaska Interagency

Wildland Fire Management Plan (AIWFMP) consolidates the original 13 plans and eliminates the need to refer to multiple documents while providing the land manager/owner(s) and fire suppression organizations a single reference for interagency fire management operational information. The amended AIWFMP also incorporates operational changes that have occurred since the inception of the statewide fire management planning effort. This amendment also accomplishes the Fire Management Planning Group objective to eliminate planning area boundaries once the 13 plans were completed (personal communication, F. Malotte).

The AIWFMP contains the common elements from the approved thirteen plans. Area-specific support documentation exists in the original planning documents. Copies of the 13 area specific plans are available at the locations identified in Appendix A. Local land and fire management agency/owners should have a copy of the area specific plan that applies to their area on file. The interim draft of this plan was entitled "Alaska Consolidated Interagency Fire Management Plan 1993." It was also determined that dropping "consolidated" simplified the title. "Fire" was replaced with "Wildland Fire" to adhere to terminology changes approved by the National Wildland Fire Coordinating Group in June 1997.

Since the beginning of the statewide fire planning effort, the goal has been to provide an opportunity through cooperative planning for land manager/owner(s) to accomplish individual fire-related land-use objectives in the most cost-effective manner. Within the AIWFMP, land managers/owners are defined as state and federal land managing agencies, Regional and Village Native corporations, and Native allotment owners represented by the Bureau of Indian Affairs or local tribal organizations. The AIWFMP continues the requirement for an annual, pre-season land manager/owner review of the fire protection needs on lands under their management authority. Once fire protection needs are determined, the lands are placed in Critical, Full, Modified, or Limited management option. Option selections are based on land manager/owner(s) values to be protected as well as land and resource management objectives. The fire management strategies selected vary from initial attack and sustained suppression efforts in the critical and full management areas to surveillance in the limited management areas. This categorization and ensuing prioritization ensures that: (1) human life, private property, and identified resources receive an appropriate level of protection with available firefighting resources, (2) the cost of the suppression effort is commensurate with values identified for protection, and (3) the ability of land manager/owner(s) to achieve their individual management objectives is optimized. The AIWFMP affirms that:

- Lightning caused wildland fires are an important component of the boreal forest and arctic tundra ecosystems, and the complete exclusion of these fires is neither ecologically sound nor economically feasible.**
- In the Southeastern Alaska coastal forest, lightning caused wildland fire is not ecologically significant. People cause the majority of the fires while undertaking logging operations and recreational activities in the coastal forest.**
- The natural role of fire in the environment must be tempered by the need to protect human life and health, private property, developments, and certain valued natural and cultural resources.**
- During the fire season availability of suppression resources may become limited due to commitments on numerous initial attack assignments and/or large fires.**
- The pre-fire season assignment of management options establishes priorities for allocation of suppression forces and substantially improves the cost-effectiveness of wildland fire management.**

•Non-standard responses become necessary when situations such as unusual burning conditions, critical shortages of suppression resources, or human safety and health issues arise. These responses occur rarely and are limited to specific instances and specific geographic locations. A convened Multi-Agency Coordinating (MAC) group or the involved fire suppression organization and land manager/owner(s) will document all non-standard responses.

•Well-trained, well-equipped, and adequately funded suppression forces are essential to maintain public safety and public confidence in the fire management programs, and to provide cost effective suppression while recognizing the role of fire in Alaska ecosystems.

•Pre-suppression efforts, such as fuel break construction and prescribed fires for hazard fuel reduction will reduce the potential threat to human life and private property, and help meet fire-related land and resource management objectives to reduce fire suppression expenditures on adjacent lands.

•Prescribed fire is a viable fire management tool in a variety of situations including:

-- Site-specific land and resource management objectives are not met by the existing fire regime.

-- The spread of human developments makes it unsafe or not cost-effective to use any alternative fire management strategy other than prescribed fire.

-- Reduction of accumulated vegetation (fuels) is necessary to protect human life, developments, and high-value resources.

In addition to the AIWFMP, the Wildland Fire Situation Analysis (WFSA) process is critical to the fulfillment of land manager/owner(s) and suppression organization responsibilities. A WFSA is completed when one of the following occurs:

•a fire escapes initial attack,

•resource shortages prevent prompt implementation of the appropriate suppression response,

•significant additional resources are required to meet suppression objectives because a significant change in suppression strategy/action is anticipated,

•an ongoing fire threatens to or moves into an area that requires an increased suppression response, or

•land manager/owner(s) or suppression organization requests the completion of a WFSA.

The land manager/owner(s) of burning and/or threatened lands together with suppression organization personnel prepare the WFSA to determine the appropriate suppression action. The land manager/owner(s) approve the WFSA, with concurrence by the suppression organization.

Fires are classified either as wildland fires that are managed under the AIWFMP, or prescribed fires, which are ignited to accomplish land and resources objectives, and are managed under agency policies and procedures. The events of the 1994 wildland fire season created a renewed awareness and concern about the impacts of fire and firefighter safety among the Federal land management agencies, State land management agencies and their constituents. As a result of these concerns and in response to specific recommendations in the report by the South

Canyon Fire Interagency Management Review Team (IMRT), the Federal Wildland Fire Management Policy and Program Review was chartered to ensure that Federal policies and cohesive interagency and intergovernmental fire management programs exist. Guiding principles outlined in the Final Report of the Federal Wildland Fire Management Policy and Program Review, dated December 18, 1995, are embodied in the AIWFMP.

The Secretary of Agriculture and Secretary of Interior accepted and endorsed the principles, policies and recommendations in the Federal Wildland Fire Management Policy and Program Review Report.

The State of Alaska recognizes the importance of the Federal Wildland Fire Management Policy and Program Review. The State supports most of the concepts in the policy and is dedicated to working with its federal agency cooperators in assisting them in implementing it in Alaska. If contradictions occur between the Federal Wildland Fire Management Policy and State of Alaska Policy, they will be mitigated on a case-by-case basis.

2002. DGGs Publications. AK Department of Natural Resources, Division of Geological and Geophysical Surveys: <http://www.dggs.dnr.state.ak.us/pubseries.html> *BIBLIOGRAPHY; HYDROLOGY; WATER QUALITY; geology; MINING*

The links [provided] lead to the bibliographic citations for publications in each of DGGs's publication series. These citations are linked to the individual files for each publication. [Including Administrative Reports, Alaska Open File Reports, Alaska Territorial Department of Mines Reports, Annual and Bicentennial Reports, Geochemical Reports, Guidebooks, Geophysical Reports, Geologic Reports, Information Circulars, Laboratory Reports and Laboratory Notes, Miscellaneous Papers, Public-Data Files, Preliminary Investigative Reports, Professional Reports, Raw Data Files, Reports of Investigations, and Special Reports.]

AGI, 2002. Bibliography on Cold Regions Science and Technology. American Geological Institute: <http://www.coldregions.org/qbecoldz.htm> *BIBLIOGRAPHY; engineering; hydrology; water quality; ground water; surface water; sediment; soil; ground ice / permafrost; glaciology; river ice; air quality; infrastructure; bridge; road; pipeline; imaging (remote sensing); precipitation; snow; contaminants; remediation*

The American Geological Institute (AGI) is continuing the Antarctic Bibliography and the Bibliography on Cold Regions Science and Technology as part of the Cold Regions Bibliography Project. These bibliographies provide coverage of

- Antarctic research and exploration
- Cold Regions engineering and physical science information

AGI compiles the Cold Regions Bibliography based on sources provided by U.S. and overseas scientists, the Cold Regions Research and Engineering Laboratory (CRREL), the National Science Foundation (NSF), and libraries and polar and research institutions worldwide.

In addition, through a cooperative agreement with AGI, the Scott Polar Research Institute (SPRI) provides information on the Antarctic materials housed in the SPRI library at the University of Cambridge.

The Cold Regions Bibliography Project is supported by the National Science Foundation and the U.S. Army Cold Regions Research and Engineering Laboratory under NSF Cooperative Agreement No. OPP 9909727.

You may search the data bases for the Antarctic Bibliography and the Bibliography on Cold Regions Science and Technology free of charge through September 2002. Modest subscription rates will apply after this date.

Albert, P., 1995. The history of Kokrines and Ruby along the Yukon River: a project, M.A., 198 p *PEOPLE; anthropology*

Albert, D., 1999. Grizzly bear - human interactions: effects of human activities and habitat selection by bears, University of Alaska Fairbanks, M.S., 64 p *POPULATION; mammals; grizzly bear; habitat selection; seasonality; people; recreation; management*

The author "studied relationships among human activity, habitat selection by grizzly bears (*Ursus arctos*) and interactions between grizzly bears and people in Denali National Park and Preserve, Alaska, USA, during 1990 and 1991. With other variables held constant, distribution of human use was the best predictor of where interactions occurred. Habitats associated with interactions also exhibited seasonal differences consistent with selection of habitat by bears. While interactions increased in association with levels of human use, the number of interactions in which bears approached people increased sharply as use of shuttle buses exceeded approximately 14,000 riders over a 2-week period. Continued focus on regulating levels of human activity, as well as education, monitoring and management are crucial to avoiding conflicts between bears and people in the future"

Albright, L., Masuda, K., and Ennis, G., 1978. Water investigations along the Alaska Highway Pipeline Route in the Yukon Territory. Inland Waters Directorate. Pacific and Yukon Region. Canada, *HYDROLOGY; SEDIMENT; engineering; infrastructure; pipeline*

Contents: [v. 1]. Main report -- [v. 2]. Appendix A. Streamflow and suspended sediment at selected sites along the Alaska Highway route in the Yukon Territory. Appendix B. A study of selected hydrologic quantities of the Yukon Territory for examination of pipeline proposals. Appendix C. Channel geometry of streams in the Yukon Territory. Appendix D. Kinematic wave model -- [v. 3]. Appendix E. Water quality processes and conditions in the Ogilvie and Swift river basins, Yukon Territory /by H. Schreier -- [v. 4]. Appendix F. Microbial water quality of the Ogilvie and Swift river basins

Aldrich, J., 1979. Sheet-rill erosion associated with landscape manipulation within interior Alaska, University of Alaska Fairbanks, 92 p *INCOMPLETE (need abstract); SOIL; HYDROLOGY; surface water; engineering*

Alexander, V., and Gu, B., 1996. The limnology of Smith Lake. In: Milner, A., and Oswood, M., eds., *Freshwaters of Alaska: Ecological Synthesis*. Ecological Studies. Springer, New York, NY, pp. 131-153. *LIMNOLOGY; POPULATION; invertebrates; water quality; nutrient cycling; nitrogen; vegetation; mosses; black spruce*

Smith Lake (64 degree 52'N and 146 degree 52'W) is located in the Tanana River valley in the interior region of Alaska between two major mountain ranges, the Alaska Range to the south and the Brooks Range to the north. Here, rolling hilly terrain is transected by the Yukon-Tanana river system, forming a valley that exceeds 150 km in width. The region experiences large seasonal temperature extremes, with warm dry summers and very cold dry winters, and a mean annual precipitation of only about 30 cm. The Smith Lake watershed is occupied by typical taiga forest, composed of spruce, aspen, birch, and alder, with a ground cover of subarctic muskeg. Black spruce (*Picea mariana*) dominates. The mosses that comprise the muskeg ground cover have low decomposition rates. Research on Smith Lake has focused on the nitrogen cycle, but a considerable body of limnological information has been amassed for this lake in conjunction with that work. The initial research was carried out between 1962 and 1967, with a second research program undertaken between 1988 and 1993. The techniques applied to limnological work have changed somewhat in the interim and therefore the results are not exactly comparable; nevertheless this chapter offers an excellent opportunity to make reasonable comparisons to determine whether the lake has changed significantly over the 20 year period.

Alt, K., 1979. Contributions to the life history of the humpback whitefish in Alaska. Transactions of the American Fisheries Association 108 (2), 156-160. *POPULATION; fish; whitefish; distribution; behavior (reproductive/nesting); growth/development; subsistence*

Modal gill raker counts of *Coregonus pidschian* from various areas of Alaska ranged from 21 to 26, with populations of coastal streams having lower counts. Humpback whitefish are mainly distributed north of the Alaska Range and are found in lakes, streams, and brackish water. Feeding migrations into lake and slough areas of many Alaskan waters occur soon after ice breakup, with an outmigration occurring during freeze-up. Many spawning populations migrate upstream during summer and fall and spawn in upper reaches of rivers. Spawning generally occurs during late September and October over gravel bottoms. Humpback whitefish studied reached 540 mm fork length and age XIV [14 years]. Populations from interior Alaska waters grow faster than coastal populations, with Chatanika River fish reaching 442 mm at age VIII. First maturity is usually reached between ages V [5 years] and VII [7years]. Main utilization of the humpback whitefish in Alaska is for subsistence but small commercial and sport fisheries exist in interior Alaska.

AMAP, 1997. Arctic Pollution Issues: A State of the Arctic Environment Report. Arctic Monitoring and Assessment Program: <http://www.amap.no/assess/soaer-cn.htm> *CONTAMINANTS; POPs (persistent organic pollutants); metals; radiation; acidification; noise; air quality; climate; mining; population; people; mammals; birds; sediment; soil; vegetation; water quality*

INTRODUCTION

Environmental protection of the Arctic –a short history

Concerns about contaminants in the Arctic date back at least 30 years, with an increasing and broadening awareness since the early 1970s. In the spring of 1989, Finland proposed a conference on the protection of the Arctic environment. The idea was favorably received by the governments of the other circumpolar countries: Canada, Denmark/Greenland, Iceland, Norway, Sweden, the Soviet Union, and the United States. The first preparatory meetings were held in Rovaniemi, Finland, in September 1989, which started the ‘Rovaniemi process’.

One idea agreed upon early was to produce a series of reports concerning the potential pollutants in different parts of the Arctic environment and its ecosystems. These initial ‘State of the Arctic Environment’ reports were presented at the First Arctic Ministerial Conference in Rovaniemi, Finland in June 1991. The ministerial conference was a breakthrough in the development of international cooperation for the protection of the Arctic, and led to the adoption of the Arctic Environmental Protection Strategy (AEPS).

The objectives of the AEPS, as adopted in the Rovaniemi Declaration, are as follows:

- *to protect the Arctic ecosystems, including humans;**
- *to provide for the protection, enhancement and restoration of environmental quality and sustainable utilization of natural resources, including their use by local populations and indigenous peoples in the Arctic;**
- *to recognize and, to the extent possible, seek to accommodate the traditional and cultural needs, values and practices of indigenous peoples as determined by themselves, related to the protection of the Arctic environment;**
- *to review regularly the state of the Arctic environment;**
- *to identify, reduce and, as a final goal, eliminate pollution.**

Moreover, in adopting the AEPS, the governments of the eight circumpolar countries formally recognized the importance of including representatives of indigenous peoples of the north as active participants in the process.

To implement the AEPS, five working groups were instituted:

Arctic Monitoring and Assessment Programme (AMAP), with responsibilities to monitor the levels and assess the effects of anthropogenic pollutants in all compartments of the Arctic environment.

Conservation of Arctic Flora and Fauna (CAFF), with responsibilities to facilitate the exchange of information and coordination of research on species and habitats of Arctic flora and fauna.

Emergency Prevention, Preparedness and Response (EPPR), with responsibilities to provide a framework for future cooperation in responding to the threat of Arctic environmental emergencies.

Protection of the Arctic Marine Environment (PAME), with responsibilities to take preventative and other measures directly or through competent international organizations regarding marine pollution in the Arctic, irrespective of origin.

Sustainable Development and Utilization (SDU), with responsibilities to propose steps governments should take to meet their commitment to sustainable development of the Arctic, including the sustainable use of renewable resources by indigenous peoples.

Since the First Arctic Ministerial Conference in 1991, two further conferences have been held, in Nuuk, Greenland in 1993, and in Inuvik, Canada in 1996. A fourth AEPS Ministerial Conference, in Norway in 1997, will consider this report and its recommendations. Following this conference, the AEPS and its programs will be incorporated under the newly established Arctic Council.

AMAP

AMAP's first objective has been to provide information for a comprehensive assessment report on threats from pollution to Arctic ecosystems. The assessment was to identify possible causes for changing conditions, detect emerging problems, and recommend actions required to reduce risks to Arctic ecosystems.

From its inception, AMAP was conceived as a process integrating both monitoring and assessment activities. During its first period (1991-1996), AMAP has designed and implemented a coordinated program to monitor levels of pollutants in all compartments of the Arctic environment – the atmospheric, terrestrial, freshwater, and marine environments – and in human populations with respect to human health.

AMAP has also instituted an assessment process to produce assessment reports based on data already published in scientific literature, data obtained from AMAP's monitoring program, and traditional knowledge.

International agreements relevant to the Arctic

Pollution issues are covered by several international agreements that are important in political efforts to reduce damage to Arctic ecosystems. Those that have particular relevance to this assessment are:

Convention on Long-Range Transboundary Air Pollution (LRTAP): The purpose of the UN Economic Commission for Europe's LRTAP Convention is to prevent, reduce, and control transboundary air pollution from both existing and new sources. This regional, binding agreement and the five related protocols represent the most appropriate instrument for addressing relevant components of the Arctic pollution problem. Current negotiations in LRTAP include efforts to conclude a new protocol on photochemical pollution, acidification, and eutrophication, and to prepare new protocols on heavy metals and persistent organic pollutants.

Convention for the Protection of the Marine Environment of the North East Atlantic, 1992 (OSPAR): OSPAR was developed under the Oslo and Paris Commissions to update two existing Conventions (the 1974 Paris Convention for the Prevention of Marine Pollution from Land-based Sources, and the 1972 Oslo Convention for the Prevention of Marine Pollution from Ships and Aircraft). The 1992 OSPAR Convention is currently one of the most applicable international agreements for addressing Arctic marine pollution from various sources.

The International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78): This convention is a combination of two treaties adopted in 1973 and 1978. It covers all the technical aspects of pollution from ships, except the disposal of waste into the sea by dumping, and applies to ships of all types. It has five annexes covering oil, chemicals, sewage, garbage, and harmful substances carried in packages, portable tanks, freight containers, etc.

Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter - London Dumping Convention: The London Dumping Convention is the primary international agreement regulating ocean dumping of wastes. It has direct significance for several aspects of environmental protection of the Arctic, particularly in relation to radioactive waste disposal issues. All eight Arctic countries are Contracting Parties and have signed a recent comprehensive revision and restructuring of this Convention.

Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer: The Vienna Convention of 1985 identified the threat to ozone in the atmosphere and resulted in the adoption of the 1987 Montreal Protocol, which limits the production of substances responsible for stratospheric ozone depletion. Compliance with the protocol including its amendments is the primary mechanism for protecting stratospheric ozone.

Climate Convention: Adopted at the Rio Conference in 1992, the United Nations Framework Convention on Climate Change provides an international framework to discuss greenhouse gases, especially carbon dioxide. A ministerial declaration at a meeting of parties to the convention in June 1996 includes instructions to negotiate binding agreements to reduce emissions.

UNEP Global Programme of Action: The 19th session of the UNEP Governing Council has decided to establish a negotiating committee before July 1, 1998 to prepare a global, legally-binding agreement on at least 12 persistent organic pollutants, and to finish its work before 2000. This fulfills a ministerial agreement within UNEP's Global Programme of Action for the Protection of the Marine Environment from Land-based Activities.

The initial work of AMAP focuses on three priority pollutants: persistent organic pollutants, heavy metals, and radioactivity. AMAP was also requested to monitor hydrocarbons to achieve better documentation of oil pollution in the Arctic. At the Nuuk ministerial conference in 1993, acidification was given priority status on a subregional basis for Fennoscandia. Global climate change and stratospheric ozone layer depletion are addressed by other international programs, and at Nuuk AMAP was asked to assess whether the coverage of Arctic areas was sufficient within these programs.

Structure

The work of AMAP is implemented by the AMAP Working Group, which includes the following members:

Representatives from the eight Arctic countries: Canada, Denmark/Greenland, Finland, Iceland, Norway, Russia, Sweden, and the United States;

Representatives from indigenous peoples organizations: Saami Council, Inuit Circumpolar Conference (ICC), and the Association of Indigenous Peoples of the North, Siberia, and the Far East of the Russian Federation (AIPON).

To facilitate and harmonize AMAP's work with other actors in the Arctic, the following countries and organizations participate as observers in the Working Group:

Observing countries: Germany, Netherlands, Poland, United Kingdom;

Observing and Cooperating International Organizations: Advisory Committee on Protection of the Sea (ACOPS), European Environment Agency (EEA), International Arctic Science Committee (IASC), International Atomic Energy Agency (IAEA), International Council for the Exploration of the Sea (ICES), International Union for Circumpolar Health (IUCH), Nordic Council of Parliamentarians (NCP), Northern Forum, OECD Nuclear Energy Agency (OECD/NEA), Oslo and Paris Commissions (OSPARCOM), United Nations Economic Commission for Europe (UN ECE), United Nations Environment Programme (UNEP), World Meteorological Organization (WMO), World Wide Fund for Nature (WWF);

AEPS Organizations: Conservation of Arctic Flora and Fauna (CAFF), Protection of the Arctic Marine Environment (PAME), Emergency Prevention, Preparedness and Response (EPPR), Indigenous Peoples Secretariat (IPS), Sustainable Development and Utilization (SDU).

AMAP also established an Assessment Steering Group to coordinate all work associated with the assessment of contaminants in the Arctic environment. The members are scientists active in different fields of research, representatives of indigenous peoples organizations, and the AMAP Board (chair, vice-chair, and executive secretary).

AMAP is supported by a permanent Secretariat located in Oslo, Norway.

AMAP's assessment process

This assessment of contaminants in the Arctic regions has not been designed as an assessment of environmental impact, nor is it intended to be a formal risk assessment for human and environmental health for the purposes of developing risk management policies. Rather, the aim of the assessment is to provide a baseline for understanding the status of contaminants in the Arctic: it provides the fundamental information needed to structure and conduct formal risk assessments related to human health and ecosystem damage in future work.

The assessment reports

The assessment is presented in two reports. The scientific documentation, including data and references, is available in *The AMAP Assessment Report: Arctic Pollution Issues*, which has been prepared by drafting groups with key scientific expertise under the responsibility of one or more lead countries. The work has been supported by a large number of additional experts. Representatives of indigenous peoples organizations have actively participated in the assessment, especially in those chapters that concern human populations and human health. The authors of the respective chapters are responsible for the content and conclusions in their chapters of *The AMAP Assessment Report: Arctic Pollution Issues*.

The second report, *Arctic Pollution Issues: A State of the Arctic Environment Report*, is a summary and synthesis of *The AMAP Assessment Report: Arctic Pollution Issues*, written by a science journalist for a general audience interested in the implications of contaminants in the Arctic environment. While the Assessment Steering Group, with the assistance of many experts, has provided information and feedback for this second report, the responsibility for its final content, including the Executive Summary, rests with the AMAP Working Group.

The structures of the two reports are similar, and readers of this book interested in more details about particular topics are referred to the corresponding chapters of *The AMAP Assessment Report: Arctic Pollution Issues*.

Reader's guide

The AMAP Working Group has summarized the information from AMAP's assessment of pollution in the Arctic in the Executive Summary, which appears at the beginning of this report. The Executive Summary also highlights the actions that need to be taken to follow up on the assessment, including scientific research priorities for continued assessment work and recommendations for political actions to reduce or limit further contamination of the Arctic.

More information on each of the subjects is found in the different chapters in the body of this report.

The Introduction (this chapter), describes the political background for the reports and the assessment process, and chapters 2 to 5 form a background for the discussion of specific contaminants.

The Arctic describes the geography of the area covered in AMAP's assessment and some features of the Arctic environment.

Physical pathways of contaminants transport focuses on the movement of contaminants with air masses, ocean currents, and waterways, specifically addressing the Arctic as a recipient of contaminants from other areas.

Polar ecology discusses adaptations of Arctic plants and animals to the polar environment that make them especially susceptible to the effects of contaminants. It also describes biological pathways and food webs in terrestrial, freshwater, and marine ecosystems.

Peoples of the North gives an introduction to Arctic lifestyles with a focus on indigenous populations. Special emphasis is placed on the role of traditional foods in a cultural context.

The following four chapters, **Persistent organic pollutants, Heavy metals, Radioactivity, and Acidification and Arctic haze**, contain syntheses of the circumpolar assessment of priority pollutants, describing their toxicology, levels, trends, and effects on Arctic plants and animals.

Petroleum hydrocarbons describes the actual and potential effects of oil exploitation in the Arctic. This chapter also includes a discussion of levels and trends of polycyclic aromatic hydrocarbons (PAHs).

Two global environmental issues and their potential effects on the Arctic environment are covered in the chapter **Climate change, ozone depletion, and ultraviolet radiation**.

Pollution and human health assesses the impact that the contaminants described in the other chapters have on human well-being and provides a context of communication and culture that is essential in the continued discussion of Arctic pollution issues. It also presents the first results of AMAP's human health monitoring program.

The report also contains a circumpolar map (inside front cover).

1998. Assessment Report: Arctic Pollution Issues. Arctic Monitoring and Assessment Programme, Oslo, Norway.

1999. Strategic Plan: 1998-2003. AMAP report 99:6. AMAP, Oslo. www.amap.no/ol-docs/str-plan.pdf *REFERENCE; CONTAMINANTS; POPs (persistent organic pollutants); metals; radiation; research methods*

The AMAP Strategic Plan presents an overall strategy of collaborative actions involving the AMAP member countries and permanent participants, observing countries and observing organizations to meet the Ministerial requests. The aim of the Strategic Plan is to set a framework for implementing practical activities within AMAP.

2001. Guidelines for the AMAP Phase 2 Assessments. AMAP Report 2001:1. AMAP, Oslo. www.amap.no/ol-docs/assess-gl.pdf *REFERENCE; CONTAMINANTS; POPs (persistent organic pollutants); metals; radiation; research methods*

Preface

In 1997, AMAP presented its first State of the Arctic Environment Report. This assessment was conducted according to an agreed set of guidelines (Guidelines for the AMAP Assessment, AMAP Report 95:1).

AMAP's second phase (1998-2003) aims to produce a series of assessments between 2002 and 2004 that will update and expand upon the information presented in its 1997 assessment. As a part of this activity, a revised set of assessment guidelines has been prepared by the AMAP Working Group as part of its direction to the Assessment Steering Group (ASG) that is responsible for the preparation of the phase 2 assessments.

The first draft of the revised "Guidelines for the AMAP Phase 2 Assessments" (Version 1.0) was prepared during 2000 and published as Version 1.1 (AMAP Report 2001:1) in January 2001. It is the intention that these Guidelines be updated and extended as necessary, to incorporate new information arising as work in preparing the assessment reports proceeds. The AMAP Secretariat would appreciate any comments concerning

improvement or additions to these guidelines and will distribute revised sections as appropriate.

The Arctic Monitoring and Assessment Programme (AMAP) was established in 1991 under the Arctic Environmental Protection Strategy (AEPS) and is, since 1997, a programme group of the Arctic Council. AMAP is mandated to "monitor the levels of and assess the effects of anthropogenic pollutants in all compartments of the Arctic Environment and to prepare regular State of the Arctic Environment Reports, summarising the results of AMAP as a basis for necessary steps to be taken to reduce pollution".

It is the intention that all experts involved in the drafting of the AMAP assessments will follow the recommendations presented in these guidelines, especially regarding quality assurance and data handling procedures and instructions to authors and drafting groups regarding language, document registration and identification, exchange and distribution of assessment texts, units/symbols/abbreviations, statistics, biological data and bibliographical references, etc.

2002. Arctic Pollution 2002, Tromso, Norway, Arctic Monitoring and Assessment Programme Andersen, D., 1982. Regional subsistence bibliography; Volume II Number I; Interior Alaska. Technical Paper no. 2. Alaska Dept. of Fish and Game, Division of Subsistence, Juneau, Alaska. <http://www.state.ak.us/adfg/subsist/geninfo/publctns/subabs.htm#interiorregion> *PEOPLE; subsistence; BIBLIOGRAPHY; traditional food; nutrition; land use; population; climate; mining; management; economics*

This bibliography compiles references related to many aspects of subsistence in Alaska's interior and western Yukon Territory. "In an attempt to provide a broad spectrum of information to researchers, title collection efforts were directed toward the following major subject areas: 1) subsistence hunting, fishing, trapping, and gathering; 2) physical, historical, social, economic, and demographic profiles of contemporary Alaskan Communities; 3) the impacts of historic and contemporary development upon communities, culture, rural economies, and subsistence resources; 4) the distribution and movement of wild, renewable resources of Alaska; 5) diet, nutrition, and health of rural Alaskans, as they relate to hunting, fishing, trapping, and gathering; 6) traditional Alaska Native culture, society, and sociocultural change; and 7) archeological reconstructions of past land use patterns, resources utilized, and subsistence technologies."

1992. The Use of Dog Teams and the Use of Subsistence-Caught Fish for Feeding Sled Dogs in the Yukon River Drainage, Alaska. Technical Paper No. 210. Alaska Department of Fish and Game, <http://www.state.ak.us/adfg/subsist/geninfo/publctns/subabs.htm#interiorregion> *PEOPLE; subsistence; traditional food; fish; salmon; domestic animals; dog; trapping*

In response to a petition to the Board of Fisheries to prohibit the feeding of subsistence-caught salmon to sled dogs used for racing, trapping, and other commercial uses, this study examined the use of dog teams in central Alaska and the use of subsistence-caught fish to feed them. Interviews were conducted with mushers during May and June 1991 in the Yukon River drainage communities of Fort Yukon, Huslia, Kaltag, Manley, Russian Mission, St. Mary's and Tanana. The 68 mushers surveyed owned a total of 1,078 dogs in kennels ranging in size from four to 80 dogs. Includes an overview of the Yukon River drainage sled dog population, a description of how dog teams are used today, and examines the kinds and quantities of fish used to feed dogs. The use of fish by urban mushers is also discussed based on telephone interviews with Fairbanks area mushers. Andersen, D., and Alexander, C., 1992. Subsistence Hunting Patterns and Compliance with Moose Harvest Reporting Requirements in Rural Interior Alaska. Technical Paper No. 215.

Alaska Department of Fish and

Game, <http://www.state.ak.us/adfg/subsist/geninfo/publctns/subabs.htm#interiorregion>
subsistence; PEOPLE; traditional food; population; moose; management

This report discusses why traditional subsistence moose hunting patterns in many rural Interior Alaska communities are not conducive to moose harvest reporting requirements of the state management system. Key respondent interviews were used to identify factors related to this issue. Common traditional practices include several group hunts and sharing of moose kills among multiple households over the course of a year. Individual non-transferable bags of one moose, and individual harvest reporting tickets in state regulation were bound to be difficult to use for reporting harvests under the traditional system. Other factors included traditional seasons and differences in language.

Andersen, D., 1993. Trapping in Alaska and the European Economic Community import ban on furs taken with leghold traps. Technical paper 223. Alaska Department of Fish and Game, Division of Subsistence, Juneau, Alaska.

<http://www.state.ak.us/adfg/subsist/geninfo/publctns/subabs.htm#interiorregion> *PEOPLE; subsistence; trapping; economics*

Trapping has a centuries-long history in Alaska. Among the indigenous people of the arctic and subarctic, furbearers have been important sources of food and furs for clothing and trade. The search for furs and the expanding network of Russian and Euroamerican fur trading posts into the North American frontier in the 19th century was the predominant agent of "first contact" with the indigenous population over much of Alaska.

An organized "anti-trapping movement" has a history spanning more than 65 years in the United States. The leghold trap has been the focus of much of the controversy over trapping. Increasingly, those opposed to trapping and the use of leghold traps have aligned with well-funded and politically influential animal-rights groups concerned with a broad range of animal welfare issues. Such groups have been successful in promoting anti-trapping legislation in several U.S. states and in Europe.

Andersen, D., Utermohle, C., and Brown, L., 2000. The 1998-99 harvest of moose, caribou, and bear in ten middle Yukon and Koyukuk River communities. Technical paper 251. Alaska Dept. of Fish and Game, Division of Subsistence, Juneau. *INCOMPLETE (need abstract); PEOPLE; subsistence; traditional food; moose; caribou; grizzly bear; black bear*

Andersen, D., Utermohle, C., and Jennings, G., 2001. The 1999-2000 harvest of moose, caribou, and bear in ten middle Yukon and Koyukuk River communities. Technical paper 262. Alaska Dept. of Fish and Game, Division of Subsistence, Juneau. <http://www.arlis.org/> *INCOMPLETE (need abstract); subsistence; PEOPLE; traditional food; moose; caribou; grizzly bear; black bear*

Anderson, R.S., 1981. The biology and distribution of the silphidae and agyrtidae of Canada and Alaska (Insecta: coleoptera [beetles]) [microform], Carleton University, M. Sc., 279 p *INCOMPLETE (need abstract); POPULATION; invertebrates; insects; beetle; distribution*

Anderson, B.A., 1983. Habitat selection and habitat partitioning in four Interior Alaska sparrows, University of Alaska Fairbanks, M.S., 78 p *INCOMPLETE (need abstract); POPULATION; birds; songbirds; sparrow; distribution; habitat selection; behavior (territorial)*

Andrews, E.F., 1975. Salcha: an Athapaskan band of the Tanana River and its culture, University of Alaska, M.A., 173 p *INCOMPLETE (need abstract); PEOPLE; subsistence; anthropology; traditional food; history*

Andrews, E., 1985. Moose Hunting in the Minto Flats Management Area by Minto Permit Holders, 1984-85. Technical Paper No. 122. Alaska Department of Fish and Game, *subsistence; hunting; moose; population; people; economics*

This report describes moose hunting activities by residents of Minto who participated in the Minto Flats Management Area permit moose hunt during the 1984-85 season. Information is presented on historic and contemporary moose hunting, methods, harvest levels, hunting party composition, characteristics of permit holders, and costs of hunting.

1986. Yukon River Subsistence Fall Chum Fisheries: An Overview. Technical Paper No. 147. Alaska Department of Fish and Game, *PEOPLE; subsistence; fishing; fish; salmon; chum*

This report describes the subsistence fall chum salmon fisheries along the Yukon River in terms of geographic location, seasonality, methods and means, and harvest trends since 1977. The report focuses on Alaska communities of the Yukon River drainage.

1988. The Harvest of Fish and Wildlife for Subsistence by Residents of Minto, Alaska. Technical Paper No. 137. Alaska Department of Fish and Game, *PEOPLE; subsistence; hunting; fishing; trapping; vegetation; traditional food; economics*

This study describes the harvest of fish and wildlife by residents of Minto in central Alaska. It includes harvest levels of fish and wildlife species used, geographic areas used for harvesting, and participation in harvests. The report also describes historical development of the community from the late 19th century through 1984 and describes historic and contemporary settlement patterns and annual round of subsistence activities. Socioeconomic conditions and demographic aspects of the community are included for all 48 households which comprised the community in 1983-84. The study found that hunting and fishing made major contributions to Minto's economy and household participation was high during 1983-84. A survey of nearly all households showed that household harvests averaged 3,971 edible pounds of wild fish, game and plants with a per capita harvest of 1,015 pounds. Minto's economy is based on a combination of cash and subsistence components. Variety in income sources and fish and wildlife harvests typifies the individual household economy and that of the community as a whole.

ANHB, 1999. Rural Alaska Sanitation Coalition website. Alaska Native Health Board:

<http://www.anhb.org/sub/rasc/index.html> *INFRASTRUCTURE; WATER QUALITY; CONTAMINANTS; waste (human); waste (solid); health (condition); economics; bibliography*
Many rural Alaskans live without running water and flush toilets. The basic sanitation needs in nearly one-half of Alaska's 192 Native villages have yet to be met. Another 76 rural communities are not considered to be Native villages; however, the Federal Field Work Group on Alaska Rural Water and Wastewater Sanitation Issues reported in 1995 "sanitation facilities in a number of these communities are known to be similar to those of Alaska Native villages."

The work group, which was commissioned by Congress, reviewed the social-economic factors contributing to sanitation inadequacy and noted that one-fourth of Alaska's Native residents "live without running water and use plastic buckets for toilets."

In many villages, residents must haul water to their homes. Due to the high need for housing, many homes are constructed without adequate sanitation facilities being available to connect homes or provide safe running water or proper sewage disposal.

Communities are often faced with having to make difficult decisions between adequate housing and adequate sanitation.

The provision of acceptable sanitation services is often a prerequisite to economic development and growth. It is difficult for villages which lack these basic services to attract viable local industries or develop as a community. For example, the full potential of eco-tourism may not be realized in rural Alaska since even the most seasoned traveler would prefer to visit an area where safe drinking water and flush toilets are available.

If villages had acceptable water and sewage systems, they could develop industries thereby bringing more jobs and a cash-economic base into their communities.

The Rural Alaska Sanitation Coalition, more commonly referred to as RASC, is a statewide coalition committed to bringing about positive, long-term change in the substandard water, sewer, solid waste, and related environmental health conditions existing in Alaska villages.

2001. Alaska Native Health Links, Reports, and Other Helpful Resources. Alaska Native Health Board: <http://www.anhb.org/sub/epi/resources.html> *PEOPLE; health (condition); health (effects); health (comparative); diabetes; cancer; alcohol; contaminants; subsistence; traditional food; economics; risk assessment; bibliography*

Antcliffe, B., and Finster, A., 1999. Dissolved gas supersaturation monitoring at three hydroelectric generating facilities in the Yukon, Canada, in August of 1997 and 1998. 2275. Department of Fisheries and Oceans, Vancouver, BC (Canada). *INFRASTRUCTURE; WATER QUALITY; infrastructure; dam; limnology; population; fish; risk assessment; monitoring*
The Department of Fisheries and Oceans conducted dissolved gas supersaturation monitoring at three hydroelectric generating facilities in the Yukon, Canada, in August of 1997 and 1998. The three facilities were Whitehorse Rapids, Aishihik, and Mayo. The purpose was to conduct an initial reconnaissance program and use the results to identify future monitoring and assessment needs in preparation for relicensing of the facilities under the Yukon Waters Act. At all facilities, total gas pressure measurements were below acute levels for all species and life history phases of interest. Concern remains in regard to chronic effects in shallow water habitat, particularly during periods of warm water temperatures. Recommendations for further sampling and biological investigations include: THP sampling below Whitehorse Rapids Dam and in the Aishihik tailrace to assess potential chronic effects; TGP sampling below the Wareham Lake Dam spillway; and fish utilisation of shallow water habitat where low-level TGP is sustained over long periods of time.

ANTHC, 2002. website. Alaska Native Tribal Health Consortium: <http://www.anthc.org/> *PEOPLE; health care; health (condition)*

Thirty years ago Alaska's indigenous people began a long journey towards the realization of a tribally-governed Alaska Native health care system. In 1999, we arrived. The perseverance, intelligence, and vision of tribal health care leaders brought about this historic achievement. Together, we have created one of the most sophisticated and comprehensive tribally owned and managed health care systems in the world. It provides seamless integrated programs to more than 100,000 Alaska Natives from 226 tribes in all parts of this vast state. The Consortium has joined a state-of-the-art health care system which provides the highest quality health care services to all Alaska Natives.

Anthony, R., Anderson, W., Sedinger, J., and McDonald, L., 1995. Estimating populations of nesting brant using aerial videography. *Wildlife Society Bulletin* 23 (1), 80-87. *POPULATION; birds; waterfowl; brant; imaging (remote sensing); reproduction; monitoring*

We mounted a video camcorder in a single-engine aircraft to estimate nesting density along 10-m wide strip transects in black brant colonies on the Yukon Delta National Wildlife Refuge, Alaska during 1990-1992. A global positioning system (GPS) receiver was connected to the video recorder and a laptop computer to locate transects and annotate video tape with time and latitude-longitude at 1-second intervals. About 4-5 hours of flight time were required to record 30-40 minutes of video tape needed to survey large (>5,000 nests in > 10 km²) colonies. We conducted ground searches along transects to locate and identify nests for determining detection rates of nests in video images. Counts of nests from video transects were correlated with actual numbers of nests. Resolution of images was sufficient to detect 81% of known nests (with and without incubating females). Of these, 68% were correctly identified as brant nests. The most common misidentification of known nests was failure of viewers to see the nest that the detected bird was incubating. Unattended nests with exposed eggs, down-covered nests, and nesting brant, cackling Canada geese, and emperor geese were identified in video images. Flushing of incubating geese by survey aircraft was not significant. About 10% of known nests were unoccupied in video images compared to 16% unoccupied nests observed from tower blinds during periods without aircraft disturbance.

Anthony, R., 1996. Den use by arctic foxes (*Alopex lagopus*) in a subarctic region of western Alaska. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 74 (4), 627-631.

POPULATION; mammals; fox; behavior (reproductive/nesting); distribution; habitat selection; vegetation

Distribution, abundance, and use of arctic fox dens located in coastal tundra communities of the Yukon-Kuskokwim delta were determined in studies from 1985 to 1990. Dens were denser and less complex than those described in studies conducted above the Arctic Circle. Eighty-three dens of varying complexity were found in the 52-km² study area. Nineteen dens were used by arctic foxes for whelping or rearing pups. Three females relocated litters to multiple dens; a maximum of four dens were used concurrently by pups from one litter. Although red foxes (*Vulpes vulpes*) were common in the region, their use of dens in the study area was minimal. Differences in vegetation at den sites and nearby unoccupied sites were minimal. Furthermore, den sites could not be distinguished from non-den sites during aerial surveys.

1997. Home ranges and movements of arctic fox (*Alopex lagopus*) in western Alaska. *Arctic* 50 (2), 147-157. *POPULATION; mammals; fox; distribution; habitat selection; behavior (reproductive/nesting); monitoring*

During the period from 1985 to 1990, radio collars were attached to 61 arctic foxes (*Alopex lagopus*) in the coastal region of the Yukon-Kuskokwim Delta in western Alaska. Radio tracking using hand-held receivers from aircraft and from fixed towers was conducted to determine daily and seasonal movements of foxes. Intensive radio tracking of 18 foxes from May through July indicated that males used larger areas ($x = 10.22$ plus or minus 6.18 km²) than females ($x = 4.57$ plus or minus 1.94 km²) regardless of breeding status. Generally foxes were relocated near ($x = 3.4$ plus or minus 2.4 km) their summer home ranges during other seasons of the year. There were no complex social groups of foxes among the marked population. Foxes did not have a definitive preference for any plant community, probably because of the even distribution and abundance of prey throughout all communities. Thirty foxes were relocated repeatedly during a period of at least 10 months, which included the denning season of one year and the breeding season of the next. Of 24 confirmed deaths of collared foxes, 16 were caused by shooting or trapping by local residents and 8 had unidentified causes. Maximum distance moved between relocations was 48.4 km. Males moved farther from initial capture sites in the winter following capture than did females, largely because of greater

than 20 km movements by two foxes. There were no seasonal differences in movements between males and females.

Anthony, R., Barten, N., and Seiser, P., 2000. Foods of arctic foxes (*Alopex lagopus*) during winter and spring in western Alaska. *Journal of Mammalogy* 81 (3), 820-828. *POPULATION; mammals; fox; behavior (feeding); nutrition; trapping*

During 1986-1991, carcasses of 619 arctic foxes (*Alopex lagopus*) collected from local trappers and at biological field camps on the Yukon-Kuskokwim Delta in western Alaska from November through May were analyzed to determine gastrointestinal contents, age, sex, and body condition. Prey in declining order of importance were small mammals (95% tundra voles, *Microtus oeconomus*), birds, marine mammals, and fishes. Foxes with small mammal remains in their stomachs were captured farther from the Bering Sea coast ($x = 5.2$ km) than those without small-mammal remains (2.8 km); foxes consuming remains of marine mammals were closer to the coast (1.9 km) than others (4.9 km). Although eggshells had a poor likelihood of occurrence in stomachs, they were found in all months and years. In 1986 and 1987, foxes consumed fewer small mammals than in other years. Mean ages of foxes captured in 1986 (3.7 years) and 1987 (3.2) were greater than in all other years (1.5). Capture of adults was more common as winter progressed. Indexes of subcutaneous fat decreased annually in April-May and were highest in 1991, when occurrence of carrion of marine mammals was highest.

Armbruster, W., and Guinn, D., 1989. The solitary bee fauna (Hymenoptera: Apoidea) of interior and arctic Alaska: flower associations, habitat use, and phenology. *Journal of the Kansas Entomological Society* 62, 468-483. *INCOMPLETE (need abstract); POPULATION; insects; bee; vegetation; habitat selection; climate; seasonality*

Arnow, G., and Hubbs, G., 196-. Characteristics of surface and ground waters in selected villages of Alaska. Anchorage, Arctic Health Research Center. *INCOMPLETE (need abstract); WATER QUALITY; surface water; ground water; hydrology; sediment; ground ice / permafrost*
Contents: Pt. 1. Lower Kuskokwim River, Lower Yukon River, Norton Sound-Seward Peninsula, Kotzebue and St. Lawrence Island.--Pt. 2. Drainages of the Tanana River, Upper Yukon River, Koyukuk River, Brooks Range and Arctic Slope

Arvey, W.D., 1974. Glycerol metabolism and other biochemical features associated with overwintering in the adult insect *Pterostichus brevicornis* (Carabidae [Ground beetles and tiger beetles]): College [Fairbanks], University of Alaska, Ph.D., 123 p *INCOMPLETE (need abstract); POPULATION; insects; beetle; seasonality; biochemistry; metabolism; endocrinology*

Arvey, W., and Burkholder, A., 1990. Stock Assessment of Northern Pike in the Vicinity of the Yukon River Haul Road Crossing, 1988 and 1989. Fisheries Manuscript 90-1. Alaska Department of Fish and Game; Division of Sport Fish, Anchorage.
<http://www.sf.adfg.state.ak.us/FedAidPDFs/fm90-01.pdf> *POPULATION; fish; pike; distribution; management; growth/development; infrastructure; road*

Northern pike, *Esox lucius*, were studied during the summers of 1988 and 1989 to determine whether harvests were sustainable in the Dall River. In the summer of 1988, 1,827 northern pike were sampled and tagged in streams located in the vicinity of the Yukon Haul Road Bridge: Dall River (964), Little Dall River (276), Old Lost Creek (437), Ray River (55), Hess Creek (78), and miscellaneous Yukon River Locations (17). Northern pike longer than 250 millimeters fork length were marked with a numbered, external anchor tag. In July and August, 1989, 906 northern pike were captured, sampled, tagged, and released in the lower 18km of the Dall River. Immigration of fish tagged in 1988 and recaptured in 1989 in the Dall River showed that northern pike in that river are part of a larger population extending beyond the Dall River. Because of this immigration, the estimated abundance of 4,385 northern pike in the lower 18 km is probably biased high.

Northern pike ages 5 through 9 were most frequent in all streams sampled and the oldest individual encountered was an estimated 17 years old. Age composition of northern pike in the Little Dall River was skewed toward the younger age classes in comparison with samples from the Dall River and Old Lost Creek. Female northern pike were more abundant in the larger size classes than males. Growth rate of northern pike in the Dall River was faster than in all other stocks measured to date in interior Alaska. A partial angler survey conducted in 1988 in the Dall River in which 58 individuals were contacted, revealed that 76 northern pike were harvested by these fishermen. An expanded sport harvest estimate for either season is not available.

Ayers, M.L., 2001. Uncertainty in fish location using a split beam sonar, University of Alaska Fairbanks, M.S., 83 p *POPULATION; fish; monitoring; modeling; management*

Summary: "The enumeration of fish is of critical importance to the management of both commercial and sport fisheries in Alaska and worldwide. Current methods for riverine fish enumeration are inaccurate and unreliable. Improved fish counting accuracy in Alaskan rivers by acoustic methods is required. A split beam sonar system in the presence of noise is modeled. The sonar system including the received sonar pulse, receiver system, transducer beam pattern, propagation losses, and noise are modeled. An analysis of the effects of noise, pulse duration and sampling frequency on the uncertainty in fish location is presented. Signal to noise ratios less than 5 decibels (dB) can cause significant errors in the calculation of received signal phase. A stationary fish with a signal to noise ratio [SNR] of 15 dB has approximately plus or minus 0.001 degrees of uncertainty in the angles of arrival. Reducing the SNR to 3 dB the uncertainty increases to plus or minus 3.6 degrees in the angles of arrival"

Babcock, J., 1985. An Alaskan record for mountain midges (Diptera: Deuterophlebiidae) with notes on larval habitat. *Entomological News* 96 (5), 209-210. *POPULATION; invertebrates; insects; habitat selection; reproduction; river ice*

Larvae of *Deuterophlebia* sp. are reported for the first time from Alaska. The larva were found adhering to quartz boulders in an isolated interior Alaska muskeg-black spruce associated creek. The preceding winter conditions at the collection area were extremely harsh with water flow restricted at times to movement through the substrate and considerable anchor ice formation.

Babcock, C., and Fly, C., 1994. Classification of vegetation communities in which geese rear broods on the Yukon-Kuskokwim Delta, Alaska. *Canadian Journal of Botany/Revue Canadienne de Botanique* 72 (9), 1294-1301. *VEGETATION; sedges; surface water; population; goose; habitat selection; behavior (feeding); imaging (remote sensing)*

Plant communities are described from an area on the Yukon-Kuskokwim (Y-K) delta of Alaska that is used extensively for brood rearing by three species of geese. Earlier studies identified plant species important as food for young geese, but few studies describe or quantify plant communities. We classified species presence or absence information from over 700 quadrats using a two-way indicator species analysis (TWINSpan) and then tested for agreement of signatures on colour infrared air photos with the identified communities. Sedges were found to dominate all but the wettest and driest communities. Most of the brood-rearing area was covered by *Carex ramenskii* and *Carex rariflora* meadows, ponds, *Carex mackenziei*-dominated pond margins, and *C. ramenskii* and grass levee meadows. Our interpretation of airphotos accurately predicted vegetation community classes, which will facilitate future studies of habitat selection by geese during the time they are rearing young. The TWINSpan classification was comparable to classifications of studies conducted elsewhere on the Y-K delta. The interpretation of air photos will enable the identification and evaluation of wetland vegetation complexes and potential goose brood-rearing areas away from our study site.

Bailey, R., Kennedy, M., Dervish, M., and Taylor, R., 1998. Biological assessment of freshwater ecosystems using a reference condition approach: comparing predicted and actual benthic invertebrate communities in Yukon streams. *Freshwater biology* 39 (4), 765-774. *WATER QUALITY; MINING; gold; surface water; sediment; population; invertebrates; microbes; modeling; limnology*

The reference condition approach to bioassessment is based on comparing a biological community found at a test site to the range of communities observed at a set of reference sites. A community descriptor (e.g. number of taxa) is estimated for the test site. If the value of the descriptor falls outside of a given boundary, or biocriterion, from the distribution of the descriptors for the reference sites, the test site fails. The sensitivity of the reference condition approach can be increased by modelling and explaining variation in the community descriptor among the reference sites, and then using the predictive model to refine the expectation of the descriptor's value at a test site. This study applied the reference condition approach, with predictive modelling, to the bioassessment, using benthic macroinvertebrate (BMI) communities, of streams exposed to placer gold mining effluent in central Yukon Territory, Canada. The major changes to the stream caused by mining are increased turbidity and metal concentrations. Among reference sites sampled from 1993 to 1995, a predictive model using year of sampling and simple geographical characteristics (distance to source of the stream, upstream catchment area, altitude, two-way interactions) explained over half of the variation in each of five BMI community descriptors including richness (number of families), Simpson's diversity, Simpson's equitability, family biotic index and Bray-Curtis distance to the median reference community. Biocriteria (other than Bray-Curtis distance to the median community) based on the predictive models failed a far greater proportion of sites currently exposed to placer mining (50-100%) than biocriteria not based on predictive models (7-71%). A similar increase in the sensitivity of the bioassessment was seen when evaluating sites previously exposed to placer mining effluent. The simplest, most sensitive bioassessment of the effects of placer gold mining effluent on stream ecosystems used richness (number of families) of the BMI community together with a predictive model.

Bailey, E., Smith, D., Abston, C., Granitto, M., and Burleigh, K., 2000. National Geochemical Database: U.S. Geological Survey RASS (Rock Analysis Storage System) geochemical data for Alaska;. open file report 99-433. U.S. Geological Survey, Anchorage. <http://geopubs.wr.usgs.gov/open-file/of99-433/index.html> *WATER QUALITY; SEDIMENT; SOIL; MINING; geology*

History and Introduction

This portion of the RASS database contains geochemical data for Alaska produced by the analytical laboratories of the Geologic Division of the U.S. Geological Survey (USGS). The data represent analyses of stream-sediment, heavy mineral concentrate, soil, and organic material samples. Most of the data comes from mineral resource investigations conducted in the Alaska Mineral Resource Assessment Program (AMRAP). However, some of the data were produced in support of other USGS programs. The data were originally entered into the in-house Rock Analysis Storage System (RASS) database. The RASS database, which contains over 580,000 data records, was used by the Geologic Division from the early 1970's through the late 1980's to archive geochemical data. Much of the data have been previously published in paper copy USGS Open-File Reports by the submitter or the analyst but some of the data have never been published.

Over the years, USGS scientists recognized several problems with the database. The two primary issues were location coordinates (either incorrect or lacking) and sample media (not precisely identified). This dataset represents a re-processing of the original RASS data to address these problems and to make the data accessible in digital format and

more user-friendly. The re-processing consisted of checking the information on sample media and location against the original sample submittal forms, the original analytical reports, and published reports.

Location coordinate errors were corrected by using the original submittal forms or published reports or by digitizing from the original base maps. All coordinates are now reported in decimal degrees. As necessary, fields were added to the original data to more fully describe the sample preparation methods used and sample medium analyzed. The actual analytical data were not checked in great detail, but obvious errors were corrected. This dataset currently contains 126,272 records for stream sediment, heavy mineral concentrate (derived from stream sediment), soil, and organic material samples collected in Alaska. Additional records will be added as they become available. Rock sample data will be added in the future.

Baker, S.A., 1979. A survey of environmental mercury concentrations in Yukon Territory, 1977. 79-21. Environmental Protection Service, Yukon Branch, *CONTAMINANTS; mercury; long range transport; water quality; surface water; moose; fish; mining; sediment*

The Yukon mercury survey was set up to establish a data base of mercury concentrations throughout the Territory. Samples of fish muscle tissue, sediment and water were obtained from 38 water bodies around Yukon. Several moose tissue and waterfowl tissue samples were also analyzed for mercury concentration. The project was jointly funded by the Environmental Protection Service and Department of National Health and Welfare. Results of the sampling were compared with results found in the literature from other areas. The general finding was that the Yukon is problem free in terms of mercury contamination, although there are a few areas with naturally elevated concentrations. There is no evidence of anthropogenic mercury pollution in Yukon. The Yukon food chain is presently uncontaminated by industrial mercury with the exception of some increased levels around the hard rock mining areas. If Yukon is to maintain this condition at the present or better level, development must be done in such a way as to minimize impacts and protect the aquatic resources which we now have at our disposal. (Locations of mercury sampling sites include a number of rivers and creeks in the vicinity of mining operations.)

Baker, B., 1991. The effectiveness of a team approach to diabetes program management in interior Alaska. Arctic Medical Research Suppl, 415-417. *INCOMPLETE (need abstract); PEOPLE; health (condition); diabetes; health care; management*

Balsler, A.W., 1996. Combining Landsat TM and multi-temporal ERS-1 imagery to improve classification accuracy and detail in the Tanana Flats wetlands complex, interior Alaska, University of Alaska Fairbanks, M.S., 102 p *INCOMPLETE (need abstract); VEGETATION; fen; surface water; mapping; imaging (remote sensing); modeling*

Bankes, N., 1982. The international law of shared natural resources [microform] : a case study of an international wildlife range between Alaska and the Yukon, University of British Columbia, LL.M. *INCOMPLETE (need abstract); POPULATION; mammals; caribou; management; international law*

Barber, V., Juday, G., and Finney, B., 2000. Reduced growth of Alaskan white spruce in the twentieth century from temperature-induced drought stress. Nature 405 (6787), 668-674. *CLIMATE; VEGETATION; white spruce; precipitation; stress; carbon; nutrient cycling*
Presents multi-proxy tree-ring data from twenty productive stands of white spruce in the interior of Alaska. Evidence that radial tree growth has decreased with increasing temperature; Effect of temperature-induced drought; Suggestion that drought stress may

have been an important factor limiting carbon intake in North American forests; Implications for the future capacity of northern latitudes to sequester carbon.

Barr, W., 1999. Survey of recreational use, Yukon River, 1997. *Polar Record* 35 (195), 346-347. *PEOPLE; recreation*

In the summer of 1997, the Parks and Protected Areas Division of the Department of Renewable Resources, Government of Yukon, carried out a survey of recreational travellers (presumably canoeists and kayakers) on the Yukon, Teslin, and Big Salmon rivers, with a view to collecting information on the origins, attitudes, and behaviour of the travellers, and on the impact of recreational travel on the rivers.

Bartecchi, K.M., 2001. Effects of Military Overflights on Nesting Neotropical Migrants Annual Report, 28 January, 2001. Alaska Bird Observatory:

<http://www.alaskabird.org/ABOResearch/ABOMOA2000Rept.html#Introduction> *POPULATION; birds; songbirds; MILITARY; noise; stress; endocrinology*

We initiated a three-year study to determine whether intense jet noise at Eielson Air Force Base is adversely affecting nesting songbird species. The Eielson Air Force Base was closed to air traffic during 2000, therefore our first year of study represents a control year. We compared nesting productivity, species diversity and abundance of birds at Eielson to an area without intense aircraft disturbance (Bonanza Creek). We also collected baseline data on avian nesting ecology and chronology to provide guidelines for the subsequent years of this study and because this information currently does not exist for landbirds in interior Alaska. Field technicians searched for nests and conducted point-count censuses in three plots ranging in size from 20 to 36ha in each study area. We found no obvious differences in nesting productivity between sites, though we could not confirm this statistically due to low sample sizes. We found no major differences in the number of species detected at each site within a 50m radius of the observer. When detections of species at all distances were considered, we observed some disparity between sites, though frequently this was due to differences in the adjacent habitat. Within a 50m radius, bird abundance was slightly higher at Bonanza Creek than Eielson, largely because of high numbers of white-winged crossbills foraging on white spruce cones at Bonanza Creek. A summary of noise-monitoring data collected at each site showed average noise levels from military aircraft to be higher at Eielson than Bonanza Creek, even though the runway was closed at Eielson. We identified several revisions and additions to the protocol to improve this study in the following years. First, to increase the number of nests in our sample we will begin fieldwork in mid-May, nearly three weeks earlier than last year, and focus on finding nests of the more abundant species. Second, instead of only one census of each plot we will conduct three censuses to provide a measure of precision for our estimates of species diversity and abundance. Third, we will expand this study by comparing concentrations of corticosterone in birds exposed to intense military jet noise (Eielson) to birds not affected by this disturbance (Bonanza Creek). Corticosterone is a hormone that has been shown to increase rapidly in passerines under stressful conditions.

Bartleman, A.-P., Miyanishi, K., Burn, C., and Cote, M., 2001. Development of Vegetation Communities in a Retrogressive Thaw Slump near Mayo, Yukon Territory: A 10-Year Assessment. *Arctic* 54 (2), 149-156. *VEGETATION; succession; CLIMATE; hydrology; soil; recovery*

The vegetation in a retrogressive thaw slump, first surveyed and documented in 1987, was revisited 10 years later to investigate its subsequent development and to test a chronosequence-based successional model. The thaw slump stabilized in 1994, when the headwall became covered by organic and mineral debris. As a result, the meltwater supply from headwall ablation ceased. Alteration of environmental conditions due to stabilization of the headwall diverted the vegetation succession from the

chronosequence determined in 1987. Areas that were marshy in 1987 dried up, and an area dominated by *Polygonum alaskanum* [Alaska wild rhubarb] appeared close to the headwall. Much of the thaw slump was dominated by *Salix* spp. in 1997, rather than the *Equisteum* [horsetail] of 1987. However, the ground more than 200 m from the headwall, over a decade old in 1987, experienced less change in edaphic [soil related] conditions, and the communities there continued to develop a structure approaching the surrounding undisturbed forest.

Barton, L.H., 1995. Sonar enumeration of fall chum salmon on the Sheenjek River, 1988-1992. Technical fishery report ; 95-06. Alaska Dept. of Fish and Game, Commercial Fisheries Management and Development Division, Juneau, Alaska.

Bauer, D., 2002. FACT SHEET: ANNUAL LONG-TERM GROUNDWATER MONITORING RESULTS, SERVICING OF RESIDENTIAL CARBON FILTER SYSTEMS; SIX MILE RICHARDSON HIGHWAY. Alaska Department of Environmental Conservation; Division of Spill Prevention and Response; Contaminated Sites Remediation Program, Fairbanks.

http://www.state.ak.us/dec/dspar/csites/public_notices/fact_sheets/6milegwfeb02.pdf WATER QUALITY; CONTAMINANTS; POPs (persistent organic pollutants); monitoring

Executive Summary

The monitoring data indicate that the size of the regional TCE plume has not changed significantly from past years. However, the installation of new monitoring wells has increased the confidence in estimating the plume's lateral boundaries. As a result, the regional plume is somewhat narrower than originally estimated in 1995. Figure 1 depicts the estimated boundaries of the regional plume showing the 1 µg/l and 5 µg/l concentration levels at a thirty-foot depth. In some parts of the plume, the concentration levels are decreasing at predictable rates. In other parts of the plume, the concentration levels exhibit no trend. At one monitoring well the TCE concentration levels have continued to increase slightly.

Only three residences are known to have TCE in their well water above the drinking water standard in 2001 as compared to twelve residences in 1995. However, it should be noted that two of the twelve residences sampled in 1995 did not allow re-sampling in 2000 and it is unknown if these two homes are above the safe drinking water standard. Figure 2 shows the concentration levels detected in 2001. All of the homes have carbon filter systems that can effectively remove the low levels of contamination.

The three residences with water that remains above the TCE standard presently exhibit decreasing concentration trends. Activated carbon filters were changed at twelve residences in 2001. The residential carbon filter treatment systems (if properly serviced and maintained) are capable of removing organic contaminants to essentially non-detect limits: generally 0.5 µg/l or one tenth of the safe drinking water standard of 5 µg/l. A 1999 assessment of the filter systems by ADEC found that the majority of installed systems were not properly maintained. In 2000, ADEC assumed responsibility for the filter system maintenance. If the filters are serviced properly, all systems effectively removed organic contamination to acceptable limits.

2002. FACT SHEET: DENNY PROPERTIES; TRACTS 1 & 2, GROFF SUBDIVISION SIX MILE RICHARDSON HIGHWAY. Alaska Department of Environmental Conservation; Division of Spill Prevention and Response; Contaminated Sites Program, Fairbanks.

http://www.state.ak.us/dec/dspar/csites/public_notices/fact_sheets/dennyfeb02.pdf WATER QUALITY; CONTAMINANTS; POL (petroleum/oil/lubricants = hydrocarbons); remediation; monitoring

What's New

Benzene contaminated groundwater continues to shrink in size and concentration level. Since 2000, the contaminated groundwater has been confined to the Denny properties.

Results from the summer 2001 groundwater monitoring again confirm that the 1998 remedial efforts at the Denny properties were successful. All Six-Mile Village Subdivision residential drinking water wells that were adversely affected by the original benzene contaminant plume continue to meet safe drinking water standards.

Also, the benzene concentration in all monitoring wells that are located close to the former source area now meet safe drinking water standards. The contaminated groundwater that remains above the safe drinking water standard is now less than 170 feet in length and remains confined to the Denny properties. It is expected to continue to decrease in size and concentration due to natural attenuation processes.

Background

A historical gasoline release created a benzene groundwater plume that extended approximately 1500 feet off site of the Denny properties. Four residential drinking water wells in 1995 contained benzene concentrations above the safe drinking water standard of 5 µg/l (micrograms per liter). The benzene plume commingled with a much larger and regional trichloroethylene (TCE) groundwater plume that also impacted residences in the Six-Mile Village Subdivision.

Between 1996 and 1998, ADEC investigated the area of the gasoline spill, characterized the extent of contamination, and developed remediation alternatives. Following consultation with the public, it was decided that excavation of the contaminated soil and natural attenuation of the groundwater were the preferred cleanup options.

In the fall of 1998, approximately 750-cubic yards of gasoline contaminated soil were excavated and transported to a thermal treatment facility. In the summer of 1999, sampling of the four residential wells that were originally impacted in 1995 and six groundwater monitoring wells that were specially installed to monitor the groundwater cleanup showed a substantial reduction in benzene levels. At that time, all residential wells and five of the six monitoring wells met the safe drinking water standard. Monitoring well MW-103, located approximately 170 feet from the former source area, showed a decrease in benzene from 185 µg/l in 1998 to 40.5 µg/l in 1999, a 79% reduction.

In the summer of 2000, all four residential wells and five of the six monitoring wells continued to show substantial reductions in the benzene levels. MW-103 continued to show substantial reduction in benzene from 40.5 µg/l in 1999 to 7.4 µg/l in 2000, a 72% reduction. Although MW-103 remains slightly above the safe drinking water standard, it is expected to reach the safe drinking water standard within a year based on the trend established from previous monitoring events. The monitoring data indicates that the contaminated groundwater above the safe drinking water standard does not extend off the Denny properties.

In the summer of 2001, all four residential wells and all six monitoring wells had benzene concentration levels below 5.0 µg/l. The concentration level in MW-103 decreased from 7.4 µg/l in 2000 to 4.2 µg/l in 2001.

Regional TCE Groundwater Plume

ADEC continues to investigate the sources and potential cleanup of the regional TCE groundwater plume. Separate fact sheets will be issued concerning that effort.

Questions or Need Additional Information

If you have any questions or need additional information, please contact the ADEC project manager, Douglas Bauer, at (907) 451-2192 or by email at doug_bauer@envircon.state.ak.us.

Beacham, T., Murray, C., and Withler, R., 1989. Age, morphology, and biochemical genetic variation of Yukon River chinook salmon. Transactions of the American Fisheries Association 118 (1), 46-63. *POPULATION; fish; salmon; chinook; genetics; growth/development; hydrology*

The authors examined chinook salmon *Oncorhynchus tshawytscha* populations in the Yukon Territory for variation in age and size of spawning adults, juvenile morphology, and biochemical genetics during 1985-1987. Yukon River chinook salmon spent at least one winter in fresh water as juveniles; about 6% of the returning adults had spent two winters in fresh water as juveniles. Males matured at younger ages and generally at smaller mean lengths at age than did females. They observed differences in juvenile morphology among populations: juveniles in habitats with faster water velocities had larger fins and thicker bodies than those in habitats with slower water velocity.

Becker, E., Spindler, M., and Osborne, T., 1998. A population estimator based on network sampling of tracks in the snow. Journal of Wildlife Management 62 (3), 968-977. *POPULATION; mammals; wolf; modeling; snow*

We developed a technique to use stratified network sampling to sample animal tracks in the snow and to obtain population estimates. This method requires sufficient snow conditions to allow animals to leave continuous tracks and a recent snowstorm or windstorm for delineation of fresh (poststorm) tracks. Additional requirements are that no fresh tracks in aerially surveyed sample units are completely missed, that made these tracks can be correctly enumerated. Using this technique, we estimated gray wolf (*Canis lupus*) population density to be 8.16 plus or minus 0.91 wolves/1,000 km² in a 31,373-km² game management unit in Interior Alaska. This sample design also allowed us to obtain population estimates and confidence intervals for those portions of the Koyukuk and northern Innoko national wildlife refuges (NWR) within the study area. Using concurrently collected radiotelemetry on 9 wolf packs, we did not detect any violations of assumptions.

Beine, H.J., 1996. NO_x [NO and NO₂] photochemistry in high northern latitudes during spring, University of Alaska Fairbanks, Ph. D. *AIR QUALITY; acidification; nitrogen; ozone; long range transport*

"... At both locations [Poker Flat Research Watershed and Svalbard] PAN decomposition was an important NO_x source... These results indicate that stable ozone precursors which are transported into the Arctic from anthropogenic sources can influence the ozone budget in high latitudes."

Beisinger, K.E., 1967. Micronutrients as possible factors limiting primary productivity in certain Alaskan lakes [which lakes?], University of Michigan, Ph. D., 114 p *INCOMPLETE (need abstract); POPULATION; invertebrates; nutrition; nutrient cycling*

Ben-David, M., Bowyer, R., Duffy, L.K., Roby, D., and Schell, D., 1998. Social behavior and ecosystem processes: river otter latrines and nutrient dynamics of terrestrial vegetation. Ecology (Washington, D C) 79 (7), 2567-2571. *NUTRIENT CYCLING; nitrogen; river otter; vegetation; behavior (feeding); behavior (territorial)*

River otters (*Lutra canadensis* Schreber) inhabiting coastal environments scent-mark specific locations along the coast, known as latrine sites. In this study, we used stable isotope techniques to investigate the effects of this scent-marking behavior on terrestrial vegetation at the terrestrial-marine interface. Our analysis of stable isotope ratios of fur and feces indicated that river otters fed mainly on intertidal and subtidal fish. Eight different species of plants, growing in latrine sites of river otters, had significantly higher values of delta ¹⁵N compared with the same plant species growing on nonlatrine sites.

Elevated ^{15}N concentrations occurred only in grasses and mosses growing in latrine sites. Our results indicate that, through their scent-marking behavior, coastal river otters transfer marine-derived nitrogen into the beach-fringe forest and thus fertilize the terrestrial vegetation in the terrestrial-marine interface.

Ben-David, M., McColl, C., Boonstra, R., and Karels, T., 1999. ^{15}N signatures do not reflect body condition in Arctic ground squirrels. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 77 (9), 1373-1378. *POPULATION; mammals; squirrel; health (condition); biochemistry; nutrition; stress; nitrogen; reproduction; behavior (feeding)*

Studies using stable-isotope analysis documented an enrichment in delta ^{15}N values in nutritionally stressed animals. Investigators suggested that changes in delta ^{15}N values measured in urine, hair, and blood may be a good indicator of lean-tissue losses. During our investigations into the effects of population density on body condition and reproduction of female Arctic ground squirrels (*Spermophilus parryi plesius*) near Kluane Lake, Yukon, Canada, we examined the relations between body condition and delta ^{15}N values. Data obtained from 20 livetrapped female ground squirrels suggested that reproductive females from a population with moderate density and low food availability experienced a reduction in body condition, as indicated by mass loss and changes in blood urea nitrogen (BUN) and glucose concentrations. In contrast, those from a population that failed to reproduce successfully and had high density and low food availability experienced no nutritional stress. Similarly, those females from a high-density population with high food availability (i.e., supplemented food) that reproduced successfully suffered no noticeable nutritional stress. In contrast to our prediction, delta ^{15}N values did not show a decline with increasing body mass, and animals in poor and excellent body condition had similar delta ^{15}N values. In addition, female ground squirrels from the same group with access to similar types of food (natural or supplemented) and with similar body masses, BUN, and blood glucose concentrations showed a difference of up to 1.8 ppt in delta ^{15}N values. Thus, our results suggest that the ecological process (i.e., diet selection) may have obscured the physiological one (i.e., recycling of nitrogen). Therefore, we recommend that field ecologists studying animal diets using stable-isotope analysis use alternative techniques when attempting to evaluate the body condition of their subjects.

Benson, A.-M., 2000. Temporal patterns of migration, molt, and fat storage among high-latitude passerine migrants, University of Alaska Fairbanks, M.S. *POPULATION; birds; songbirds; migration; nutrition; seasonality; metabolism; climate*

Summary: "Aspects of migration, fattening, and molt in trans-continental passerine migrants were examined during spring and autumn migration in Fairbanks, Alaska (64050' N, 147050' W). From 1992-1998, 25,718 birds of 18 species were banded. Based on median dates of spring and autumn passage, species-level estimates of the duration of breeding range occupation ranged from 48 to 129 days. Adults departed significantly later than immatures in 11 of the 18 species examined and significantly earlier than immatures in only one species, the Alder Flycatcher. Adults had significantly higher fat scores than immatures in most species, but these differences were attributable to the influence of ambient temperatures, length of preceding night, and the time of day the bird was captured. Adults of many species overlapped the final stages of the prebasic molt with autumn migration, and individuals that did so had less stored fat than those that were not molting"

Benson, A.-M., Pogson, T., and Doyle, T., 2000. Updated geographic distribution of eight passerine species in central Alaska. *Western Bird* 31, 100-105. *POPULATION; birds; songbirds; flycatcher; warbler; nuthatch; kinglet; sparrow; distribution*

We documented the occurrence of eight rare passerines in central Alaska. Our observations of the Yellow-bellied Flycatcher, Red-breasted Nuthatch, Arctic Warbler,

Golden-crowned Kinglet, Tennessee Warbler, Palm Warbler, Mourning Warbler, and Clay-colored Sparrow provided new distributional information on the occurrence of these species in central Alaska. Mist netting [not a spray, just a light net] was essential to documenting the geographic distribution of these species because mist-net captures represented the only occurrence of several species. Additionally, many of these records could not have been identified to subspecies without collecting individuals as voucher specimens that could be verified by other scientists.

Benson, A.-M., and Winker, K., 2001. Timing of Breeding Range Occupancy Among High-latitude Passerine Migrants. *Auk* 118 (2), 513-519. *POPULATION; birds; songbirds; migration; nutrition; reproduction*

The brief subarctic summer limits the time available for birds to complete their reproductive activities, yet the temporal requirements of high-latitude passerine migrants are not well understood. Our analyses examined the timing of spring and autumn migration among 18 passerine species to obtain indirect estimates of the time they occupy their breeding ranges in northwestern North America. From 1992 to 1998, the Alaska Bird Observatory (64 degree 50'N, 147 degree 50'W) banded 31,698 individuals during the most intensive standardized mist-netting study ever conducted in subarctic North America.

Benyshek, D., Martin, J., and Johnston, C., 2001. A reconsideration of the origins of the type 2 diabetes epidemic among Native Americans and the implications for intervention policy. *Medical Anthropology* 20 (1), 25-64. *REFERENCE; PEOPLE; health (condition); biochemistry; health (comparative); diabetes; genetics; nutrition; stress*

Type 2 diabetes has reached epidemic proportions in many Native American communities in North America. The overwhelming majority of physicians, biomedical researchers, and medical ecologists continue to explain the astoundingly high prevalence rates of diabetes among Native Americans and other high prevalence populations in terms of yet-to-be-identified genetic factors. Recent experimental and epidemiological research, however, has brought to light an etiological alternative to the genetic-predisposition model. This body of research suggests that type 2 diabetes may result initially from fetal malnutrition and, in subsequent generations, be propagated via perturbations in the intrauterine environment. Native American populations at greatest risk for diabetes today are the ones most likely to have endured severe nutritional stress in their recent histories, thus experiencing the conditions that are most conducive to the diabetic developmental sequence. If further substantiated, the implications of the fetal-origin model of diabetes for diabetes intervention programs are profound.

Berardi, G.M., and Donnelly, S., 1999. Rural sanitation and participatory research in an interior Alaska village. Misc. publication 99-7. School of Agriculture and Land Resources Management, Agricultural and Forestry Experiment Station, University of Alaska Fairbanks, Fairbanks. *waste (human); waste (solid); WATER QUALITY; surface water; INCOMPLETE (need abstract)*

Berteaux, D., and Boutin, S., 2000. Breeding dispersal in female North American red squirrels. *Ecology* 81 (5), 1311-1326. *POPULATION; squirrel; distribution; behavior (territorial); reproduction*

Although natal dispersal has received considerable attention from animal ecologists, the causes and consequences of breeding dispersal have remained largely unexplored. We used telemetry, direct observation, and long-term mark-recapture (9 yr) to study breeding dispersal in the North American red squirrel (*Tamiasciurus hudsonicus*) at Kluane, Yukon, Canada. We recorded the postbreeding behavior (keep the territory, share it with juveniles, or bequeath it to juveniles) of mothers from 485 litters, and monitored the fates of eight cohorts of weaned juveniles (680 individuals). The proportion of mothers that bequeathed their territory to one of their offspring was roughly one-third of that keeping

or sharing it. Breeding dispersal was a recurrent phenomenon that characterized a fraction of the population of reproductive females every year. Dispersing females did not improve the quality of their breeding environment. In contrast, by leaving their territory, mothers allowed some offspring to stay on the natal site, which increased juvenile survival. Breeding dispersal by female red squirrels was thus a form of parental investment. Dispersing females were older than others, had higher numbers of juveniles at weaning, and moved their breeding sites more frequently after reproducing when food availability was high. These patterns are consistent with the major predictions of parental investment theories. We detected no difference in survivorship or future reproduction between dispersing and resident mothers. Juvenile males dispersed more often than females, but not farther. The sex of offspring did not influence whether mothers dispersed or not. Although we showed that breeding dispersal can have major impacts on the dynamics of squirrel populations, the relative implications of natal and breeding dispersal for the genetic structure and demography of populations and the social evolution of species remain unknown.

Bertram, M., and Vivion, M., 2002. Moose mortality in Eastern interior Alaska. *Journal of Wildlife Management* 66 (3), 747-756. *POPULATION; mammals; moose; health (condition); predation; grizzly bear; black bear; hunting; management*

We investigated causes of mortality and the physical condition of moose (*Alces alces gigas*) in a multiple-predator system in eastern interior Alaska, USA, from 1998 to 2000. We identified the sources of mortality of calf and cow moose and collected fecundity and fitness data to obtain information on range quality and carrying capacity. Radiocollars were placed on 30 cow moose in 1998 and on 62 moose calves in 1998 (n = 29) and 1999 (n = 33). Estimates of fecundity and fitness parameters indicated that reproductive potential for moose was high, with a twinning rate of 63%, a pregnancy rate of 89%, and above-average body sizes of female and neonate moose. We inferred that range quality may not be a significant limiting factor for this population. We documented low neonate survival through the first 14 weeks of life (28%). Predation was responsible for 92% of known calf mortality; black bears (*Ursus americanus*, 45%) and grizzly bears (*Ursus arctos*; 39%) were the major causes of mortality. Despite low population densities in this region, grizzly bears were an important predator on neonates as well as adult female moose. Mean annual calf and adult female moose survival (20% and 88%, respectively) were similar to rates reported in other low-density moose populations in North America. We also estimated from 7 to 12% of the population was harvested annually by humans, and of that, illegal cow harvest constituted at least 33%. Our data suggest that low calf survival, adult mortality from wolf (*Canis lupus*) and grizzly bear predation, illegal cow harvest, and low predator harvest, all act in concert to maintain this moose population at a low density.

Bilello, M.A., 1972. Air masses, fronts and winter precipitation in central Alaska [microform], McGill University, M.S. *INCOMPLETE (need abstract); CLIMATE; precipitation; snow; air quality*

Billings, S.F., 2000. Distribution of hexachlorobenzene concentrations in spruce needle samples across Alaska, University of Alaska Fairbanks, M.S., 80 p *AIR QUALITY; CONTAMINANTS; POPs (persistent organic pollutants); long range transport; bioaccumulation; vegetation; spruce*
Summary: "The global distribution of persistent organic pollutants has initiated considerable effort towards understanding long range atmospheric transport and partitioning of these potentially damaging compounds. Apparent latitude dependent concentration gradients of organic pollutants in otherwise pristine environments has given rise to a global fractionation model, coined the cold finger effect. According to the cold finger theory, semi-volatile persistent organic pollutant will show a preference for partitioning from the atmosphere to the ground and vegetation at northern latitudes. Here

we present a study of hexachlorobenzene in spruce needle samples across Alaska, which offers a large range of climates, from its southern coastal rain forests to the northern arctic. The large variation in climate across Alaska should result in a measurable latitude dependent concentration gradient for HCB, if the cold finger effect is being realized. Spruce needle samples were extracted, cleaned, and analyzed by GC/MS. According to principle component regression analysis, HCB concentrations in all the spruce needle samples across Alaska show a strong positive correlation with lipid content of the needles. The HCB concentrations also show two distinct latitude trends. The spruce needle samples taken from the coast to approximately 63° north show relatively high HCB concentrations and a possible negative correlation with latitude. The samples between 63° and 68° north show a definite positive correlation between HCB concentration and latitude, which is consistent with the cold finger effect" [The topography of the Alaska Range, which is highest at about 63° along the sampling line, is a plausible explanation for the possibly negative correlation between HCB concentration and latitude to that point.]

Billington, M., 1981. Nitrogen fixation in a black spruce (*Picea mariana* [Mill.] B.S.P.) forest in interior Alaska, University of Alaska, Fairbanks, 92 p *INCOMPLETE (need abstract); NUTRIENT CYCLING; nitrogen; vegetation; black spruce*

Birtwell, I., Hartman, G., Anderson, B., McLeay, D., and Malick, J., 1984. A brief investigation of Arctic grayling (*Thymallus arcticus*) and aquatic invertebrates in the Minto Creek drainage, Mayo, Yukon Territory: An area subjected to placer mining. #1287. Department of Fisheries and Oceans, West Vancouver, B.C. *MINING; POPULATION; fish; LIMNOLOGY; grayling; distribution; health (effects)*

The distribution and abundance of fish in the Minto Creek drainage, Mayo, Yukon Territory, was investigated between August 6 and 10, 1982. The study was carried out to obtain preliminary information on the effects of placer mining on the distribution, feeding and condition of Arctic grayling (*Thymallus arcticus*).

Bishop, M., and Warnock, N., 1998. Migration of Western Sandpipers: Links between their Alaskan stopover areas and breeding grounds. *Wilson Bulletin* 110 (4), 457-462. *POPULATION; birds; migration; sandpiper*

Thirty-two radiomarked Western Sandpipers (*Calidris mauri*), tagged in California and Washington, were relocated at stopover and breeding sites north and west of the Copper River Delta, Alaska. At Cook Inlet, Alaska, seven of the nine relocated birds were at Redoubt and Kachemak bays. Only 1 of the 17 birds relocated on the Yukon-Kuskokwim Delta had been previously detected at Cook Inlet. Detections of birds in western Alaska provide evidence that the Yukon-Kuskokwim Delta is the final breeding destination for many of the birds migrating through San Francisco and other Pacific Coast areas. The Mulchatna River area, 325 km southeast of the Yukon-Kuskokwim Delta, may support a breeding population of Western Sandpipers.

Bjerklie, D., and LaPerriere, J., 1985. Gold-mining effects on stream hydrology and water quality, Circle Quadrangle, Alaska. *Water Resources Bulletin* 21 (2), 235-243. *WATER QUALITY; HYDROLOGY; ground water; surface water; sediment; MINING; gold; health (effects); limnology*

Effects of placer mining on the hydrology and water quality of several interior Alaska streams were studied as part of a project on the impacts of placer mining on stream ecosystems. Surface and subsurface waters were analyzed in the field for conductivity, pH, temperature, alkalinity, total and calcium hardnesses, iron, copper, manganese, ammonia-N, nitrate-N, nitrite-N, settleable solids, and turbidity. Total, nonfiltrable, and filtrable residues were determined in the laboratory.

Blais, J., Schindler, D., Muir, D., Sharp, M., Donald, D., Lafreniere, M., Braekevelt, E., and Strachan, W., 2001. Melting glaciers: a major source of persistent organochlorines to subalpine Bow Lake in Banff National Park, Canada. *Ambio* 30 (7), 410-415. *REFERENCE; CONTAMINANTS; POPs (persistent organic pollutants); WATER QUALITY; surface water; glacial discharge*

Organochlorine pesticides and polychlorinated biphenyls (PCBs) are ubiquitous and persistent in the environment. They are known to concentrate in cold environments as a result of progressive evaporation from warm regions, and condensation in colder regions. In this study we show that melting glaciers supply 50 to 97% of the organochlorine inputs to a subalpine lake in Alberta, Canada, while contributing 73% of input water. Tritium analyses indicated that during the mid- to late summer warm period, at least 10% of the glacial melt originated from ice that was deposited in 1950-1970, when it was more contaminated with organochlorines. This finding suggests that climate warming may cause melting glaciers to become increasing sources of contaminants to freshwaters. Organochlorines from glacial streams were largely in dissolved form because the organic-poor glacial clays had a limited sorption capacity for the more hydrophobic chemicals.

Boertje, R., Valkenburg, P., and McNay, M.E., 1996. Increases in moose, caribou, and wolves following wolf control in Alaska. *Journal of Wildlife Management* 60 (3), 474-489. *POPULATION; mammals; predation; wolf; management; moose; caribou*

Short-term studies in our study area and southeast Yukon have previously documented substantial increases in moose (*Alces alces*) and caribou (*Rangifer tarandus*) following wolf (*Canis lupus*) control. To provide long-term information, we present a 20-year history beginning autumn 1975 when precontrol wolf density was 14 wolves/1,000 km². Private harvest and agency control kept the late-winter wolf density 55-80% (mean = 69%) below the precontrol density during each of the next 7 years. Wolf numbers subsequently recovered in less than or equal to 4 years in most of the study area and increased further to between 15 and 16 wolves/1,000 km² during a period of deep snowfall winters. The post-hunt moose population increased rapidly from 183 to 481 moose/1,000 km² during the 7 years of wolf control (finite rate of increase, $\lambda_{sub(r)}$ = 1.15) and increased more slowly during the subsequent 12 years ($\lambda_{sub(r)}$ = 1.05) reaching a density of 1,020 moose/1,000 km² by 1994. The Delta caribou herd increased rapidly during wolf control ($\lambda_{sub(r)}$ = 1.16), more slowly during the subsequent 7 years ($\lambda_{sub(r)}$ = 1.06), then declined for 4 years ($\lambda_{sub(r)}$ = 0.78) from a peak density of 890 caribou/1,000 km². This decline coincided with declines in 2 adjacent, low-density herds (240-370 caribou/1,000 km²). These caribou declines probably resulted from the synergistic effects of adverse weather and associated increases in wolf numbers. Reduced caribou natality and calf weights were associated with adverse weather. Wolf control was reauthorized to halt the Delta herd's decline in 1993. Similar subarctic, noncoastal systems without effective wolf control have supported densities of 45-417 moose/1,000 km² (mean = 148, n = 20), 100-500 caribou/1,000 km², and 2-18 wolves/1,000 km² (mean = 9, n = 15) in recent decades. In our 20-year history, 7 initial winters of wolf control and 14 initial years of favorable weather apparently resulted in 19 years of growth in moose, 14 years of growth in caribou populations, and a high average autumn wolf density after control ended (12 wolves/1,000 km²). Benefits to humans included enjoyment of more wolves, moose, and caribou and harvests of several thousand additional moose and caribou than predicted if wolf control had not occurred. We conclude from historical data that controlling wolf populations, in combination with favorable weather, can enhance long-term abundance of wolves and their primary prey, and benefits to humans can be substantial.

Boggs, K., Libbey, C., and Michaelson, J., 1997. Information management for use in watershed planning for Alaska. Environmental Protection Agency, Anchorage, Alaska. from http://www.uaa.alaska.edu/enri/aknhp_web/bib/bib.html *INCOMPLETE (need abstract); WATER QUALITY; land use; ecology; monitoring; management*

Boise, C.M., 1977. Breeding biology of the lesser sandhill crane *grus canadensis canadensis* (L.) on the Yukon-Kuskokwim Delta, Alaska, University of Alaska, Fairbanks, M.S., 79 leaves illus., maps p *INCOMPLETE (need abstract); POPULATION; birds; waterfowl; sandhill crane; behavior (reproductive/nesting); reproduction*

Boitnott, G., Iskandar, I., and Grant, S., 1997. The use of frozen-ground barriers for containment and in-situ remediation of heavy-metal contaminated soil. *Proceedings International Symposium on Physics, Chemistry, and Ecology of Seasonally Frozen Soils*, Fairbanks, Alaska, CRREL (Cold Regions Research and Engineering Laboratories, US Army Corps of Engineers), p. 409-416 *CONTAMINANTS; metals; soil; remediation; ground ice / permafrost; INCOMPLETE (need abstract)*

Boles, S., and Verbyla, D., 2000. Comparison of three AVHRR-based fire detection algorithms for interior Alaska. *Remote Sensing of Environment* 72 (1), 1-16. *VEGETATION; wildfire; imaging (remote sensing); modeling; radiometry*

Three satellite fire detection models (threshold, contextual, and fuel mask) were compared and evaluated using National Oceanographic and Atmospheric Administration (NOAA)-11, NOAA-12, and NOAA-14 Advanced Very High Resolution Radiometer sensor data from interior Alaska. The fixed threshold model compared the radiant temperature of each pixel to predetermined threshold values. The contextual model compared the radiant temperature of each pixel to its surrounding (background) pixels. The fuel mask model is similar to the contextual model, but pixels were tested for fuel availability according to pre-fire vegetation index values. Fire location data from the Alaska Fire Service was used to assess the accuracy of the fire detection models. Fire detection accuracy: (a) was highest using the fuel mask model; (b) was lowest using the fixed threshold model; (c) increased as fire size increased; (d) was considerably greater in afternoon images than morning or night images. Fire detection methods may be less accurate in taiga/tundra regions such as interior Alaska due to landscape heterogeneity and relatively low aboveground fuel. (C) Elsevier Science Inc., 2000.

Boonstra, R., and Singleton, G.R., 1993. Population declines in the snowshoe hare and the role of stress. *General Comparative Endocrinology* 91 (2), 126-43. *POPULATION; mammals; snowshoe hare; biochemistry; endocrinology; stress; nutrition*

Every 10 years snowshoe hare populations across the boreal forest of North America go through a population cycle, culminating in a decline lasting 4 or more years. We tested the hypothesis that snowshoe hares during the decline are in poor condition and less able to respond to challenges in their environment by examining the stress response of male hares. Three groups from February and May, 1991 (the second year of the hare decline in the Yukon), were compared: baseline hares were collected to obtain resting hormone levels; control hares were wild animals caught at randomly placed sites; and fed hares were wild animals caught on supplementary fed areas. The latter two groups were sequentially bled to examine their response to dexamethasone (DEX) followed by adrenocorticotrophic hormone (ACTH). Trapping and handling were stressful to the experimental hares as the initial blood levels of total and free cortisol levels were higher (especially in controls), testosterone levels were lower, and glucose levels were higher in experimental hares than in baseline hares. Control and fed hares showed similar total and free cortisol responses, falling to low levels after the DEX injection and increasing

rapidly in response to the ACTH injection. However, control hares were in worse condition than fed hares as indicated by the higher free cortisol levels and lower maximum corticosteroid-binding capacity (MCBC) in control hares. In addition, though testosterone levels fell in both groups in response to DEX, only the fed hares showed a large, transitory increase 30 min after the ACTH injection. An unexpected finding was a dramatic increase in MCBC levels 30 min after the ACTH injection in both experimental groups, but it was more pronounced in the fed group. We conclude that the pituitary-adrenocortical feedback system in hares from declining populations is operating normally and that they should be able to cope with acute, short-term stressors, but that they are in poor condition and are exposed to higher levels of free cortisol than fed hares in good condition.

Boonstra, R., Hik, D., Singleton, G.R., and Tinnikov, A., 1998. The impact of predator-induced stress on the snowshoe hare cycle. *Ecological Monographs* 68 (3), 371-394. *POPULATION; mammals; snowshoe hare; behavior (defensive); endocrinology; predation; stress; reproduction*
The sublethal effects of high predation risk on both prey behavior and physiology may have long-term consequences for prey population dynamics. We tested the hypothesis that snowshoe hares during the population decline are chronically stressed because of high predation risk whereas those during the population low are not, and that this has negative effects on both their physiology and demography. Snowshoe hares exhibit 10-yr population cycles; during declines, virtually every hare that dies is killed by a predator. We assessed the physiological responsiveness of the stress axis and of energy mobilization by subjecting hares during the population decline and low to a hormonal-challenge protocol. We monitored the population demography through live-trapping and assessed reproduction through a maternal-cage technique. During the 1990s' decline in the Yukon, Canada, hares were chronically stressed - as indicated by higher levels of free cortisol, reduced maximum corticosteroid-binding capacity, reduced testosterone response, reduced index of body condition, reduced leucocyte counts, increased overwinter body-mass loss, and increased glucose mobilization, relative to hares during the population low. This evidence is consistent with the explanation that predation risk, not high hare density or poor nutritional condition, accounted for the chronic stress and for the marked deterioration of reproduction during the decline. Reproduction and indices of stress physiology did not improve until predation risk declined. These findings may also account for the lag in recovery of hare reproduction after predator densities have declined and thus may implicate the long-term consequences of predation risk on prey populations beyond the immediate effects of predators on prey behavior and physiology.

Boonstra, R., and McColl, C., 2000. Contrasting stress response of male arctic ground squirrels and red squirrels. *Journal of Experimental Zoology* 286 (4), 390-404. *POPULATION; mammals; rodents; squirrel; nutrition; biochemistry; endocrinology; stress; reproduction; behavior (territorial)*

A hormonal-challenge protocol was used to compare the stress response of males of Arctic ground squirrels and red squirrels during the breeding season (May). These squirrels live in the same boreal forest of the Yukon, but have very different life histories and utilize the forest in markedly different ways. Red squirrels had levels of total cortisol, maximum corticosteroid-binding capacity, and free cortisol that were 5, 7, and 2 times, respectively, those of Arctic ground squirrels. Red squirrels were resistant to suppression by an artificial glucocorticoid, dexamethasone (DEX); Arctic ground squirrels were not. Cortisol levels in red squirrels responded slowly but continuously to the ACTH injection; Arctic ground squirrels responded rapidly and then stabilized. Testosterone levels in red squirrels were extremely sensitive to the challenge, being suppressed by both DEX and ACTH; levels in Arctic ground squirrels were resistant to

the challenge, being modestly suppressed by DEX and stimulated by ACTH. Energy mobilization, as measured by glucose and free fatty acid responses, was not affected. Red squirrels had four times the levels of white blood cells and higher proportions of lymphocytes and lower proportions of eosinophils than Arctic ground squirrels, indicating that the latter were in worse condition immunologically. Our evidence suggests that the functions associated with the hypothalamic-pituitary-adrenal axis are compromised in breeding male Arctic ground squirrels, but not in red squirrels. We propose that in male red squirrels this axis has evolved in the context of a stable social system based on long-lived animals with individual territories which are needed to deal with unpredictable winter food supplies. In contrast, Arctic ground squirrels escape the rigors of winter by hibernation and this hormonal axis has evolved in short-lived males in the context of intense intra-sexual competition in a social system based on female kin groups and regular male dispersal to avoid inbreeding.

Boonstra, R., Hubbs, A., Lacey, E., and McColl, C., 2001. Seasonal changes in glucocorticoid and testosterone concentrations in free-living arctic ground squirrels from the boreal forest of the Yukon. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 79 (1), 49-58.

POPULATION; mammals; squirrel; seasonality; endocrinology; stress; reproduction

We examined how glucocorticoid and testosterone concentrations changed from spring to summer by livetrapping free-living populations of arctic ground squirrels (*Spermophilus parryii*). The primary glucocorticoid was found to be cortisol, with corticosterone below measurable concentrations in most individuals. Livetrapping elicited a strong stress response in both sexes: breeding males and females trapped in spring had free cortisol concentrations 4 and 34 times, respectively, those of base-line animals. The maximum corticosteroid-binding capacity (MCBC) was unaffected by trapping and was about 3 times higher in breeding females than in breeding males. Over the active season, MCBC values were lowest in all male classes (juveniles, nonreproductive adults, and reproductive adults), being less than half those in all female classes; pregnant females had values approximately twice those of juvenile females. However, free cortisol concentrations were similar in all female classes and in juvenile males and about half those in adult males. Livetrapping increased testosterone concentrations in males over those found in samples from base-line males, and testosterone concentrations did not affect MCBC values. Testosterone concentrations in livetrapped animals differed significantly among male classes, with nonreproductive males maintaining concentrations 64% of those in breeding males and 10 times those in juveniles.

Boonstra, R., Takagi, N., Bissoon, N., Vij, S., and Gurd, J., 2002. Trapping-induced changes in expression of the N-methyl-D-aspartate receptor in the hippocampus of snowshoe hares.

Neuroscience Letters 324 (3), 173-176. *POPULATION; snowshoe hare; genetics; endocrinology; trapping; stress*

Live-trapping of animals in natural populations is one of the main ways to determine population processes. We examined the effects of live-trapping on the expression of N-methyl-D-aspartate (NMDA) receptor subunits in the hippocampus of snowshoe hares. Snowshoe hares were obtained either with or without the stress of live-trapping. The CA1, CA3 and dentate gyrus were dissected and analyzed for the presence of NMDA receptor subunits. Trapping resulted in a significant reduction of NMDA receptor 1 (NR1) in each of the regions examined but did not affect the levels of either NMDA receptor 2A or 8 (NR2A or NR2B). Co-immunoprecipitation analysis showed that the association between NR1 and NR2A was decreased in the trapped animals. These results suggest that stress associated with the trapping experience may adversely affect the structure and/or function of the NMDA receptor. (C) 2002 Elsevier Science Ireland Ltd. All rights reserved.

Boucher, S., and Wheeler, T., 2001. Diversity of Agromyzidae (Diptera) [leafmining flies] in disjunct grasslands of the southern Yukon Territory. *Canadian Entomologist* 133 (5), 593-621.

POPULATION; insects; vegetation; herbivory; grasses; distribution; genetics; climate

The diversity of Agromyzidae (Diptera) associated with disjunct xeric grasslands was studied at six south-facing slopes in the southern Yukon Territory, Canada. Agromyzidae was the most diverse of 32 families of Brachycera at the sites, with 34 species (485 specimens) collected. Eight new species are described: *Liriomyza nares* sp.nov., *Metopomyza adretana* sp.nov., *Phytoliriomyza depricei* sp.nov., *Phytoliriomyza triangulata* sp.nov., *Phytomyza conglomerata* sp.nov., *Phytomyza dioni* sp.nov., *Phytomyza klondikensis* sp.nov., and *Phytomyza takhiniensis* sp.nov. Twenty previously described species were identified and six other unnamed species were represented by females only. Fourteen of the 20 previously described species are recorded from the Yukon for the first time; ecological and systematic notes are given for each species.

Although the vegetation of the sample sites was often similar, there were pronounced differences in the species assemblage of Agromyzidae collected at each site. Thirteen of the previously known species are widespread in the Nearctic region (including Holarctic species), six species are restricted to the western Nearctic, and one species is known from the Palaearctic and western Nearctic. Several major range extensions are noted.

Boulanger, J., and Krebs, C.J., 1994. Comparison of capture-recapture estimators of snowshoe hare populations. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 72 (10), 1800-1807. *POPULATION; mammals; snowshoe hare; modeling*

We used two island populations of snowshoe hares (*Lepus americanus*) in the Kluane Lake area of the Yukon Territory of Canada to evaluate capture-recapture estimators.

These islands were intensively sampled, allowing us to enumerate the actual population size. Population size estimates were calculated using the programs CAPTURE and JOLLY, and estimators were compared for bias characteristics. Results from both islands suggest that the CAPTURE heterogeneity models M_h (jackknife), M_h (Chao), and M_{th} (time-heterogeneity) and the Jolly-Seber model were approximately unbiased. All other CAPTURE models displayed a negative bias. The CAPTURE model selection routine picked estimation models of different biases for each trapping period, an undesirable result. We conclude that it is best to use one robust estimator such as the M_h (jackknife) with snowshoe hare data.

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Boutin, S., Tooze, Z., and Price, K., 1993. Post-breeding dispersal by female red squirrels (*Tamiasciurus hudsonicus*): The effect of local vacancies. *Behavioral Ecology* 4 (2), 151-155.

POPULATION; mammals; squirrel; behavior (territorial); distribution; reproduction

Red squirrels (*Tamiasciurus hudsonicus*) defend food-based territories year round, and juveniles must acquire a territory before winter to survive. We experimentally removed territory owners during the time that juveniles were becoming independent to examine the effect of local vacancies on dispersal patterns. Juveniles attempted to take over removal territories most frequently. However, females with offspring still on the natal territory actually took over twice as many territories as juveniles. These females did not appear to move because of low reproductive potential or to increase territory quality. Instead, moving to a removal territory allowed more of the ir offspring to remain on the natal territory, which appeared to increase juvenile survival.

Bowyer, R., Van Ballenberghe, V., Kie, J., and Maier, J., 1999. Birth-site selection by Alaskan moose: Maternal strategies for coping with a risky environment. *Journal of Mammalogy* 80 (4), 1070-1083. *POPULATION; mammals; moose; behavior (reproductive/nesting); reproduction; habitat selection*

habitat selection

We studied birth-site selection in Alaskan moose (*Alces alces gigas*) from 1990 to 1994 in Denali National Park and Preserve in interior Alaska. Twenty percent of preparturient females made extensive movements (greater than or equal to 5 km) immediately before

giving birth. Females selected (use was greater than availability) sites for giving birth (n = 39) that were on southerly exposures with low soil moisture and high variability in overstory cover. Moose selected birth sites based on micro-site characteristics rather than on broad types of habitat, which were used in proportion to their availability. Spatial distribution of birth sites did not differ significantly from random locations. We hypothesize that such unpredictable behavior by females is a strategy to avoid predators. Parturient females also selected sites with high visibility that were located at high elevation, which ostensibly allowed them to see and then hide from approaching predators. We rejected the hypothesis, however, that moose in this population spaced themselves away from predators or avoided habitat types favored by large carnivores. Likewise, we rejected the hypothesis that moose gave birth close to human developments to avoid predators; random sites were >100 m closer to human developments than were birth sites. Cover of forage, especially willows (*Salix*), was more than twice as abundant at birth sites than random sites. Forage quality, as indexed by nitrogen content and in vitro dry matter digestibility, was slightly but significantly higher at birth sites. An inverse relationship between visibility and availability of forage indicated that female moose made tradeoffs between risk of predation and food in selecting sites to give birth. Thus, maternal females coped with a risky environment; they gave birth at sites that helped them minimize risk of predation but exhibited risk-averse behavior with respect to the forage necessary to support the high cost of lactation. We hypothesize that risk of predation prevented moose from seeking birth sites with more forage and, hence, a greater nutritional reward, which reduced the variance in forage availability at birth sites.

Boyce, I., 2001. Enumeration of adult chum salmon, *Oncorhynchus keta*, in the Fishing Branch River, Yukon Territory, 1995. Canadian manuscript report of fisheries and aquatic sciences/Rapport manuscrit canadien des sciences halieutiques et aquatiques(2563), 38. *POPULATION; fish; salmon; chum; distribution; genetics; modeling*

A total of 51,971 migrating adult chum salmon (*Oncorhynchus keta*) was enumerated at a weir on the Fishing Branch River from August 27 to October 17, 1995. The run was estimated to be 50.9% female (n = 51,971) and 0.6% age-3₁, 70.6% age-4 sub(4), 27.7% age-5₁, and 1.2% age-6₁ (n=623). Fork length (mm) averaged 672 for males and 626 for females (n=795). A sample of post-spawn fish that drifted downstream onto the weir was 36.3% age-4 sub(), 57% age-5 sub(), 6.7% age-6 sub(1) (n=135), and 49% female (n=50). Estimated expenditure of milt/eggs averaged 86.5% for males (n=77, st. dev. = 40.5%) and 99.3% for females (n=73, st. dev.=37.2%). Seven chinook and 112 coho salmon were observed. Water temperature ranged from 6.5 degree C to 2.0 degree C; level fluctuated by 0.9 m. A helicopter survey was conducted upstream of the weir on October 4; the count was 15.7% of the weir count to that date.

Boyce, I., and Wilson, B., 2001. Enumeration of adult chum salmon, *Oncorhynchus keta*, in the Fishing Branch River, Yukon Territory, 1998. Canadian manuscript report of fisheries and aquatic sciences/Rapport manuscrit canadien des sciences halieutiques et aquatiques(2499), 31 pp. *POPULATION; fish; salmon; chum; distribution; genetics; modeling*

A total of 13,564 migrating adult chum salmon (*Oncorhynchus keta*) was enumerated at a weir on the Fishing Branch River from 31 August to 22 October 1998. The run was estimated to be 60% female (n=13,564) and 77.4% age 4₁, 22.1% age 5₁, and 0.4% age 6₁ (n=730). Fork length (mm) averaged 671 for males and 628 for females (n=750). A sample of 29 carcasses obtained at the weir was 65.5% age 4₁, 31.0% age 5₁, 3.4% age 6₁, and 72% female. Milt/egg retention averaged 25% for male and 20% for female carcasses (standard deviation for each = 33%). Six grey and 189 orange spaghetti tags were observed; 46% of these, and four radio tags, were recovered. Spaghetti tag loss was identified on four of 10,440 fish examined. Seventy-four juvenile coho salmon were

captured for DNA sampling. Water temperatures ranged from 7 degree C to 1.5 degree C; level fluctuated by 0.4 m. Air temperatures ranged from 21 degree C to -21 degree C.

Boyce, I., and Vust, P., 2002. Enumeration of adult chum salmon, *Oncorhynchus keta*, in the Fishing Branch River, Yukon Territory, 1997. Canadian Manuscript Report of Fisheries and Aquatic Sciences 2585, 41. *POPULATION; fish; salmon; chum; distribution; monitoring*

A total of 26,968 migrating adult chum salmon (*Oncorhynchus keta*) was enumerated at a weir on the Fishing Branch River from August 28 to October 15, 1997. The run was estimated to be 51.6% female (n= 26,968), and 38.0% age-4 sub(1), 54.1% age-5 sub(1), 7.7% age-6 sub(1) and 0.2% age 7 sub(1) (n=618). Fork length (mm) averaged 676 for males and 624 for females (n=800). A total of 175 spaghetti tags was observed. Tag loss was not identified conclusively. A sample of fish that drifted downstream onto the weir was 37.2% age-4 sub(1), 56.6% age-5 sub(), 6.2% age-6 sub(1) (n=129), and 38.5% female (n=130). Estimated expenditure of milt/eggs in these fish averaged 92.3% for males (n=80, st.dev.=15.1%) and 90.6% for females (n=50, st.dev.=13.6%). Twelve chinook and eight coho salmon were observed. Water temperature ranged from 7.5 degree C to 1.5 degree C; level fluctuated by 0.2 m.

Brabets, T.P., Wang, B., and Meade, R.H., 2000. Environmental and Hydrologic Overview of the Yukon River Basin, Alaska and Canada. # 99-4204. United States Geological Survey, Anchorage. http://ak.water.usgs.gov/Publications/Abstracts/2000.Abstracts/yukon_river.abs.htm (includes link to full report) *HYDROLOGY; water quality; ground water; surface water ;ground ice / permafrost; sediment; soil; climate; geology; contaminants*

The Yukon River, located in northwestern Canada and central Alaska, drains an area of more than 330,000 square miles, making it the fourth largest drainage basin in North America. Approximately 126,000 people live in this basin and 10 percent of these people maintain a subsistence lifestyle, depending on the basin's fish and game resources. Twenty ecoregions compose the Yukon River Basin, which indicates the large diversity of natural features of the watershed, such as climate, soils, permafrost, and geology. Although the annual mean discharge of the Yukon River near its mouth is more than 200,000 cubic feet per second, most of the flow occurs in the summer months from snowmelt, rainfall, and glacial melt. Eight major rivers flow into the Yukon River. Two of these rivers, the Tanana River and the White River, are glacier-fed rivers and together account for 29 percent of the total water flow of the Yukon. Two others, the Porcupine River and the Koyukuk River, are underlain by continuous permafrost and drain larger areas than the Tanana and the White, but together contribute only 22 percent of the total water flow in the Yukon. At its mouth, the Yukon River transports about 60 million tons of suspended sediment annually into the Bering Sea. However, an estimated 20 million tons annually is deposited on flood plains and in braided reaches of the river. The waters of the main stem of the Yukon River and its tributaries are predominantly calcium magnesium bicarbonate waters with specific conductances generally less than 400 microsiemens per centimeter. Water quality of the Yukon River Basin varies temporally between summer and winter. Water quality also varies spatially among ecoregions.

SUMMARY

This report describes the environmental and hydrologic setting of the Yukon River Basin, the fourth largest drainage basin in North America. The primary environmental and hydrologic features of the Yukon River Basin are as follows:

- The population of the Yukon River Basin is approximately 126,000 people. Approximately 10 percent of these people have a subsistence lifestyle and depend on the fish and game resources of this 330,000- square- mile basin.**
- The climate of the Yukon River Basin is variable because of its large size and range in altitude. Precipitation ranges from 10 to 130 in. annually and the mean average air temperature is about 22 degrees F. The upstream part of the basin**

is rolling topography or moderately high rugged mountains, whereas the downstream part of the basin is primarily low mountains, plains, and low-lands. The geology is complex and consists of many types of consolidated rocks in the mountain ranges surrounding the basin and unconsolidated sediments deposited in the lowland areas. • Wetlands account for about 30 percent of the Yukon River Basin. The primary land cover is needleleaf forest and the primary soils are Gelisols. Many of the Gelisols are frozen organic soil. These soils are located in the northern third of the basin which is underlain by continuous permafrost. • The Yukon River Basin consists of 20 ecoregions, distinct areas delineated by the integration of their natural features. Interior Forested Lowlands and Uplands is the largest ecoregion of the basin and accounts for 21 percent of the drainage area. The Interior Highlands ecoregion is the second largest ecoregion of the basin and accounts for about 17 percent of the drainage area. • Discharge from streams and rivers in the Yukon River Basin varies depending on the presence of glaciers. Two major tributaries that drain glacier areas of the Yukon River, the Tanana River and the White River, account for 29 percent of the flow of the Yukon River but only account for about 20 percent of the drainage area. Melting glaciers add more water to these rivers and sustain runoff through the summer season. The average annual discharge of the Yukon River near its mouth is 227,000 cubic ft/s. However, most of the flow occurs from May through September. • Near its mouth, the Yukon River transports about 60 million tons of suspended sediment toward the Bering Sea annually. However, each year, about 20 million tons of sediment are deposited on flood plains and in braided reaches of the river. Implications of this deposition are enormous for the sequestration of organic carbon, contaminants, and other materials that are absorbed onto, or otherwise associated with, alluvial sediments. • The waters of the main stem of the Yukon River and its tributaries are predominantly calcium magnesium bicarbonate waters with specific conductance ranging from 54 to 373 μ S/cm. Concentrations of the nutrients nitrogen and phosphorus are generally less than 0.5 mg/L. Temporal trends in water quality between summer and winter are evident at some sites along the Yukon River. Comparison of water-quality data within ecoregions indicates that total organic carbon concentrations were highest in ecoregions dominated by organic soils. • Some anthropogenic effects to water quality of the Yukon River Basin have been documented. These effects are due to atmospheric processes, pre-regulation mining, and old military sites used during the Cold War. The cumulative effects on the Yukon River Basin cannot be made because of a lack of water-quality data.

Bradley, M., Parker, W.B., Dasher, D., Verbrugge, L., Nobmann, E., Berner, J., Rubin, C., and Lanier, A., 1999. Alaska Pollution Issues. Alaska Native Health Board, Anchorage, AK. <http://www.anhb.org/sub/epi/publications.html> CONTAMINANTS; metals; POPs (persistent organic pollutants); POL (petroleum/oil/lubricants = hydrocarbons); acidification; bioaccumulation; health (effects); growth/development; cancer; radiation; risk assessment; traditional food

PREFACE

The Arctic and Alaska are often considered to be one of the few remaining pristine environments on earth. Unfortunately that is no longer true. Long-range transport of contaminants that originate from distant areas of the globe are now found in all areas of the Arctic. These long range contaminants as well as pollutants from local sources enter Arctic food chains and expose indigenous populations who utilize traditional foods. This issue has created significant concern among Alaska Natives and other indigenous arctic peoples. Arctic contaminants have been blamed for everything from climatic and ecological changes to increased rates of disease. Of special concern is the safety of traditional foods.

The behavior and effects of contaminants in the Arctic are poorly understood. However through the Arctic Monitoring and Assessment Program (AMAP) information is accumulating rapidly. AMAP was established in 1991 by the eight nations of the Arctic Council to coordinate studies on the levels of contaminants in the Arctic and to assess their effects on the Arctic environment including human health. Unfortunately what is known, especially recent information, has not been widely shared. It is our belief that this information gap is partly responsible for the apprehension among Alaska Natives concerning environmental contaminants.

In an effort to bridge this information gap the Alaska Native Epidemiology Center (EpiCenter) sponsored a Conference on Environmental Contaminants and Disease on 28 October 1998. The conference was principally for the EpiCenter Advisory Council made up of representatives from Tribal Health Corporations in Alaska.

Planning for the conference began with a search for speakers who were recognized as foremost authorities on the various aspects of contaminants in Alaska. Results of this process were unique in that everyone who we sought was most willing and able to attend, and presented at the conference.

This report is based on their presentations. The major objective of the report is to educate Alaska Natives on the types, sources, pathways and effects of contaminants in the Arctic and Alaska. This report does not have all the answers about Arctic contaminants - no one has all the answers. However the report provides a review what is known.

The first chapter consists of tables that list the significant contaminants found in the Arctic. They are based primarily on recent AMAP publications. The tables include an overview of sources, pathways, routes of exposure to humans and health effects. The tables are designed to serve as a concise reference for information on Arctic contaminants.

Chapter two is a much more detailed review of the sources, pathways and patterns of distribution of Arctic contaminants. It includes much information on Alaska that has not been published. A large section of the chapter deals with radiation, which has become a topic of particular concern among Alaska Natives. The chapter also includes an extensive bibliography.

Chapters three and four deal with the issue of contaminants in traditional or subsistence foods. Chapter three is an overview of a project by the Section of Epidemiology, Division of Public Health, Alaska Department of Health and Human Services to assess levels and health effects of contaminants in traditional foods. It focuses on mercury, cadmium and PCBs. The chapter reviews dietary intake guidelines of various agencies, includes data on contaminant levels in subsistence foods and discusses the benefits of traditional foods. Chapter four provides a more detailed review of the nutritional value and benefits from consumption of traditional foods. Both chapters conclude that the benefits of traditional food consumption far outweigh any relative health risks posed by contaminants.

Chapters five and six deal with the health hazards associated with contaminants found in the Arctic. Chapter five is a review of what is known about the general health effects from exposure to Arctic contaminants. Because this is such a broad subject it focuses on the group which many now feel are the most vulnerable to exposure from environmental contaminants – infants and unborn children.

Chapter six is devoted to environmental causes of cancer. Cancer is probably the most feared disease in Alaska Native communities and many believe that environmental contaminants are the cause of many cancers. This chapter reviews what is known about the relationship between environmental contaminants and cancer. It also discusses investigation of cancer clusters.

Michael Bradley - Editor

Bradley, M., 2001. Alaska Pollution Issues Update. Alaska Native Health Board, Anchorage. <http://www.anhb.org/sub/epi/API%20UPDATE.pdf> *CONTAMINANTS; metals; POPs (persistent organic pollutants); POL (petroleum/oil/lubricants = hydrocarbons); traditional food; nutrition; risk assessment; bioaccumulation; health (effects); growth/development; cancer*

EXECUTIVE SUMMARY

The persistent environmental contaminants include organochlorine compounds such as the PCBs and pesticides, heavy metals and radioactive elements. They are found at many military sites, mining and oil extraction sites and municipal land fills throughout Alaska. Most however, originate from other parts of the world and make their way here by air, water and even migratory wildlife pathways.

Chemically they are very stable and concentrate in the food chain, which serves as the most significant route of exposure to humans. While many traditional foods from many areas of the state have yet to be tested, data that is available indicates levels in traditional foods are not significantly elevated. Nearly all are below the FDA action level. Highest levels are of heavy metals in marine mammal liver and kidneys. However, potential health effects are based on cumulative lifetime exposures so periodic consumption of marine mammal organs may not even come close to a potential toxic level of exposure.

Levels of these contaminants in Alaska Natives are about the same as in other populations and are consistent with the levels in traditional foods. The persistent environmental contaminants have a range of known and suspected health effects that may damage the central nervous and immune systems; cause cancer; or have adverse effects on the developing fetus. Health effects which would occur at low levels of exposure, which seem to be the case in Alaska, are subtle if they occur at all and are more difficult to detect. It is known however that the developing fetus and newborn infants are the most sensitive and most vulnerable to these contaminants.

The value of nutritional benefits associated with traditional diets is of much greater certainty. Traditional foods contain high quality protein and many other components that sustain health and help prevent diseases such as diabetes, cancer, heart diseases, etc. Studies in Canada and Alaska clearly show that diets high in traditional foods offer a much more healthy diet than western foods. More research is needed to better determine the contaminant levels in traditional foods, actual exposure to Alaskans from contaminants in traditional foods, and the ill health effects from this exposure. Until more is known, the benefits of traditional foods outweigh potential risks posed by contaminants and use of traditional foods should continue.

Braune, B., 1996. Trends and effects of environmental contaminants in Arctic seabirds, waterfowl and other wildlife: contaminants in waterfowl: native harvest in the Yukon. Synopsis of Research Conducted Under the 1994/95 Northern Contaminants Program (Environmental Studies - Canada 73), 223-227. *INCOMPLETE (need abstract); CONTAMINANTS; POPs (persistent organic pollutants); bioaccumulation; traditional food; birds; waterfowl*

Braune, B.M., Muir, D., DeMarch, B., Gamberg, M., Poole, K., Currie, R., Dodd, M., Duschenko, W., Eamer, J., Elkin, B., Evans, M., Grundy, S., Hebert, C., Johnstone, R., Kidd, K., Koenig, B., Lockhart, L., Marshall, H., Reimer, K., Sanderson, J., and Shutt, L., 1999. Spatial and temporal trends of contaminants in Canadian Arctic freshwater and terrestrial ecosystems: a review. *Science of the Total Environment* 230 (1-3), 145-207. *CONTAMINANTS; POPs (persistent*

organic pollutants); metals; radiation; soil; air quality; water quality; vegetation; traditional food; bioaccumulation; fish; mammals; birds

The state of knowledge of contaminants in Canadian Arctic biota of the freshwater and terrestrial ecosystems has advanced enormously since the publication of the first major reviews by Lockhart et al. and Thomas et al. in *The Science of the Total Environment* in 1992. The most significant gains are new knowledge of spatial trends of organochlorines and heavy metal contaminants in terrestrial animals, such as caribou and mink, and in waterfowl, where no information was previously available. Spatial trends in fresh water fish have been broadened, especially in the Yukon, where contaminant measurements of, for example, organochlorines were previously non-existent. A review of contaminants data for fish from the Northwest Territories, Yukon and northern Quebec showed mercury as the one contaminant which consistently exceeds guideline limits for subsistence consumption or commercial sale. Lake trout and northern pike in the Canadian Shield lakes of the Northwest Territories and northern Quebec generally had the most elevated levels. Levels of other heavy metals were generally not elevated in fish. Toxaphene was the major organochlorine contaminant in all fish analyzed. The concentrations of organochlorine contaminants in fish appear to be a function not only of trophic level but of other aspects of the lake ecosystem. Among Arctic terrestrial mammals, PCBs and cadmium were the most prominent contaminants in the species analyzed. Relatively high levels ($10\text{-}60 \times 10^{-6} \text{ g/g}$) of cadmium were observed in kidney and liver of caribou from the Yukon, the Northwest Territories and northern Quebec, with concentrations in western herds being higher than in those from the east. For the organochlorine contaminants, a west to east increase in total PCBs, HCB and total HCH was found in caribou, probably as a result of the predominant west to east/north-east atmospheric circulation pattern which delivers these contaminants from industrialized regions of central and eastern North America to the Arctic via long-range atmospheric transport. Radiocesium contamination of lichens and caribou has continued to decrease. Significant contamination by PCBs and lead of soils and vascular plants was observed in the immediate vicinity and within a 20-km radius of DEW line sites in the Canadian Arctic. There was also evidence for transfer of PCBs from plants to lemmings. There was no evidence, however, that large mammals such as caribou living in the general area of the DEW line sites had elevated levels of PCBs. There is very limited temporal trend information for most contaminants in biota of Arctic terrestrial and freshwater environments.

Breaser, S., Stearns, F., Smith, M., West, R., and Reynolds, J., 1988. Observations of movements and habitat preferences of burbot in an Alaskan glacial river system. *Transactions of the American Fisheries Association* 117 (5), 506-509. *POPULATION; distribution; monitoring; burbot; behavior (reproductive/nesting)*

The authors studied the movements of burbot *Lota lota* from October 1983 to December 1984 in the upper reaches of the Tanana River, a glacial tributary of the Yukon River in eastern Alaska. They surgically implanted radio transmitters into 21 burbot and monitored the fish by aerial telemetry once every 3 weeks. Fish were relocated up to 68 km downstream and 84 km upstream from release sites. The longest combined upstream and downstream movement observed for an individual fish was 125 km. Although burbot moved about during all seasons, their longest movements occurred during November-March, the normal period of spawning activity.

Britten, M., Kennedy, P., and Ambrose, S., 1999. Performance and accuracy evaluation of small satellite transmitters. *Journal of Wildlife Management* 63 (4), 1349-1358. *POPULATION; birds; raptor; peregrine falcon; distribution; migration; modeling*

Recent technological advances have resulted in small (30 g) satellite platform transmitter terminals (PTTs) that can be used to track animals with masses as little as 900-1,000 g.

While larger PTTs (>80 g) often yield locations accurate to within hundreds of meters, the location accuracy of smaller PTTs has not been tested. We did these tests while using the PTTs to document migration routes and nonbreeding areas of American peregrine falcons (*Falco peregrinus anatum*). We PTT-tagged 42 female peregrines from 2 breeding areas (upper Yukon River in eastcentral Alaska and Lake Powell on the Colorado Plateau in southern Utah and northern Arizona) late in the breeding seasons of 1993-95. Only 2 of the PTTs failed prematurely (4.7% failure rate). Active PTTs (i.e., PTTs on live birds that eventually stopped transmitting due to battery exhaustion) averaged 280 transmission hours for 1993-94 (n = 3), 380 transmission hours for 1994-95 (n = 7), and 430 transmission hours for 1995-96 (n = 15). Using an estimate of maximum ground speed of peregrines (104 km/hr) based on empirical observations and aerodynamic calculations, we determined that 4.48% of all locations provided to us by Argos (n = 2,323) were biologically implausible. We also received many poor-quality locations (68% of records were in Argos location classes 0, A, and B) typical of small, relatively underpowered PTTs. To estimate location accuracy of these poor-quality locations, we compared Argos-estimated locations with known locations of 11 rock doves (*Columba livia*) tagged with PTTs. The location types with the highest precision averaged 4 km from the true location, while the location types with the lowest precision averaged 35 km from the true location. These results indicate the PTT locations were sufficient to document animal movements over broad spatial scales such as identifying migration routes and nonbreeding areas of birds. This technology is more efficient and less biased than the current approaches used to obtain this information (mark-resighting of banded animals or standard radiotelemetry techniques). However, the PTTs currently available are not suitable when position accuracy <35 km is needed.

Britton, J., 2000. Alaska Resource Data File; Chandalar quadrangle. open file report 00-357. US Geological Survey, Anchorage, AK. ftp://pluton.wr.usgs.gov/pub/ardf_data/Chandalar.pdf
MINING; INFRASTRUCTURE; gold; silver; copper; nickel; manganese

"Descriptions of the [109] mineral occurrences shown on the accompanying figure follow. See U.S. Geological Survey (1996) for a description of the information content of each field in the records. The data presented here are maintained as part of a statewide database on mines, prospects and mineral occurrences throughout Alaska." This and related reports are accessible through the USGS World Wide Web site <http://ardf.wr.usgs.gov>. Comments or information regarding corrections or missing data, or requests for digital retrievals should be directed to: Frederic Wilson, USGS, 4200 University Dr., Anchorage, AK 99508-4667, e-mail fwilson@usgs.gov, telephone (907) 786-7448.

Brown, E., Luong, H., and Forshaug, J., 1982. The occurrence of *Thiobacillus ferrooxidans* and arsenic in subarctic streams affected by gold-mine drainage. *Arctic* 35 (3), 417-421. *MINING; gold; WATER QUALITY; surface water; contaminants; metals; arsenic; iron; sulfur; acidification*
Thirty-five streams in gold-mining regions between Rampart, Alaska, and Dawson City, Yukon Territory, were sampled to determine dissolved arsenic concentrations, and numbers of the acidophilic iron- and sulfur-oxidizing bacterium *Thiobacillus ferrooxidans*. The pH of the streams varied from 6.3 to 8.6 and the streams were nearly saturated with dissolved oxygen. *T. ferrooxidans* was found in eight of nine streams affected by gold-mine drainage and in only one of 26 streams not affected by gold-mine drainage. Some of the streams affected by gold-mine drainage near Fairbanks, Alaska, occasionally contained levels of dissolved arsenic above 50 parts per billion. The recognition that *T. ferrooxidans* is associated with gold-mine material and that the heavy metal arsenic exists in streams affected by gold-mine wastes is important for understanding the environmental effects of mining activity on subarctic streams.

Brown, R., and Braaten, R., 1998. Spatial and temporal variability of Canadian monthly snow depths, 1946-1995. *Atmosphere - Ocean* 36 (1), 37-54. *CLIMATE; precipitation; snow; hydrology*

In 1995 the Atmospheric Environment Service of Canada made a major effort to digitize paper records of daily and weekly snow depth that were not in the Canadian Digital Archive of Climate Data. This resulted in the extension of the snow depth record back to the late 1940s at many stations, and the filling of missing data from a number of stations, particularly in the Arctic. This paper describes the database, the methods used both for quality control and to reconstruct missing data, and presents an analysis of the spatial and temporal characteristics of the data over the 1946-1995 period. Principal component analysis of monthly snow depths revealed that snow depths varied coherently over relatively large regions of Canada, with dominant centres of action located over the West Coast, Prairie, Yukon-Mackenzie, southern Ontario, northern Quebec and Maritime regions. In many cases, nodes of coherent snow depth variations were associated with corresponding nodes of coherent snow cover duration fluctuations, with the two time series exhibiting significant positive correlations. Winter and early spring snow depths were observed to have decreased significantly over much of Canada in the 1946-1995 period, with the greatest decreases occurring in February and March. These depth decreases have been accompanied by significant decreases in spring and summer snow cover duration over most of western Canada and the Arctic. The snow depth changes were characterized by a rather abrupt transition to lower snow depths in the mid-1970s that coincided with a well-documented shift in atmospheric circulation in the Pacific-North America sector of the Northern Hemisphere.

Brown, R., and Severin, K., 1999. Elemental distribution within polymorphic inconnu (*Stenodus leucichthys*) otoliths is affected by crystal structure. *Canadian Journal of Fisheries and Aquatic Sciences/Journal Canadien des Sciences Halieutiques et Aquatiques* Ottawa 56 (10), 1898-1903. *POPULATION; fish; inconnu [sheefish]; otolith*

The chemistry and crystal structure of sagittal otoliths from inconnu (*Stenodus leucichthys*) were examined optically, with an electron microprobe, a scanning electron microscope, and with X-ray diffraction techniques. The distributions of strontium (Sr), sodium (Na), potassium (K), and calcium (Ca) were determined with line scans and area maps of thin, transverse otolith sections. Regions depleted in Sr, Na, and K were found to be discordant with optical annuli and were optically distinct from other regions of the otoliths. These patterns of trace element depletion cannot be explained by models of otolith growth that are based on ionic composition of endolymph fluids as the sole control of otolith composition. Electron micrographs showed the depleted regions of the otoliths to be of a different crystal structure than other regions of the otoliths. X-ray diffraction analyses revealed the presence of vaterite in otoliths with depleted regions, while otoliths without depleted regions showed no evidence of vaterite. The depleted areas may be composed of vaterite, and the crystal structure of vaterite may prevent certain trace elements from incorporating in the otolith. Scientists using fish otolith chemistry to infer environmental conditions or life history should be aware that elemental abundance within otoliths may be affected by other processes as well.

Brown, R., 2000. Migratory patterns of Yukon River inconnu [sheefish] as determined with otolith microchemistry and radio telemetry, University of Alaska Fairbanks, M.S., 80 p *POPULATION; fish; inconnu [sheefish]; migration; reproduction; distribution; monitoring*

Summary: "Migratory patterns of Yukon River inconnu *Stenodus leucichthys* [sheefish] were evaluated using otolith aging and microchemical techniques and radio telemetry. Research was conducted each fall between 1997 and 1999, on inconnu captured at a study site 1,200 river km from the Bering Sea. Biological data were collected to establish maturity and spawning condition. Sagittal otoliths were analyzed optically to determine

age distribution, and microchemically to determine amphidromy. Inconnu were tagged with radio transmitters and located in upstream spawning destinations. Inconnu captured at the study site were uniformly large, mature fish preparing to spawn. Age estimates ranged from 7 to 28 years. Microchemical analyses suggested that the population was amphidromous rather than freshwater only. Preliminary testing of radio transmitter attachment methods showed that the internal method (pushed through the esophagus into the stomach) was superior to the external method (attached behind the dorsal fin) for use with migrating inconnu. Most radio-tagged inconnu were located during their spawning time in a common region of the Yukon River. Inconnu captured at the study site each fall were mature fish engaged in a spawning migration that originated in the lower Yukon River or associated estuary regions, and continued towards a common spawning destination in the Yukon River, approximately 1,700 river km from the sea"

Buklis, L., 1999. A Description of Economic Changes in Commercial Salmon Fisheries in a Region of Mixed Subsistence and Market Economies. *Arctic* 52 (1), 40-48. *PEOPLE; subsistence; POPULATION; fish; salmon; chum; chinook; coho; economics*
Commercial salmon fisheries in the Arctic-Yukon-Kuskokwim (AYK) region of Alaska generally provide a cash supplement to the subsistence way of life of the rural residents, who make up the bulk of the commercial fishers. Changes have occurred in commercial salmon fishery sales and exvessel values in the region during the period 1976-97. While commercial sales of chum salmon have declined in recent years, chinook salmon sales have been more stable, and those of coho salmon were on an increasing trend until the weak return in 1997. Price drops have been most pronounced for chum salmon. These changes have brought shifts in composition of commercial salmon fishery exvessel values. Exvessel value grew from \$4.4 million in 1976 to relatively stable levels during the 1980s and early 1990s, except for a record value of \$29.2 million in 1988; values then declined in the mid 1990s to only \$7.5 million in 1997. The 1993-97 exvessel values, when adjusted for inflation, are the lowest since 1976. It is not known whether exvessel values will rebound, making the current downturn temporary, or whether the declines will persist. However, impacts of supply on a broader scale pose a serious problem for the commercial salmon fisheries in this remote region of Alaska, where the areas with the largest commercial salmon fisheries also have the lowest per capita incomes in the state. World supply trends for salmon are a supply-side factor in these economic changes. Impacts to the fishers at the local level are described in practical terms.

Bulkow, L., Singleton, R., Karron, R., Harrison, L., and Group, A.R.S., 2002. Risk factors for severe respiratory syncytial virus infection among Alaska native children. *Pediatrics* 109 (2), 210-216. *PEOPLE; infants; children; health (condition); respiratory infection; risk assessment*

OBJECTIVE: The incidence of hospitalization for respiratory syncytial virus (RSV) infection among Alaska Native children is much higher than among non-Native populations in the United States. We conducted this study to better understand factors associated with hospitalization attributable to RSV infection in this high-risk population. DESIGN: Case-control study, including collection of cord blood for RSV-neutralizing antibody measurement.

SETTING: Remote region of southwest Alaska served by 1 regional hospital and 2 referral hospitals.

SUBJECTS: Case-patients identified through surveillance for RSV infection and matched control subjects without acute respiratory infection hospitalization.

RESULTS: Breastfeeding was associated with a lower risk of RSV hospitalization (odds ratio: 0.34), whereas underlying medical conditions (primarily prematurity) were associated with increased risk (odds ratio: 6.25). Environmental factors associated with a higher risk of hospitalization included household crowding (4 or more children in the

household and crowding index $>$ or $=2$). The level of maternal RSV-neutralizing antibody was not associated with the risk of hospitalization.

CONCLUSIONS: In this region with extremely high risk of RSV hospitalization, several measures, such as encouraging breastfeeding and reducing household crowding, could reduce the risk of hospitalization attributable to RSV.

Bunch, T.D., Hoefs, M., Glaze, R.L., and Ellsworth, H.S., 1984. Further studies on horn aberrations in Dall's sheep (*Ovis dalli dalli*) from Yukon Territory, Canada. *Wildlife Disease* 20 (2), 125-33. *POPULATION; mammals; sheep; deformity; growth/development*

The prevalence of horn aberrations in Dall's sheep from the Kluane Lake area of Yukon Territory observed during July 1982 represented 1% of the total population and 7% of rams 6 yr or older. Ewes were not considered in these percentages because they were too difficult to inspect by aerial survey. When these data were combined with other data collected from 1977 through 1981, the prevalence equalled 2.4% of the total population and slightly exceeded 16% in mature rams (greater than or equal to 6 yr). The anomaly followed necrosis of the terminal region of the horn core and the sequestering of portions of the core within the sheath as the sheath continued to grow. Sheath that was produced after the core was anatomically altered resulted in abnormal growth patterns of the horn. Rams with aberrant horns could not maintain homeostatic temperatures within horn cores when horns were experimentally exposed to -80 C for 30 min. Histologic examination of superficial and corneal vascular systems did not reveal any structural alterations that would restrict blood flow within cores of affected horns. Examination of museum specimens consisting of 130 skulls from rams and 81 from ewes collected from Alaska, USA, Yukon Territory, Canada, and Northwest Territories, Canada, established only one ewe and no rams with the horn aberration. The skull was from a ewe and had both horns affected and was collected from the Joe River Drainage, Yukon Territory in 1912.

Burch, J.W., 2001. Evaluation of wolf density estimation from radiotelemetry data, University of Alaska Fairbanks, M.S., 55 p *POPULATION; mammals; wolf; distribution; monitoring; imaging (remote sensing)*

Summary: "Density estimation of wolves (*Canis lupus*) requires a count of individuals and an estimate of area those individuals inhabit. With radiomarked wolves, the count is straightforward but estimation of area is more difficult and often given inadequate attention. The population area, based on the mosaic of pack territories, is influenced by sampling intensity similar to individual home ranges. If sampling intensity is low, population area will be underestimated and wolf density will be inflated. Using data from studies in Denali National Park and Preserve, I investigated these relationships using Monte Carlo simulation to evaluate effects of radiolocation effort and number of marked packs on density estimation. As the number of adjoining pack home ranges increase, fewer relocations are necessary to define a given percentage of population area. I evaluated the utility of nonlinear regression to adjust for biases associated with under sampling and present recommendations for monitoring wolves via radiotelemetry"

Burek, K., and Underwood, T.J., 2002. Morbidity of Tagged Wild Adult Fall Chum Salmon Captured by Fish Wheel in the Yukon River, Alaska. Alaska Fisheries Technical Report Number 60. U.S. Fish and Wildlife Service, Fairbanks Fishery Resource Office, Fairbanks.

POPULATION; fish; salmon; chum; migration; health (condition); bacteria; parasitic infection; mortality; endocrinology; morphology

A mark-recapture study using fish wheels and spaghetti tags was conducted annually on migrating Yukon River chum salmon since 1996. A substantial decrease in the relative abundance of tagged fish was observed with increased distance upstream, potentially indicating excessive mortality of tagged fish. To evaluate causes of mortality and morbidity and describe histologic changes during migration, chum salmon were sampled

and examined by full necropsies that included external lesions, weight, length, hematology, bacteriology, ELISA for bacterial kidney disease antigen, and semiquantitative histopathology. To assess body condition, Fulton's condition factor, hepatosomatic and gonadosomatic, indices, were determined. None of these analyses indicated a definitive cause for mortality or morbidity specific to the tagged fish. Local damage at the tag site, higher neutrophil numbers, and lower total protein in tagged fish suggested further study into the possibility of infection as a cause of mortality associated with tagging. A single untagged fish had a systemic infection of *Aeromonas salmonicida*. These bacteriology results indicated that septicemia from tagging was not occurring during the interval examined. There was one weak positive for an antigen of the bacterial kidney disease agent indicating that this disease was not a significant factor in morbidity. Blood smears were negative for viral erythrocytic necrosis inclusion bodies. Lesions suggestive of other major infectious diseases were not evident. Lesions typical of these migrating salmon included somatic and gastrointestinal skeletal muscle degeneration, contraction band necrosis in the heart, fibrin thrombi in the heart and gills, apoptosis of the gastrointestinal epithelial cells, bone remodeling, ulcers, vacuolar change in the islets of Langerhans and zymogen granule depletion in the pancreas, and mesenteric fat atrophy. Parasites included *Ichthyophonus hoferi*, *Loma salmonae* in the gill and intraarterial, an unidentified microsporidian in the kidney, a myxosporidian *Parvicapsula* sp. in the kidney and intestine, nematode larvae within the walls of the stomach and intestine, intestinal cestodes, and gastric trematodes.

Burger, C., and Swenson, L., 1977. Environmental surveillance of gravel removal on the Trans-Alaska Pipeline System, with recommendations for future gravel mining. Special report - Joint State/Federal Fish & Wildlife Advisory Team ; no. 13. U.S. Department of the Interior, Anchorage. *INCOMPLETE (need abstract); MINING; reclamation; INFRASTRUCTURE; TAPS (Trans Alaska Pipeline System); road*

Burn, C., 1982. Investigations of thermokarst development and climatic change in the Yukon Territory: Ottawa, Carleton University *INCOMPLETE (need abstract); HYDROLOGY; CLIMATE; ground ice / permafrost; thermokarst*

Burn, C., and Smith, M., 1985. On the origin of aggradational ice; preliminary report ... with respect to investigation of influence of climate change on permafrost conditions. Investigation of permafrost and climate change - long term study phase 2; preliminary final report. Carleton University, Geotechnical Science Laboratories, Ottawa, Ontario.
<http://www.yukon.taiga.net/infosources/details.cfm?ID=98> *INCOMPLETE (need abstract); CLIMATE; HYDROLOGY; ground ice / permafrost; thermokarst*

Burn, C., and Michel, F., 1987. Evidence for Recent Temperature-Induced Water Migration into Permafrost from the Tritium Content of Ground Ice Near Mayo, Yukon Territory, Canada. Canadian Journal of Earth Sciences/Revue Canadienne des Sciences de la Terre 25, 909-915. *CLIMATE; ground ice / permafrost; hydrology; ground water*

Determinations of the tritium (³H) content of ground ice collected near Mayo, Yukon Territory, indicate that since the mid-1950s atmospheric water has infiltrated permafrost to depths of up to 50 cm. The rate of tritium infiltration into permafrost at two plots irrigated with tritiated water in 1983 suggests that tritium movement is principally due to temperature-induced transport rather than molecular diffusion.

Burn, C., 1988. Observations of the 'Thermal Offset' in Near-Surface Mean Annual Ground Temperatures at Several Sites near Mayo, Yukon Territory, Canada. Arctic 41 (2), 99-104. *CLIMATE; ground ice / permafrost; thermokarst; soil; modeling*

Temperature profiles in the surface layers of the ground were measured frequently over a 12-month period beginning in May 1984 at seven sites near Mayo, Yukon Territory. Permafrost is present at six of the sites. The mean annual ground temperature profile at each site displays a thermal offset, with measured mean annual temperatures in the active layer up to 1.7°C higher than in permafrost. Similar mean annual soil temperature profiles are presented from other stations in northern Canada and the USSR. Such near-surface inflections are not included in conventional models of the thermal regimes of permafrost. The data indicate that equilibrium or aggrading permafrost may be present at sites where the mean annual ground surface temperature is above 0°C.

Burn, C., and Friele, P., 1989. Geomorphology, vegetation succession, soil characteristics, and permafrost in retrogressive thaw slumps near Mayo, Yukon Territory. *Arctic* 42 (1), 31-40.

CLIMATE; ground ice / permafrost; thermokarst; soil; vegetation; calcium; sediment

Three retrogressive thaw slumps of varying age have been initiated by erosion of ice-rich glaciolacustrine sediments on a bend of Stewart River, 3 km upstream from Mayo, Yukon Territory. Two of the slumps are presently active; the third stabilized before 1944. The rate of retreat of the active slump headwalls between 1949 and 1987, determined from aerial photographs and ground surveys, is up to 16 m per yr. Floors of the active thaw slumps contain well-defined vegetation successional communities that are distinct from the local, mature boreal forest. Although a few clumps of mature forest vegetation survive the fall into the slump, a birch/white spruce sere, similar to the original forest, is re-established after a period of 35-50 years. Changes in soil calcium carbonate and soil structure profiles on disturbed surfaces of varying age demonstrate the initiation of pedogenesis in the floor of the stabilized slump, but assays of pH, organic carbon and total nitrogen indicate that after about 40 years the new soils remain immature.

Burn, D., 1989. A stage distribution approach to estimating ice related flooding probabilities.

Water Resources Bulletin 25 (5), 953-960. *HYDROLOGY; surface water; climate; river ice; flooding; modeling*

A procedure is presented for estimating flooding probabilities resulting from either open water or ice condition events. The methodology involves individually fitting a distribution function to water stages from open water and ice events and determining the composite probability of exceedence of any stage value. The parameters of the two distribution functions are estimated using censored maximum likelihood. The approach is evaluated with a Monte Carlo sampling program and is applied to estimate flooding probabilities on the Yukon River.

Burn, C., 1990. Development of Thermokarst Lakes During the Holocene at Sites Near Mayo, Yukon Territory. *Permafrost and Periglacial Processes* 1, 161-176. *CLIMATE; ground ice / permafrost; soil; thermokarst; wildfire; imaging (remote sensing); vegetation*

The origin and growth of numerous thermokarst near Mayo, central Yukon, has been examined, using ground surveys, aerial photographs and dendrochronology. Many of the lakes are currently expanding, at rates of axial increment up to 1.2 m/yr. Three lakes, whose axes are currently enlarging at about 1.0 m/yr, were studied in particular detail: tree-ring analysis indicates that these lakes formed by the middle to the late part of the last century. The talik profile was determined beneath one lake, and is consistent with the Stefan solution for thawing of ice-rich soil with such an initiation date and rate of expansion. Organic-rich horizons containing logs, vegetative detritus and fresh-water ostracods have been exposed in two retrogressive thaw slumps near the lakes. These horizons have been interpreted as the bottoms of former thermokarst lakes. Radiocarbon dates of approximately 8500 BP, 3900 BP and 2300 BP have been obtained, indicating several periods of thermokarst activity during the Holocene. The results suggest that thermokarst activity is related to the effects of forest fires.

1991. Short Communication: Permafrost and Ground Ice Conditions Reported During Geotechnical Investigations in the Mayo District, Yukon Territory. Permafrost and Periglacial Processes 2, 259-268. *CLIMATE; ground ice / permafrost; soil; disturbance; recovery; vegetation*

The Mayo District, Yukon Territory, lies in the widespread discontinuous permafrost zone. Permafrost thicknesses of up to 40 m have been measured in valleys, and of 135 m at higher elevations. Many observations of ground ice have been made by placer miners, but generally these are unrecorded. Recently, over 200 shallow geotechnical boreholes have been drilled in the area in association with municipal or highway construction. Ground ice is usually encountered at undisturbed sites within 4 m of the surface. In the main valleys, at elevations below 1100 m above sea level, coarse, clastic, outwash materials, sand dunes and slopes with southerly aspect are usually frost-free. Stripping of vegetation for construction or placer mining leads to permafrost degradation, but permafrost can re-establish as vegetation regenerates. Ground temperatures at Mayo and Keno Hill indicate a geothermal flux of over 0.1 W/m².

1992. Recent Ground Warming Inferred from the Temperature in Permafrost Near Mayo, Yukon Territory. In: Dixon, J.C., and Abrahams, A.D., eds., Periglacial Geomorphology. John Wiley and Sons, pp. 327-350. *CLIMATE; ground ice / permafrost; soil; sediment; hydrology; ground water; modeling*

Mayo, Yukon Territory, lies in the widespread discontinuous permafrost zone. Nearby, permafrost thicknesses of up to 40 m have been measured in valleys, and of up to 135 m at higher elevations. Ice-rich glaciolacustrine sediments near Mayo, in which permafrost is 34 m thick, show evidence of recent warming. The mean annual ground temperature at the depth of zero annual amplitude (10 m) is -1.3°C. At present temperatures are slightly warmer, between 0 and 5 m, almost constant between 5 and 15 m, and then increase in depth. Upward projection of the temperature gradient at depth suggests a former mean temperature at the surface of permafrost of at most -2.0°C. The ground is close to the temperature at which the unfrozen water content characteristic begins to change during warming, indicating that some ice is thawing in the soil. Geothermal modelling suggests that if ground temperatures were previously in equilibrium with a near-surface temperature of approximately -3.0°C, then it has taken about 20 years for permafrost to reach present conditions. Observed changes in mean winter temperature and snowfall have probably caused the ground warming.

1994. Permafrost, tectonics, and past and future regional climate change, Yukon and adjacent Northwest Territories. Canadian Journal of Earth Sciences/Revue Canadienne des Sciences de la Terre 31 (1), 182-191. *CLIMATE; ground ice / permafrost; geology; precipitation; snow*

Late Tertiary changes in the general circulation of the atmosphere, regionally enhanced by uplift of the Wrangell - Saint Elias and Coast mountains, were sufficient to promote permafrost development in the western Arctic. Permafrost developed in Yukon Territory and adjacent Northwest Territories during early Pleistocene glacial periods, after continued tectonic activity led to further modification of regional climate, but degraded in the interglacials. Permafrost has been present in northern parts of the region since the Illinoian glaciation, but most ground ice in central Yukon formed in the Late Wisconsinan. The present interglacial is the only one with widespread evidence of permafrost, which is maintained in the valleys of central and southern Yukon by the Saint Elias Mountains blocking continental penetration of maritime air from the Gulf of Alaska. This reduces snow depth in winter, while cold-air drainage in the dissected terrain of the Yukon Plateaus enhances the near-surface inversion, leading to continental minimum temperatures. General circulation models used to simulate climate represent the physiography of northwest Canada crudely. As a result, the simulations are unable to

reproduce conditions responsible for the development and preservation of permafrost in the region.

1998. The response (1958-1997) of permafrost and near-surface ground temperatures to forest fire, Takhini River valley, southern Yukon Territory. *Canadian Journal of Earth Sciences/Revue Canadienne des Sciences de la Terre* 35 (2), 184-199. *CLIMATE; wildfire; ground ice / permafrost; thermokarst*

Forest fires in permafrost areas often modify ground surface conditions, causing deepening of the active layer and thawing of near-surface permafrost. Takhini River valley lies in the discontinuous permafrost zone of southern Yukon Territory. The valley floor is covered by glaciolacustrine deposits, which are locally ice rich. In 1958 extensive forest fires burned most of the vegetation and the soil organic horizon in the valley, but, 50 km west of Whitehorse, 1 km² of spruce forest adjacent to the Alaska Highway escaped burning. Permafrost beneath this stand of trees is in equilibrium with surface conditions: the active layer is 1.4 m thick, the base of permafrost is at 18.5 m, the annual mean temperature at the top of permafrost (1.5 m) is -0.8 degree C, and the temperature gradient in permafrost is constant with depth. At burned sites nearby there has been little regeneration of forest vegetation since the fire, and long-term permafrost degradation has occurred. At one burned site, the permafrost table is more than 3.75 m below the ground surface, the mean annual ground temperature is -0.2 degree C or warmer throughout the profile, the annual mean temperature at 1.5 m is 0.1 degree C, and permafrost is thawing from top and bottom. A simplified analytical model for thawing of permafrost indicates that over a millennium will be required to degrade permafrost completely at this site, if thawing proceeds from the top down. The result demonstrates the persistence of ice-rich permafrost a few metres below the ground surface, even at sites near the southern margin of permafrost in Canada.

Burns, J.J., 1964. Pingos in the Yukon- Kuskokwim delta, Alaska: their plant succession and use by mink. *Arctic* 17, 202-210. *INCOMPLETE (need abstract); HYDROLOGY; ground ice / permafrost; POPULATION; mammals; mink; vegetation; habitat selection*

Burr, J., 1987. Synopsis and bibliography of lake trout (*Salvelinus namaycush*) in Alaska. Fishery Manuscript 5. Alaska Department of Fish and Game, <http://biology.usgs.gov/s+t/SNT/noframe/ak177r.htm> *INCOMPLETE (need abstract); POPULATION; fish; trout*

Burris, O., and McKnight, D., 1973. Game transplants in Alaska. Wildlife Technical Bulletin 4. Alaska Department of Fish and Game, <http://biology.usgs.gov/s+t/SNT/noframe/ak177r.htm> *INCOMPLETE (need abstract); POPULATION; mammals*

Burrows, R., Langley, D., and Evetts, D., 2000. Preliminary Hydraulic Analysis and Implications for Restoration of Noyes Slough, Fairbanks, Alaska. Water-Resources Investigations Report 00-4227. U.S. Geological Survey, Fairbanks.

<http://ak.water.usgs.gov/Publications/Abstracts/2000.Abstracts/noyes.htm> (includes link to full report in .pdf) *HYDROLOGY; surface water; infrastructure; dam; engineering; flooding; ecology; recreation; modeling*

The present-day channels of the Chena River and Noyes Slough in downtown Fairbanks, Alaska, were formed as sloughs of the Tanana River, and part of the flow of the Tanana River occupied these waterways. Flow in these channels was reduced after the completion of Moose Creek Dike in 1945, and flow in the Chena River was affected by regulation from the Chena River Lakes Flood Control Project, which was completed in 1980. In 1981, flow in the Chena River was regulated for the first time by Moose Creek Dam, located about 20 miles upstream from Fairbanks. Constructed as part of the Chena

River Lakes Flood Control Project, the dam was designed to reduce maximum flows to 12,000 cubic feet per second in downtown Fairbanks. Cross-section measurements made near the entrance to Noyes Slough show that the channel bed of the Chena River has been downcutting, thereby reducing the magnitude and duration of flow in the slough. Consequently the slough slowly is drying up. The slough provides habitat for wildlife such as ducks, beaver, and muskrat and is a fishery for anadromous and other resident species. Beavers have built 10 dams in the slough. Declining flow in the slough may endanger the remaining habitat. Residents of the community wish to restore flow in Noyes Slough to create a clean, flowing waterway during normal summer flows. The desire is to enhance the slough as a fishery and habitat for other wildlife and for recreational boating. During this study, existing and new data were compiled to determine past and present hydraulic interaction between the Chena River and Noyes Slough. The U.S. Army Corps of Engineers Hydrologic Engineering Center River Analysis System (HECRAS) computer program was used to construct a model to use in evaluating alternatives for increasing flow in the slough. Under present conditions, the Chena must flow at about 2,400 cubic feet per second or more for flow to enter Noyes Slough. In an average year, water flows in Noyes Slough for 106 days during the open-water season, and maximum flow is about 1,050 cubic feet per second. The model was used to test a single method of increasing flow in Noyes Slough. A modified channel 40 feet wide and about 2 feet deeper within the existing slough channel was simulated by changing the cross-section geometry in the HECRAS model. The resulting model showed that flow in such a modified slough channel would begin at a flow of about 830 cubic feet per second in the Chena River and would increase to a maximum flow of about 1,440 cubic feet per second. In an average year, flow would continue for 158 days during the open-water season. Theoretically, enlarging the slough channel by lowering its bed could increase flow, but other solutions are possible. Possible obstacles to excavating the channel, such as bridges and utility crossings, and the destruction of desirable features such as beaver dams were not considered in the study. Further engineering and economic analyses would be needed to assess the cost of excavation and future maintenance of the modified channel. A computer-modeling program such as HECRAS may provide a means for testing other solutions.

Burson, S., Belant, J., Fortier, K., and Tomkiewicz, W., 2000. The effect of vehicle traffic on wildlife in Denali National Park. *Arctic* 53 (2), 146-151. *POPULATION; mammals; grizzly bear; caribou; sheep; moose; disturbance; infrastructure; road*

We recorded observations of caribou (*Rangifer tarandus*), grizzly bear (*Ursus arctos*), Dall sheep (*Ovis dalli*) and moose (*Alces alces*) along the Denali National Park and Preserve road corridor during 1995-97. We compared these observations to similar data from previous studies to evaluate the effect of an increase in traffic on the number of animals sighted and their behavior. Between 1972 and 1997, annual visitation to Denali National Park increased from about 45000 to 350000, with attendant increases in traffic on the park road. The mean number of caribou, grizzly bear, and Dall sheep observed did not decline ($p > 0.301$) from 1973 to 1997. The number of moose observed declined by more than 50% ($R^2 = 0.529$, $p < 0.001$). The estimated population of moose also declined over the same period ($R^2 = 0.374$, $p = 0.002$). The distance from the park road at which caribou and grizzly bears were sighted did not change ($p > 0.787$), but fewer moose ($p < 0.031$) were observed within 100 m of the road and fewer sheep ($p < 0.011$) were observed between 400 and 500 m from the road. Adverse behavioral responses to traffic (e.g., running from vehicles) occurred in less than 1.3% of observations for each species. Increased traffic on the park road apparently has not caused significant changes in abundance, distribution, or behavior of caribou, grizzly bear, Dall sheep, and moose in the park road corridor.

Burton, C., Krebs, C., and Taylor, E., 2002. Population genetic structure of the cyclic snowshoe hare (*Lepus americanus*) in southwestern Yukon, Canada. *Molecular Ecology* 11 (9), 1689-1701. *POPULATION; mammals; snowshoe hare; distribution; genetics*

Spatial population structure has important ecological and evolutionary consequences. Little is known about the population structure of snowshoe hares (*Lepus americanus*), despite their ecological importance in North American boreal forests. We used seven variable microsatellite DNA loci to determine the spatial genetic structure of snowshoe hares near Kluane Lake, Yukon during a cyclic population peak. We sampled 317 hares at 12 sites separated by distances ranging from 3 to 140 km, and used 46 additional samples from Alaska and Montana. The level of genetic variation was high (13.4 alleles/locus, 0.67 expected heterozygosity) and the distribution of alleles and genotypes was not homogeneous across the sites. The degree of differentiation was low among Yukon sites ($F_{ST} = 0.015$) and between Yukon and Alaska ($F_{ST} = 0.012$), but the Montana site was highly differentiated ($F_{ST} = 0.20$). A weak pattern of isolation by distance was found over the Yukon study area, with an indication that local genetic drift may be important in shaping the regional genetic structure. Landscape barriers expected to influence gene flow did not consistently affect genetic structure, although there was evidence for a partial barrier effect of Kluane Lake. The high level of inferred gene flow confirms that snowshoe hare dispersal is widespread, successful and equal between the sexes. A stepping-stone model of gene flow, potentially influenced by the synchronous density cycle, appears to best explain the observed genetic structure. Our results suggest that despite their dramatic fluctuations in density, snowshoe hares in the northern boreal forest have a large evolutionary effective population size and are not strongly subdivided by either physical or social barriers to gene flow.

Buske, N., and Miller, P., 2000. Investigative Report: The Nuclear Reactor at Fort Greely. Alaska Community Action on Toxics: <http://www.akaction.net/FTGreely.pdf> *MILITARY; CONTAMINANTS; radiation*

The U.S. Army is disguising the true mission of the nuclear reactor at Fort Greely, Alaska. Rather than a plant to provide heating and electricity to the base, the Fort Greely reactor was covertly designed and operated as a small pilot plant to produce special nuclear materials suitable for use in battlefield weapons. Although it is small, the Greely reactor is capable of causing great harm. The Army conceals radioactive contamination at Fort Greely that affects workers, residents of nearby communities, and the environment. The cover-up is part of a larger strategy by the Department of Defense and Department of Energy to fool the public in an attempt to avoid accountability. This report offers evidence to support these conclusions, as well as specific courses of action to remedy the damage done at Fort Greely and to make military and political leaders accountable to the public they serve.

Byrom, A., and Krebs, C.J., 1999. Natal dispersal of juvenile arctic ground squirrels in the boreal forest. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 77 (7), 1048-1059. *POPULATION; mammals; rodents; squirrel; predation; nutrition; behavior (reproductive/nesting); behavior (territorial)*

Natal dispersal is assumed to be costly because of the risk of mortality, yet rarely are movement patterns and survival of dispersers observed directly. We determined the fates and dispersal distances of 150 radio-collared juvenile arctic ground squirrels from 1993 to 1995 at Kluane, Yukon Territory, Canada (61 degree N, 138 degree W). We tested the hypothesis that dispersal has a high mortality cost, and we also attempted to distinguish among three hypotheses to explain natal dispersal: competition for mates, competition for resources, and inbreeding avoidance. Juveniles were radio-collared at emergence from the natal burrow on five 9-ha grids nested within larger (1 km²) experimental manipulations: two controls, a predator enclosure, a food-supplemented

grid, and a predator enclosure + food grid. In all years and on all areas, dispersing juveniles were more likely to die than philopatric squirrels, and the risk of mortality increased with distance from the natal burrow for both sexes. Overall, survival of philopatric squirrels was 73%, whereas survival of dispersing squirrels ranged from a maximum of 40% to a minimum of 25%. Juvenile females were strongly philopatric independent of population density, except on the predator enclosure + food grid in 1995, where population density was extremely high and resources other than food were probably limiting. Resource competition may explain patterns of philopatry and dispersal in female arctic ground squirrels. Juvenile males moved farther from their natal site than females and more of them died. Males also had a strong tendency to disperse that was independent of food availability or population density, which suggests that male arctic ground squirrels ultimately may disperse to avoid either inbreeding with female relatives or intrasexual competition for mates.

Byrom, A., Karels, T., Krebs, C., and Boonstra, R., 2000. Experimental manipulation of predation and food supply of arctic ground squirrels in the boreal forest. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 78 (8), 1309-1319. *POPULATION; mammals; rodents; squirrel; nutrition; predation*

We examined whether arctic ground squirrel (*Spermophilus parryii plesius*) populations in northern boreal forest in the Yukon Territory, Canada, were limited by food, predators, or a combination of both, during the decline and low phases of a snowshoe hare cycle. From 1990 to 1995, populations were monitored in large-scale (1 km²) experimental manipulations. Squirrels were studied on eight 9-ha grids: four unmanipulated control grids, two food-supplemented grids, a predator-exclosure grid, and a predator-exclosure + food-supplemented grid. Population density was measured on all grids by livetrapping and active-season survival was measured using radiotelemetry. Population densities were lowest in 1992 and 1993 (2 years after the snowshoe hare population decline). Rates of population change were negative from 1991 to 1993, when predation pressure was most intense after the snowshoe hare decline, and positive from 1993 to 1995, when hares and predators were at low densities. Predation accounted for 125 of 130 mortalities (96%) of radio-collared squirrels. Adult survival was significantly lower in 1992 and 1993 than in 1994 and 1995, and was a strong predictor of annual rates of population change in arctic ground squirrels. Treatments were ranked as follows in their effect on adult survival: predator enclosure + food-supplemented > food-supplemented > predator enclosure > controls. Juvenile survival was lowest in 1992, and food addition and predator removal separately increased juvenile survival. On average, predator exclusion increased population densities twofold, food supplementation increased densities fourfold, and food supplementation and predator removal together increased densities 10-fold. We conclude that food and predation interact to limit arctic ground squirrel populations in the boreal forest during the decline and low phases of the snowshoe hare cycle. The snowshoe hare cycle may indirectly create a lagged secondary fluctuation in arctic ground squirrel populations through shared cyclic predators.

Cahill, T., and Seiber, J., 2000. Regional Distribution of Trifluoroacetate in Surface Waters Downwind of Urban Areas in Northern California, U.S.A. [as compared to levels in British Columbia, the Yukon Territory, and Alaska]. *Environmental Science & Technology* 34 (14), 2909-2912. *CONTAMINANTS; water quality; air quality; POPs (persistent organic pollutants)* Trifluoroacetate (TFA), a breakdown product of the hydrofluorocarbons (HFCs) and hydrochlorofluorocarbons (HCFCs), has been found at higher concentrations in surface waters near urban areas compared to globally remote sites, but the scale of the urban enrichment, namely local or regional, is unknown. To determine the scale of urban enrichment of TFA in Northern California, a series of streams were sampled in 1998 along a transect upwind and downwind of the San Francisco and Sacramento metropolitan

areas. In addition, 17 remote sites were sampled in British Columbia and the Yukon Territory, Canada and in Alaska, U.S.A. to determine the baseline TFA concentrations in Northern Hemisphere surface waters. The results showed elevated TFA concentrations in surface waters around and immediately downwind of urban areas. The enrichment was approximately 5-6 times higher than the concentrations in upwind sites. The northern remote sites showed a median TFA concentration of 21 ng/L, which was statistically indistinguishable from the upwind coastal sites of the Californian transect. The mechanism for the urban enrichment was unknown, but it may have been the result of additional sources of TFA other than the HFC/HCFCs or faster formation of TFA due to higher HFC/HCFC and hydroxyl radical concentrations.

Cameron, R.D., 1972. Water metabolism by reindeer (*Rangifer tarandus*): Fairbanks, University of Alaska, Ph. D., 98 p *INCOMPLETE (need abstract)*; *POPULATION*; *mammals*; *reindeer*; *caribou*; *biochemistry*; *metabolism*

Cameron, J., 1973. Oxygen dissociation and content of blood from Alaskan burbot (*Lota lota*), pike (*Esox lucius*) and grayling (*Thymallus arcticus*). *Comparative Biochemistry and Physiology Part A, Comparative Physiology* 46 (3A), 491-496. *POPULATION*; *fish*; *pike*; *burbot*; *grayling*; *physiology*; *biochemistry*

(1) Oxygen disassociation curves of whole blood were determined for northern pike, burbot and grayling from interior Alaska. (2) Temp was either 5, 10 or 15 degrees C, and CO₂ tensions were in the physiological range of 0-7.0 torr. (3) P₅₀ values ranged from 3.2 to 30.6 for burbot, from 2.7 to 7.3 for pike and from 10.0 to 25.0 for grayling. (4) P₅₀ was 6.8 for three long-nosed suckers at 10 degrees C.

Cameron, R.D., Reed, D.J., Dau, J.N., and Smith, W.T., 1992. Redistribution of calving caribou in response to oil field development on the Arctic Slope of Alaska. *Arctic* 45 (338-342), *INCOMPLETE (need abstract)*; *INFRASTRUCTURE*; *pipeline*; *POPULATION*; *mammals*; *caribou*; *distribution*

Cameron, C., 2000. Alaska Resource Data File; Charley River quadrangle. open file report 00-290. Alaska Division of Geological & Geophysical Surveys, Fairbanks. ftp://pluton.wr.usgs.gov/pub/ardf_data/CharleyRiver.pdf *MINING*; *INFRASTRUCTURE*; *gold*
Descriptions of the [40] mineral occurrences shown on the accompanying figure follow. See U.S. Geological Survey (1996) [?] for a description of the information content of each field in the records. The data presented here are maintained as part of a statewide database on mines, prospects and mineral occurrences throughout Alaska. This and related reports are accessible through the USGS World Wide Web site <http://ardf.wr.usgs.gov>. Comments or information regarding corrections or missing data, or requests for digital retrievals should be directed to: Frederic Wilson, USGS, 4200 University Dr., Anchorage, AK 99508-4667, e-mail fwilson@usgs.gov, telephone (907) 786-7448.

Campagna, C., Sirard, M., Ayotte, P., and Bailey, J., 2001. Impaired maturation, fertilization, and embryonic development of porcine oocytes following exposure to an environmentally relevant organochlorine mixture. *Biology of Reproduction* 65 (2), 554-560. *REFERENCE*; *CONTAMINANTS*; *POPs (persistent organic pollutants)*; *health (effects)*; *PEOPLE*; *reproduction*
The reproductive health risks related to exposure to persistent organic pollutants in the environment remain controversial. This debate is partly because most studies have investigated only one or two chemicals at a time, whereas populations are exposed to a large spectrum of persistent chemicals in their environment. Using the pig as a toxicological model, we hypothesized that exposing immature cumulus-oocyte complexes to an organochlorine mixture during in vitro maturation (IVM) would adversely affect oocyte maturation, fertilization, and subsequent embryo development. This

organochlorine mixture mimics that which contaminates the Arctic marine food chain. Cumulus-oocyte complexes were cultured in IVM medium containing increasing concentrations of the organochlorine mixture, similar to that found in women of highly exposed populations. Organochlorines reduced the quality of cumulus expansion and the viability of cumulus cells in a dose-response manner. The proportion of apoptotic cumulus cells also increased due to organochlorine exposure. Half of the oocytes were fixed after insemination, and the remainders were cultured for 8 days. Concentrations of organochlorines did not affect the rates of oocyte degeneration, sperm penetration, and development to morula. However, incidence of incompletely matured oocytes increased and polyspermy rate decreased, both in a dose-response manner with increasing organochlorine concentrations. Blastocyst formation and number of cells per blastocyst declined with organochlorine concentration. Exposing porcine cumulus-oocyte complexes to an environmentally pertinent organochlorine mixture during IVM disturbs oocyte development, supporting recent concerns that such pollutants harm reproductive health in humans and other mammalian species.

Campagna, C., Guillemette, C., Paradis, R., Sirard, M.-A., Ayotte, P., and Bailey, J.L., 2002. An environmentally relevant organochlorine mixture impairs sperm function and embryo development in the porcine model. *Biology of Reproduction* 67 (1), 80-87. *REFERENCE; CONTAMINANTS; POPs (persistent organic pollutants); health (effects); PEOPLE; reproduction*

We evaluated the effects of an environmentally relevant mixture of more than 15 organochlorines on the development of pig oocytes and sperm during in vitro fertilization (IVF). Oocytes were cocultured with sperm in IVF medium containing increasing concentrations of an organochlorine mixture, similar to that found in women of highly exposed populations. Exposure to the organochlorine mixture diminished oocyte penetration rates and polyspermy in a linear manner. The mixture did not affect rates of cleavage nor development to multicell embryos. However, rates of development to the blastocyst stage were lower at the highest concentration at which oocyte penetration was observed. The same experiment was performed using oocytes that were preexposed during in vitro maturation. This greater exposure to the mixture also reduced penetration in a dose-response manner and affected polyspermy. Frozen-thawed pig sperm were also cultured in IVF medium containing the same organochlorine concentrations. Sperm motility parameters were immediately reduced in a dose-dependant manner by the organochlorines, followed by diminished viability 2 h later. From these results, it appears that reduced sperm quality would account for decreases in fertilization, polyspermy, and blastocyst formation. These results suggest that exposing porcine oocytes and sperm to an environmentally pertinent organochlorine mixture in vitro disrupts the oocyte block to polyspermy, sperm fertility, and further embryonic development, and supports recent concerns that such pollutants harm reproductive health in humans and other species.

Campbell, I., 1999. Quaternary pollen taphonomy: examples of differential redeposition and differential preservation. *Paleogeography, Paleoclimatology, Paleoecology* 149 (1-4), 245-256. *VEGETATION; pollen; distribution; climate; sediment*

Pollen assemblages are affected by a variety of processes between dehiscence and recovery. Here, two examples from western Canada illustrate two of the most important biases affecting pollen assemblages after production and initial dispersal. A site in Canada's Yukon Territory provides evidence of selective redeposition of penecontemporaneous pollen grains, which is detectable only through paired coring. A deposit on the floor of a kettle depression shows trends in the ratios of extra-local pollentypes, which are opposed to the trends shown in a core taken from the slope of the same depression. This is explained as a trend to reduced mobility of saccate grains with time due to increased permeability of the substrate on the kettle slope. A study of the

differential degradation of *Populus* pollen illustrates the complexities of pollen preservation. *Populus* pollen is generally recognized as more susceptible to corrosion than are most other pollen types. The poor preservation of this pollen type is attributed largely to its lack of harmomegathic adaptation and low sporopollenin content. This real susceptibility is compounded by the pollen grain's lack of distinctive surface ornamentation, inhibiting recognition of damaged grains. At least part of the general impression of poor preservation of *Populus* pollen may be due to a recent increase in the abundance of *Populus* on the landscape in western Canada. Early studies in this region may have sampled sediments from before the increase in *Populus*, and compared their pollen spectra with post-*Populus* increase vegetation.

Cannings, S., and Cannings, R., 1994. The Odonata [dragonflies] of the northern Cordilleran peatlands of North America. *Memoirs of the Entomological Society of Canada* 169, 89-110.

POPULATION; insects; dragonfly; ecology; distribution; habitat selection

The peatlands of the northern Cordillera of North America (consisting of the mountain ranges and intermontane lowlands and plateaus of British Columbia, Alberta, the Northwest Territories, the Yukon, and Alaska) support a distinctive Odonata fauna. Forty species in six families and 12 genera are typical of northwestern peatlands and another 12 species are occasional inhabitants of these environments. Of the 40 species, eight (20%) are peatland obligates and four (10%) almost always occur in such habitats. The remaining 28 (70%) are generalists and live in a wide range of aquatic habitats; nevertheless, they often are common inhabitants of, or are even dominant in, peatland environments. The fauna is dominated by the genera *Aeshna* Fabricius and *Somatochlora* Selys, with 11 and 10 species, respectively. It is also dominated by species restricted to Boreal regions (25 species, 62.5%), six (15%) of which have Holarctic distributions. The remainder of the fauna consists of eight species (20%) ranging transcontinentally in Transition Zone forests south of the Boreal Forest, five (12.5%) restricted to the Cordillera, and two (5%) with wide distributions in North America. Notes and maps summarize our knowledge of biogeographical information and previously unpublished records are listed. Significant southerly range extensions for species such as *Coenagrion interrogatum* (Hagen), *Aeshna septentrionalis* Burmeister, *A. sitchensis* Hagen, *A. subarctica* Walker, *Somatochlora septentrionalis* (Hagen), and *Leucorrhinia patricia* Walker are reported. Ecological and natural history data are outlined for each species. There do not appear to be any clear differences between the faunas of bogs and fens; dragonflies seem to respond to the habitat's form and structure rather than to its acidity or nutrient levels. Distinctive species associations result. A better understanding of the preferences of these dragonflies for different peatland microhabitats must await detailed research on oviposition behaviour and larval ecology.

Cappiello, T., and Bromaghin, J., 1995. Mark-recapture abundance estimate of fall-run chum salmon in the upper Tanana River, Alaska, 1995. *Alaska Fishery Research Bulletin* 4 (1), 12-35.

POPULATION; fish; salmon; chum; distribution; modeling

The primary objective of this study was to determine the feasibility of a mark-recapture program to estimate inseason and postseason abundance of fall-run chum salmon *Oncorhynchus keta* in the upper Tanana River. We used 2 fish wheels, each on opposite riverbanks, to capture fish for tagging and 2 additional fish wheels on opposite riverbanks to recover tagged fish approximately 76 km upstream. All chum salmon caught during a daily 6-h schedule were marked with spaghetti tags. From 16 August through 30 September 1995, a total of 3,993 fall-run chum salmon were released with orange tags from the right bank; 181 were released with yellow tags from the left bank. From 18 August to 1 October, the right-bank recovery wheel caught 6,773 chum salmon, of which 103 were recaptures (94 orange; 9 yellow). During the same period, the left-bank recovery wheel caught 3,902 chum salmon, of which 63 were recaptures (55 orange; 8

yellow). Catches from both recovery wheels were pooled because tagged fish were not bank-oriented and there was no statistically significant difference in the marked proportions between each wheel. However, information from yellow-tagged fish was not adequate for estimating abundance. Bailey's closed population model produced a total estimate of 268,173 (SE = 21,597) fall-run chum salmon that passed the tagging site after 16 August. No significant sources of bias from assumption violations were detected. The mean migration rate between tagging and recovery sites was 26 km/d. We concluded that a mark-recapture program using fish wheels for fish capture appears feasible but should continue in a developmental stage to allow further evaluation of its utility under a variety of circumstances. Tagging fish from only the right-bank tagging wheel and tagging more fish, while using 2 wheels for tag recovery, may be necessary to improve precision of the abundance estimate.

Cappon, P., 1991. Community health status assessment of the Yukon [microform]. Yukon Health and Human Resources, Whitehorse? *INCOMPLETE (need abstract); PEOPLE; health (condition); health care*

Careau, H., and Dewailly, E., 1995. The Northern Aquatic Food Chain Contamination Database: A research tool. *Science of the Total Environment* 160-161 (Ecological Effects of Arctic Airborne Contaminants), 539-543. *BIBLIOGRAPHY; REFERENCE; CONTAMINANTS; metals; POPs (persistent organic pollutants); air quality; bioaccumulation*

During a review of data on the contamination of Canadian Arctic regions, it became apparent that a system should be developed to manage the vast array of information available. This conclusion led to the development of the Northern Aquatic Food Chain Contamination Database. It contains information on all contaminants for which data were available in the regions comprising the Yukon and Northwest Territories, the Hudson and James Bay basins, northern Quebec (Nunavik), and Labrador. Data on Greenland were also included. Data were gathered from an extensive literature review, as well as from organizations and researchers. More than 30 variables are attached to each mean concentration value, including location, species, reference, % water, % lipids, age, sex, contaminant identification, standard deviation, minimum and maximum, and sampling date. All variables are subject to availability from the authors. The area under study is divided into 10 distinct regions to facilitate data management. Sample locations are geographically referenced to permit the use of geographical information systems. The database is mounted on the 4th DIMENSION software and was developed to provide an adequate standard of user friendliness. Since the database was developed for both immediate and future needs, it has sufficient flexibility to be useful to any researchers dealing with contaminants in northern regions.

Carey, S., and Woo, M.-K., 1998. Snowmelt Hydrology of Two Subarctic Slopes, Southern Yukon, Canada. *Nordic Hydrology* 29 (4-5), 331-346. *HYDROLOGY; surface water; snow; ground ice / permafrost; soil; climate; modeling*

Large quantities of water are discharged from subarctic basins during snowmelt season. Runoff contributing areas as well as timing and magnitude of meltwater generation from different slopes are highly variable. Two slopes in the lower Wolf Creek basin, southern Yukon, were studied in 1997. The south-facing slope has a dense aspen forest that is leafless in the melt period (April - May) and is underlain by seasonal frost. The north-facing slope has open stands of spruce and an organic layer that rests on mineral soils with permafrost. In 1997, snowmelt is advanced by over 10 days on the south slope, which receives more solar radiation than the north aspect. All meltwater on the south slope infiltrates the frozen silt without generating runoff. By the time significant melt events occur on the north slope, the frost and snow are gone from the south. Meltwater is able to infiltrate the frozen organic soil but deep percolation is prevented by the ice-

rich substrate. Lateral flow begins after the organic layer is saturated, with much runoff along intermittent rills fed by diffuse and pipe flows. Rills and pipes are interconnected but the drainage network and runoff contributing area change depending on the disposition of the snow as well as water and frost table positions relative to local topography. Contrasts between the north and south slopes have important implications on direct runoff generation during the melt period. Situations similar to the study site can be found elsewhere in subarctic North America and the observed processes have a bearing upon hydrological modelling for the subarctic environment.

1999. Hydrology of two slopes in subarctic Yukon, Canada. *Hydrological Processes* 13 (16), 2549-2562. *HYDROLOGY; snow; ground ice / permafrost; soil; climate; modeling; sediment*
Two subarctic forested slopes in central Wolf Creek basin, Yukon, were studied in 1996-1997 to determine the seasonal pattern of the hydrologic processes. A south-facing slope has a dense aspen forest on silty soils with seasonal frost only and a north-facing slope has open stands of black spruce and an organic layer on top of clay sediments with permafrost. Snowmelt is advanced by approximately one month on the south-facing slope due to greater radiation receipt. Meltwater infiltrates its seasonally frozen soil with low ice content, recharging the soil moisture reservoir but yielding no lateral surface or subsurface flow. Summer evaporation depletes this recharged moisture and any additional rainfall input, at the expense of surface or subsurface flow. The north-facing slope with an ice rich substrate hinders deep percolation. Snow meltwater is impounded within the organic layer to produce surface runoff in rills and gullies, and subsurface flow along pipes and within the matrix of the organic soil. During the summer, most subsurface flows are confined to the organic layer which has hydraulic conductivities orders of magnitudes larger than the underlying boulder-clay. Evaporation on the north-facing slope declines as both the frost table and the water table descend in the summer. A water balance of the two slopes demonstrates that vertical processes of infiltration and evaporation dominate moisture exchanges on the south-facing slope, whereas the retardation of deep drainage by frost and by clayey soil on the permafrost slope promotes a strong lateral flow component, principally within the organic layer. These results have the important implication that permafrost slopes and organic horizons are the principal controls on streamflow generation in subarctic catchments.

2000. The role of soil pipes as a slope runoff mechanism, Subarctic Yukon, Canada. *Journal of Hydrology (Amsterdam)* 233 (1-4), 206-222. *HYDROLOGY; surface water; snow; ground ice / permafrost; modeling; engineering*

Pipeflow in subarctic slopes provides a preferential runoff mechanism that bypasses the soil matrix, rapidly conveying water to the stream. Extensive soil piping occurs in the central Wolf Creek basin, Yukon, at the interface of the organic and mineral horizons. Flow in these pipes are ephemeral, transmitting water only when the water table is within or above the zone where pipes occur. During snowmelt, pipeflow began several days after the onset of surface runoff. Pipeflow contribution increased until ground thaw lowered the water tables, leaving matrix flow within the organic layer as the dominant mode of runoff. Pipeflow accounted for 21% of runoff during the 15 day melt period of 1997. Following melt, pipeflow recurred only during two intense summer rainstorms, each yielding different pipeflow response characteristics. During melt, pipeflow closely followed the daily snowmelt cycles and responded earlier than the integrated slope runoff. In the summer, pipeflow hydrographs rose and fell much quicker than direct storm runoff from the entire slope, which was dominated by fast matrix flow within the organic layer. Pipeflow contributing areas were relatively small, but their extent changed with hillslope wetness. Analysis revealed that the Manning flow formula can be combined with contributing areas to simulate pipeflow discharges. Unlike temperate environments where frozen ground is not a factor, the frost table position significantly controls the

position of the phreatic surface, and must be considered in any models of pipeflow in permafrost slopes.

Carey, S., and Woo, M.-k., 2001. Spatial variability of hillslope water balance, Wolf Creek Basin, Subarctic Yukon. *Hydrological Processes* 15 (16), 3113-3132. *HYDROLOGY; surface water; ground water; ground ice / permafrost; snow; vegetation*

A hydrological study was conducted between 1997 and 1999 in the subalpine open woodland of the Wolf Creek Basin, Yukon, to assess the interslope water balance variability. The water balance during the snowmelt and summer periods on four hillslopes revealed strong contrasts in process magnitudes and highlighted important factors including frost, vegetation, soils and microclimate that controlled vertical and lateral fluxes of water. Snow accounted for approximately half the annual water input, while differences in accumulation among hillslopes were related to interception properties of vegetation. Available energy at the snow surface controlled the melt sequence and the snow on some slopes disappeared up to two months earlier than others. Snowmelt runoff was confined to slopes with ice-rich substrates that inhibited deep percolation, with the runoff magnitude governed by the snow storage and the antecedent moisture of the desiccated organic soils prior to melt. During summer, evapotranspiration exceeded rainfall, largely sustained by water from the soil moisture reservoir recharged during the melt period. Differences in net radiation on slopes controlled the potential evapotranspiration, with the actual rates limited by the phenology of the deciduous forests and shrubs. Evapotranspiration was further suppressed on slopes where the organic soils became dry in late summer. Summer runoff was confined to slopes with porous organic layers overlying mineral soils to form a two-layer flow system: (1) quickflow in the surface organic layer and (2) slowflow in the mineral soil. Differences in the rates of flow were related to the position of the water table which may rise into the organic layer to activate quickflow. The presence of ice-rich frost and permafrost impeded vertical drainage and indirectly regulated the position of the water table. The location of the hillslope within a basin influenced recharge and discharge dynamics. Slope segments with large inflows sustained discharge throughout the summer to enhance basin runoff. In this way, the present study provides insight into basin hydrology.

Carmichael, L., Nagy, J., Larter, N., and Strobeck, C., 2001. Prey specialization may influence patterns of gene flow in wolves of the Canadian Northwest. *Molecular Ecology* 10 (12), 2787-2798. *POPULATION; mammals; wolf; genetics*

This study characterizes population genetic structure among grey wolves (*Canis lupus*) in northwestern Canada, and discusses potential physical and biological determinants of this structure. Four hundred and ninety-one grey wolves, from nine regions in the Yukon, Northwest Territories and British Columbia, were genotyped using nine microsatellite loci [part of genetic code]. Results indicate that wolf gene flow is reduced significantly across the Mackenzie River, most likely due to the north-south migration patterns of the barren-ground caribou herds that flank it. Furthermore, although Banks and Victoria Island wolves are genetically similar, they are distinct from mainland wolf populations across the Amundsen Gulf. However, low-level island-mainland wolf migration may occur in conjunction with the movements of the Dolphin-Union caribou herd. Whereas previous authors have examined isolation-by-distance in wolves, this study is the first to demonstrate correlations between genetic structure of wolf populations and the presence of topographical barriers between them. Perhaps most interesting is the possibility that these barriers reflect prey specialization by wolves in different regions.

Carpenter, D., Arcaro, K., Bush, B., Niemi, W., Pang, S., and Vakharia, D., 1998. Human health and chemical mixtures: an overview. *Environmental Health Perspectives* 106 (Suppl 1), 1263-

1270. *REFERENCE; CONTAMINANTS; POPs (persistent organic pollutants); health (effects); PEOPLE; infants; children; biochemistry; endocrinology*

Unlike laboratory animals, people are rarely exposed to a single hazardous chemical. However, most of the information documenting adverse human health effects from environmental and occupational contaminants has come from studies focused on exposure to single chemicals, and there is little information available on how two or more contaminants affect humans. Most information on the effects of mixtures comes from animal systems and limited investigations of isolated human cells in culture, even though the study of mixtures in such systems has also been neglected. Two or more compounds may show additive, antagonistic, or synergistic interactions or may act on totally different systems and thus not interact. Furthermore, even a single chemical may have multiple effects and affect more than one organ system. Effects may vary with age, and metabolites may have totally different actions from the parent compound. This paper will review the variety of health effects in humans that may result from environmental contaminants and discuss how such contaminants may interact with each other. We will also present examples on how different contaminants interact from toxicologic studies of polychlorinated biphenyls performed as part of our Albany, New York, Superfund Basic Research Program project.

Carpenter, D., Arcaro, K., and Spink, D., 2002. Understanding the human health effects of chemical mixtures. *Environmental Health Perspectives* 110 (Suppl 1), 25-42. *REFERENCE; CONTAMINANTS; POPs (persistent organic pollutants); health (effects); PEOPLE; infants; children; biochemistry; endocrinology*

Most research on the effects of chemicals on biologic systems is conducted on one chemical at a time. However, in the real world people are exposed to mixtures, not single chemicals. Although various substances may have totally independent actions, in many cases two substances may act at the same site in ways that can be either additive or nonadditive. Many even more complex interactions may occur if two chemicals act at different but related targets. In the extreme case there may be synergistic effects, in which case the effects of two substances together are greater than the sum of either effect alone. In reality, most persons are exposed to many chemicals, not just one or two, and therefore the effects of a chemical mixture are extremely complex and may differ for each mixture depending on the chemical composition. This complexity is a major reason why mixtures have not been well studied. In this review we attempt to illustrate some of the principles and approaches that can be used to study effects of mixtures. By the nature of the state of the science, this discussion is more a presentation of what we do not know than of what we do know about mixtures. We approach the study of mixtures at three levels, using specific examples. First, we discuss several human diseases in relation to a variety of environmental agents believed to influence the development and progression of the disease. We present results of selected cellular and animal studies in which simple mixtures have been investigated. Finally, we discuss some of the effects of mixtures at a molecular level.

Carrier, P., and Krebs, C., 2002. Trophic effects of rainfall on *Clethrionomys rutilus* voles: an experimental test in a xeric boreal forest in the Yukon Territory. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 80 (5), 821-829. *POPULATION; mammals; vole; vegetation; nutrition; nitrogen; climate; precipitation*

The Kluane forest is unusual in that it is less productive than other boreal forests because it lies in a rain-shadow zone. Densities of the boreal red-backed vole *Clethrionomys rutilus* are known to be food-limited in the Kluane region, and its food sources (mostly plants) could be rainfall-limited. We therefore tested the hypothesis that rainfall indirectly controlled vole densities in the Kluane region. Our predictions were that (i) food for voles would increase with additional rainfall and (ii) food-limited voles

would in turn increase in numbers. Three sites in the Kluane forest were irrigated during the growing season for 5 years, and these were compared with three paired control sites without irrigation. Irrigation increased rainfall 91% above normal, on average. Neither understory plants, trees, invertebrates, nor the vole population reacted to irrigation. Only mushroom biomass increased. Hence, the above hypothesis must be rejected. The vegetation is not directly water-limited at these sites, and nitrogen limitation probably prevailed. However, mushroom biomass increased with irrigation and in turn should have increased nitrogen mineralization. It is therefore unclear why plant production and vole numbers did not increase with mushroom biomass on the irrigated sites.

Case, M., 1986. Wild Resource Use in Northway, Alaska. Technical Paper No. 132. Alaska Department of Fish and Game, Division of Subsistence, *PEOPLE; subsistence; hunting; fishing; trapping; economics; land use*

This report describes the contemporary wildlife resource harvest patterns among residents of the upper Tanana River community of Northway. Brief consideration is given to resource processing and distribution patterns, and descriptions are provided for the local environment, geographic land use areas, and current sociodemographic characteristics of the community. Historical land and resource use patterns of local residents are discussed. The report documents use of the Tetlin National Wildlife Refuge and harvest of Copper River salmon in Northway, both of which are wildlife management concerns.

Case, M., and Halpin, L., 1990. Contemporary Wild Resource Use Patterns in Tanana, Alaska, 1987. Technical Paper No. 178. Alaska Department of Fish and Game, Juneau, Alaska. *PEOPLE; subsistence; hunting; fishing; trapping; economics; land use*

This report describes the contemporary harvest and use of fish and wildlife resources by residents of Tanana. An overview of the local environment, history of the area, and socioeconomic characteristics is presented. The relationship between salmon harvest and dog ownership is also discussed. Geographic areas used by Tanana residents are described. Research was conducted in cooperation with the U.S. Fish and Wildlife Service. Particular attention is paid to Tanana's use of the Nowitna National Wildlife Refuge.

Cater, T., and Chapin III, F., 2000. Differential effects of competition or microenvironment on boreal tree seedling establishment after fire. *Ecology* 81 (4), 1086-1099. *VEGETATION; succession; wildfire; recovery; white spruce; birch; horsetail; bluestem; aspen; NUTRIENT CYCLING; nitrogen*

We used a combination of surveys of natural vegetation and seed-sowing and seedling transplant experiments to determine the relative importance of competition and microenvironmental modification as mechanisms by which understory vegetation influences the establishment of tree seedlings in an Alaskan postfire boreal forest. Seedlings of white spruce (*Picea glauca*) and paper birch (*Betula papyrifera*) became established more frequently than expected in patches that were dominated by horsetail (*Equisetum arvense*), and less frequently than expected in patches of bluestem (*Calamagrostis canadensis*) and other vegetation. Similarly, birch and spruce, whether sown directly or transplanted as seedlings into horsetail-dominated patches generally showed greater survivorship, growth, and nitrogen accumulation (for birch only) than did those transplanted into bluestem or quaking aspen (*Populus tremuloides*) patches. Clipping experiments demonstrated that the presence of aboveground vegetation reduced survivorship (for birch only), growth (for both species), and nitrogen accumulation (for spruce only) in all patch types. Thus, the understory vegetation in all patch types competed with tree seedlings. However, patch x clipping interactions were either absent or could not explain the greater inhibition of seedling establishment by bluestem or aspen than by horsetail. The strong inhibitory effect of bluestem and aspen

on the establishment of spruce and birch seedlings is best explained by the unfavorable temperature and moisture microenvironments in these patches, rather than by differential competition in patches of bluestem, horsetail, or aspen. Many asymmetrical species interactions that are thought to drive successional change may result more from the contrasting effects that species have on their environment than from resource competition among species.

Caulfield, R., 1981. Final Report on the Survey of Permit Holders in the Tanana River Subsistence Salmon Permit Fishery. Technical Paper No. 14. Alaska Department of Fish and Game, *PEOPLE; subsistence; fishing; land use; mapping; salmon*

The subsistence use of Tanana River salmon is examined through the results of a questionnaire and personal interviews with fishery participants. Demographic information is presented along with descriptions of household characteristics and use of subsistence-caught salmon.

1983. Subsistence Land Use in Upper Yukon-Porcupine Communities, Alaska. Technical Paper No. 16. Alaska Department of Fish and Game Division of Subsistence, For excerpt see <http://www.nativeknowledge.org/db/files/tp16.htm> *PEOPLE; subsistence; seasonality; land use; mapping; ecology; economics*

This work documents subsistence land use over time for the upper Yukon-Porcupine communities of Arctic Village, Birch Creek, Chalkyitsik, Fort Yukon, and Venetie. Maps of village land use and resource specific use areas are presented. Ecological, socioeconomic, and cultural factors influencing subsistence land use are examined.

Caulfield, R., Peter, W., and Alexander, C., 1983. Gwich'in Athabaskan Place Names of the Upper Yukon-Porcupine Region, Alaska: A Preliminary Report. Technical Paper No. 83. Alaska Department of Fish and Game, *PEOPLE; subsistence; traditional food; mapping; land use*

As part of subsistence land use mapping in the upper Yukon-Porcupine region, Native place names were collected which provide considerable information regarding traditional resource uses. Five large maps depict documented place names for Arctic Village, Birch Creek, Chalkyitsik, Fort Yukon, and Venetie. A summary statement about the use of place names accompanies the maps.

Chacho, E., 1993. Snowmelt Runoff and Total Solids Production in a Discontinuous Permafrost Basin. *Nordic Hydrology* 24 (2/3), 65-78. *HYDROLOGY; snow; ground ice / permafrost; sediment*

Snowmelt runoff and total suspended solids were measured for two years on Glenn Creek, a small, second-order, subarctic stream located at Fairbanks, Alaska, within the Yukon-Tanana Uplands physiographic province. The stream drains a 2.25 sq km research watershed of which 70% is underlain by permafrost. The two years of study represent very different snowmelt hydrographs due to differences in the snowpacks. In 1985, the snowpack was 180% of the long-term average, while in 1988 it was only 56% of the average. During both years, 60% of the total snowmelt-season water yield had passed before a significant rate of solids yield was observed. Also in both years, the peak in total suspended solids concentration lagged the stream discharge peak by three days. Diurnal fluctuations in discharge and total suspended solids concentrations are well defined, including a peculiar occurrence of double diurnal peaks in the discharge hydrograph during portions of the snowmelt season. The diurnal fluctuations in solids concentration are shown to be consistent with water temperature fluctuations. In 1988, the percentage of organics in the total suspended solids was scattered from 0% to 66% during the snowmelt season.

Chan, H.M., 1996. A review of environmental contaminant levels in traditional food in northern Canada. *Proceedings* 23rd Annual Aquatic Toxicity Workshop, Calgary, Alberta, Canadian technical report of fisheries and aquatic sciences/Rapport technique canadien des sciences halieutiques et aquatiques, Department of Fisheries and Oceans, Ottawa, ON (Canada), p. 35-

39 REFERENCE; CONTAMINANTS; POPs (persistent organic pollutants); metals; bioaccumulation; traditional food; risk assessment; modeling; mammals; birds; fish; vegetation

The author conducted an extensive literature review on levels of environmental contaminants in northern Canada. The range of levels of four contaminants of major concern (chlordane, Hg, PCB and toxaphene) in 59 species of marine mammals, terrestrial mammals, birds, fish and plants are summarized. This data represents 58% of the 101 species of fish, wildlife and plants mentioned in our dietary interviews conducted in the northern communities. Mathematic modelling of the distributions of the data showed that contaminant levels in most food groups are log-normally distributed and have a typical coefficient of variation of about 100%. An example of using the mathematical model for dietary exposure assessment is presented. With the current knowledge of environmental contaminant levels in the northern traditional food system, it may be feasible to conduct preliminary risk assessment of dietary exposure of environmental contaminants when some diet information for a community is available.

Chan, H.M., and Ing, A., 1998. A database for environmental contaminants in traditional food in northern Canada. *International Journal of Circumpolar Health*(Suppl. 11), 567-571.

CONTAMINANTS; health (effects); traditional food; risk assessment

The potential health effects of environmental contaminants in traditional food on indigenous peoples in Northern Canada have been a growing concern. We have conducted an extensive literature review on contaminant levels in Northern Canada through searches of commercial, private, and government databases for the years 1986-1995, including MEDLine, Agricola, Biological Abstracts, Current Contents, Applied Science and Technology, Biosis, CABCD, Aquatic Sciences and Fisheries Abstracts, CRIS/ICAR, and the Northern Aquatic Food Chain Contaminant Database. More than 20,000 data items were identified in over 50 published articles, unpublished data, government reports, and review articles. Ranges of levels of 13 contaminants in major traditional food groups collected from four geographical regions (Yukon, MacKenzie, Keewatin, Baffin and Northern Quebec) were calculated. Exposure levels, particularly according to different dietary patterns, were estimated and discussed in relation to guideline levels.

Chan, H.M., and Yeboah, F., 2000. Total toxaphene and specific congeners in fish from the Yukon, Canada. *Chemosphere* 41 (4), 507-15. CONTAMINANTS; POPs (persistent organic pollutants); traditional food; fish

Toxaphene is one of the major persistent organic pollutants with global environmental impacts. We have measured total toxaphene and specific congeners concentrations in 19 fish samples collected from the Yukon, Canada using gas chromatography coupled to ion trap MS/MS. The total toxaphene concentrations ranged from 42 to 242 ng/g (mean = 107±61 ng/g). The sum of the three specific congeners (Parlar 26, 50 and 62) was within 10-55 ng/g. The ratio of the sum of the three congeners to the total toxaphene varied between 8% and 25% in the fish samples but the ratio may be species specific. Our results suggest that consumption of these Yukon fish should have minimal risk of toxaphene exposure.

Chandler, B., and Berger, L., 2002. The financial burden of injury-related hospitalizations to an Alaska Native health system. *Alaska Medicine* 44 (2), 30-34. PEOPLE; mortality; accidents; economics

The injury death rate in Alaska for American Indians and Alaska Natives is more than triple the injury death rate for the United States. We examined the direct medical expenditures for injury-related hospitalizations to one Alaska Native health care system, the Tanana Chiefs Conference in Interior Alaska, to identify priorities for injury prevention and to promote efforts at prevention. The total expenditure for the 511 injuries resulting in hospitalizations from 1994-1998 was \$4,145,440. Suicide attempts, falls, and

acts of violence were the most frequent causes of injury hospitalization. Injuries caused by acts of violence, suicide attempts, and falls had the highest overall expenditures. On a per-victim basis, unintentional injuries involving the use of firearms and snowmobile/all-terrain vehicle injuries were the most expensive. We hope this report will raise the visibility of injuries as a prevention priority for Alaska Native communities, Native health systems, and community action programs.

Chan-McLeod, A., White, R., and Russell, D., 1995. Body mass and composition indices for female barren-ground caribou. *Journal of Wildlife Management* 59 (2), 278-291. *POPULATION; health (condition); nutrition; caribou; modeling; management*

Monitoring body mass and composition is important for detecting declining vigor in caribou (*Rangifer tarandus granti*) populations. We developed regression models to predict body mass and composition of female barren-ground caribou, using easily measured variables, including those available under 4 constraints faced by managers: access to harvested carcasses but not to measurements that would destroy meat, no access to pre-dressing measurements of harvested carcasses, no access to specialized laboratory techniques, and access only to external measurements of live animals. We evaluated 38 continuous variables for predictability of body mass and composition. Heart, gastrocnemius, and liver masses were best ($P = 0.001$) all-seasons indices of body mass. Peroneus tertius mass correlated ($P < 0.001$) with body mass in June, September, and November. Predicted body mass generally did not differ ($P > 0.01$) from observed body mass for simple and multiple regression models. Gastrocnemius and kidney fat masses were best ($P < 0.001$) all-seasons indices of carcass plus viscera mass. Best ($P < 0.001$) monthly indices of carcass plus viscera mass were femur and peroneus tertius masses in March-April, peroneus tertius mass in June, kidney fat mass or kidney fat index in September, and heart and peroneus tertius masses in November. Water content in indicator muscles and left kidney fat index were the only all-seasons indices of percent body fat. Best ($P < 0.001$) monthly indices of percent body fat were femur marrow water and kidney fat mass in March-April, tibia marrow fat mass in June, gastrocnemius fat content and chest girth in September, and metatarsus marrow water in November. Marrow fat mass correlated ($P < 0.001$) linearly with percent body fat over all observed body fat values and was an alternative to percent marrow fat, which provided estimates of body fat in lean animals only. Single indices of percent body protein were found only in March-April. There were more indices of carcass plus viscera mass and percent body fat in September than in any other sampling month, and fewest in June. Superior ($P < 0.001$) correlations in multiple regression models of all body components justified use of combined indices, but use of meat-destroying, pre-dressing, or complicated measurements were not always warranted. Exclusion of meat-destroying measurements from multiple regression models did not reduce ($P < 0.001$) correlations with body or carcass plus viscera masses appreciably, but reduced ($P < 0.001$) correlations with body fat in all seasons and with body protein in September and November. Further exclusion of pre-dressing measurements and those requiring sophisticated laboratory techniques reduced ($P < 0.001$) correlations with body mass and precluded use of multiple regression models in predicting body protein.

Chapin III, F., and Mathews, E., 1993. Boreal carbon pools: approaches and constraints in global extrapolations. In: Vinson, T., and Kolchugina, T., eds., *Carbon Cycling in Boreal Forests and Sub-Arctic Ecosystems* EPA Report number 600R-93/084. National Service Center for Environmental Publications, pp. 9-20. *INCOMPLETE (need abstract); CLIMATE; NUTRIENT CYCLING; carbon; vegetation; ground ice / permafrost*

Chapin III, F., and Starfield, A., 1997. Time Lags and Novel Ecosystems in Response to Transient Climatic Change in Arctic Alaska. *Climatic Change* 35 (4), 449-461. *CLIMATE; VEGETATION; modeling; wildfire; insects*

We use a frame-based simulation model to estimate future rate of advance of the arctic treeline in response to scenarios of transient changes in temperature, precipitation, and fire regime. The model is simple enough to capture both the short-term direct response of vegetation to climate and the longer-term interactions among vegetation, fire, and insects that are important features of dynamic vegetation models. We estimate a 150–250 yr time lag in forestation of Alaskan tundra following climatic warming and suggest that, with rapid warming under dry conditions, there would be significant development of boreal grassland-steppe, a novel ecosystem type that was common during the late Pleistocene and today occurs south of the boreal forest in continental regions. Together, the time lag and grassland development would delay the positive feedback of vegetation change to climatic warming, providing a window of opportunity to control fossil fuel emissions, the primary cause of this warming.

Chapman, J.H., 1986. Gravity and cyclonic solids removal from recycled placer mining process waters, University of Alaska, Fairbanks, M.S., 128 p *INCOMPLETE (need abstract); MINING; WATER QUALITY; surface water; engineering; remediation; carbon; sediment; metals*

Charp, P., 1998. HEALTH CONSULTATION: Fort Greely SM-1A Nuclear Reactor FORT GREELY (a/k/a FORT GREELY MILITARY RESERVATION) FORT GREELY, SOUTHEAST FAIRBANK COUNTY, ALASKA; CERCLIS NO. AK8214522155. Federal Facilities Assessment Branch; Division of Health Assessment and Consultation; Agency for Toxic Substances and Disease Registry: http://www.atsdr.cdc.gov/HAC/PHA/greely/gre_toc.html *MILITARY; radiation; waste (hazardous); WATER QUALITY*

BACKGROUND AND STATEMENT OF ISSUES

The Fort Greely Military Reservation, established in 1942 near Fort Greely, Alaska, is a government owned military site covering approximately 640,000 acres (1000 square miles). Of this area, about 1,785 acres are considered the purview of the Base Realignment and Closure (BRAC) program subject to transfer or lease to private or commercial non-governmental use. The remainder of the site will remain under control of the United States Army [1]. The reservation is about 100 miles southeast of Fairbanks and with the town of Delta Junction, Fort Greely serves as the area's major population center. The 1990 census listed Delta Junction with a population of 652 [1].

In 1962, the United States Army constructed and began operating a nuclear reactor at Fort Greely, Alaska. This reactor, called the SM-1A, operated for 10 years producing electricity and power for the area. In 1972, the reactor was decontaminated and decommissioned (D&D) [2]. The D&D involved the removal and the shipment of the nuclear fuel to a location outside the state of Alaska (destination not listed) [2]. Additional activities associated with the D&D including dismantling of the reactor components, some of which were shipped off site and others entombed in place and covered with reinforced concrete caps (covers). Liquid wastes generated during these procedures were concentrated using a steam generator to reduce volume.

Prior to D&D activities and during the power production phase, liquid wastes from the SM-1A reactor were disposed of in one of two methods [3]. From 1962 to 1968, the liquid wastes were held within the reactor complex and then diluted to ensure the radiologic components were below the release criteria established by the Atomic Energy Commission (AEC). The procedure involved mixing the radioactive liquid wastes with groundwater then pumping the water into Jarvis Creek which ultimately flows into the

Delta River. Therefore, all radiological components in the liquid wastes would enter the creek and river. The second method covering 1968 until 1972 which also included the D&D activities, involved a steam generation system to boil the radioactive liquid wastes thereby reducing the volume and also producing a condensate containing tritium. The reduced volume, containing those radiological components not evaporated and collected by the condensate, was shipped off-site for disposal. The tritium-containing condensate produced in the steam process was diluted and pumped into a recharge well and apparently entered the underlying aquifer [3]. The estimated amount of tritium disposed in this manner was 30 curies (1.1 billion becquerels, Bq). The fort has a drinking water well about 900 feet upgradient from the recharge well [4].

To oversee the transfer of BRAC properties, the military established a Restoration Advisory Board (RAB) consisting of government and resident representatives in the area. The RAB has expressed concern regarding the disposal of the liquid radioactive wastes into the aquifer to the US Environmental Protection Agency (EPA). As a result, the EPA requested the Agency for Toxic Substances and Disease Registry (ATSDR) Region X office to evaluate the potential radiologic hazards as they currently exist in and around the Fort Greely and Delta Junction areas.

Chen, L.-c., 1965. The biology of the burbot, *Lota lota leptura*, in interior Alaska: College, Alaska, University of Alaska, M.S., 83 p *INCOMPLETE (need abstract); POPULATION; fish; burbot; metabolism; reproduction*

Chen, B., 2002. Modeling fish movement in sonar beam, University of Alaska Fairbanks, M.S., 81 p *POPULATION; fish; salmon; monitoring; modeling; distribution; management*
Summary: "Enumerating salmon in the Yukon River drainage allows for assessment of annual harvest management guidelines and prediction of long-term salmon population trends in Alaska. Sonar is currently used to enumerate migrating salmon and determine salmon location in the river. To understand these results, a model of fish movement is required. This thesis analyzes the existing sonar data on fish movement to construct a model that predicts typical spatial and temporal distribution of fish. A model of the sonar measurement system, which includes target strength, transmission loss, transducer beam pattern, time delay, and noise is developed. This system will simulate a sonar signature for an arbitrary distribution of fish by making several simplifying assumptions. This thesis compares the simulated system sonar signature with assumed fish distribution to predict the accuracy of the sonar fish counting system"

Cheng, H., Wang, D., Minuk, G., Anand, C., Stowe, T., and Buchan, K., 1986. The prevalence of antibody to delta virus in western Canada. *Clinical and investigative medicine Médecine clinique et expérimentale* 9 (3), 156-159. *PEOPLE; health (comparative); health (condition); hepatitis*

To assess the prevalence and pathological role of hepatitis D virus (HDV) infection in western Canada, we tested a total of 310 sera from the province of Alberta, Yukon and Northwest Territories for antibody to HD (anti-HDV) by commercial solid phase radioimmunoassay. Two hundred and forty-five sera were hepatitis B surface antigen (HBsAg) positive. These were classified on the basis of clinical and biochemical data as either acute hepatitis, chronic hepatitis or in the healthy carrier phase of infection Sixty-five HBsAg negative sera from patients with other forms of chronic liver diseases served as controls. Anti-HDV was detected in only four of the HBsAg positive sera (1.6%) and in none of the controls. The prevalence of anti-HDV was significantly higher in patients with chronic hepatitis, three of twenty-two (13.6%) than in patients with acute hepatitis (0%) (p less than 0.05) or healthy carriers (0%) (p less than 0.005). Two of the four anti-HDV positive sera were obtained from patients with a history of parenteral drug abuse. These

results indicate that HDV infection is uncommon in western Canada but, when it does occur, is more likely to be associated with chronic inflammatory liver disease. Parenteral drug abuse appears to be the major risk factor for HDV infection in western Canada at this time.

Chikita, K., Kemnitz, R., and Kumai, R., 2002. Characteristics of sediment discharge in the subarctic Yukon River, Alaska. *Catena* 48 (4), 235-253. *HYDROLOGY; surface water; sediment; glacial discharge; precipitation; modeling*

The characteristics of sediment discharge in the Yukon River, Alaska were investigated by monitoring water discharge, water turbidity and water temperature. The river-transported sediment, 90 wt.% or more, consists of silt and clay (grain size less than or equal to 62.5 µm), which probably originated in the glacier-covered mountains mostly in the Alaska Range. For early June to late August 1999, we continuously measured water turbidity and temperature near the estuary and in the middle of Yukon River by using self-recording turbidimeters and temperature data loggers. The water turbidity (ppm) was converted to suspended sediment concentration (SSC; mg/l) of river water, using a relation between simultaneous turbidity and SSC at each of the two sites, and then, the suspended sediment discharge, approximately equal to water discharge times SSC, was numerically obtained every 1 or 2 h. It should be noted that the sediment discharge in the Yukon River is controlled by SSC rather than water discharge. As a result, a peak sediment discharge occurred in mid or late August by local sediment runoffs due to glacier-melt (or glacier-melt plus rainfall), while a peak water discharge was produced by snowmelt in late June or early July. Application of the "extended Shields diagram" indicates that almost all the river-transported sediments are under complete suspension. (C) 2002 Elsevier Science B.V All rights reserved.

Chomel, B., Kasten, R., Chappuis, G., Soulier, M., and Kikuchi, Y., 1998. Serological survey of selected canine viral pathogens and zoonoses [disease that humans may acquire from animals] in grizzly bears (*Ursus arctos horribilis*) and black bears (*Ursus americanus*) from Alaska. *Revue Scientifique et Technique* 17 (3), 756-766. *POPULATION; mammals; grizzly bear; black bear; health (condition); monitoring; people*

Between 1988 and 1991, 644 serum samples were collected from 480 grizzly bears (*Ursus arctos horribilis*) and 40 black bears (*Ursus americanus*) from Alaska, United States of America, and were tested for selected canine viral infections and zoonoses. Antibody prevalence in grizzly bears was 0% for parvovirus, 8.3% (40/480) for distemper, 14% (68/480) for infectious hepatitis, 16.5% (79 /480) for brucellosis, 19% (93/480) for tularaemia and 47% (225 /478) for trichinellosis. In black bears, prevalence ranged from 0% for distemper and parvovirus to 27.5% for trichinellosis and 32% for tularaemia. Antibody prevalence for brucellosis (2.5%) and tularaemia (32%) were identical for grizzly bears and black bears from the geographical area of interior Alaska. Links between differences in prevalence and the origin of the grizzly bears were observed. Antibodies to canine distemper virus and infectious hepatitis virus were mainly detected in grizzly bears from Kodiak Island and the Alaskan Peninsula. Brucellosis antibodies were prevalent in grizzly bears from western and northern Alaska, whereas tularaemia antibodies were detected in grizzly bears from interior Alaska and the Arctic. There was a strong gradient for antibodies to *Trichinella* spp. from southern to northern Alaska. For most diseases, antibody prevalence increased with age. However, for several infections, no antibodies were detected in grizzly bears aged from 0 to 2 years, in contrast to the presence of those infections in black bears. Grizzly bears served as excellent sentinels for surveillance of zoonotic infections in wildlife in Alaska.

CHUQ, 2002. Research Unit Publications. Centre Hospitalier Universitaire de Québec, Health and Environment Group: <http://www.chuq.qc.ca/oms/en/publi/publi.htm> REFERENCE;

BIBLIOGRAPHY; CONTAMINANTS; PEOPLE; health (effects); POPs (persistent organic pollutants); metals

Clark, R., 1996. Stock status and rehabilitation of Chena River arctic grayling during 1995. Fishery Data Series 93-5. Alaska Department of Fish and Game, <http://www.sf.adfg.state.ak.us/statewide/divreports/html/details.cfm?id=1243>

POPULATION; fish; grayling; distribution; morphology; reproduction; recovery; mortality
Stock status of Arctic grayling *Thymallus arcticus* in the lower 152 km of the Chena River was described by population abundance, age composition, size composition, recruitment, and survival rate estimates during 1995. In July of 1995, estimated abundance of Arctic grayling in the Chena River was 45,114 fish (SE = 4,356) 150 mm FL. Age 2 Arctic grayling were strongly represented in the Chena River, representing 31.2 % of fish 150 mm FL. Stock-size Arctic grayling (270 mm FL) represented 79.4 % of fish 150 mm FL. Annual recruitment between 1994 and 1995 was 6,326 Arctic grayling (SE = 747) and annual survival during this period was 62.6 % (SE = 5.4). Estimated abundance of 1992 brood year (age-3) hatchery-reared Arctic grayling, released in 1993, was 2,015 fish (SE = 282). Survival of age-3 hatchery-reared Arctic grayling from July of 1994 to July of 1995 was 54 % (SE = 8.9). Estimated abundance of 1993 brood year (age-2) hatchery-reared Arctic grayling, released in 1994, was 2,325 fish (SE = 371). Survival of age-2 hatchery-reared Arctic grayling from July of 1994 to July of 1995 was 5.5 % (SE = 1.1). Since 1992, a total of 126,371 age-1 and 23,199 age-0 Arctic grayling have been released into the Chena River. Estimated abundance of all releases of Arctic grayling in 1995 was 4,340 fish (SE = 466). Low initial post-release survival (~60% during the first month) and low overwinter survival (~8% per year) were the primary causes of failure of the releases.

Clarke, R.G., 1984. The sharp-shinned hawk (*Accipiter striatus* Vieillot) in interior Alaska, University of Alaska, Fairbanks, M.S., 130 p *INCOMPLETE (need abstract); POPULATION; birds; raptor; hawk*

Clein, J., and Schimel, J., 1995. Nitrogen turnover and availability during succession from alder to poplar in Alaskan taiga forests. *Soil Biology and Biochemistry* 27 (6), 743-752. *NUTRIENT CYCLING; nitrogen; carbon; soil; microbes; vegetation; succession; alder; poplar; flooding*
Primary succession on the Tanana river floodplain progresses from alder, with C-limited microbes and rapid nitrification, to poplar, with N-limited microbes and little nitrification. To determine the mechanisms controlling this shift, a reciprocal soil transplant experiment was conducted between alder and poplar sites. Mineralization rates (gross and net) and nitrification potentials were measured periodically over 1 year. Nitrification potentials of both soils were higher in the alder site, but transplanted soils showed higher gross rates of N turnover than soils in their native site. Thus, C additions from poplar alleviated C limitation in alder soils, accelerating N turnover, but with a net reduction in N availability to nitrifiers. Transplanting poplar soil to the alder site alleviated N limitation, accelerating N turnover while increasing net N availability. The changes in N cycling between alder and poplar were therefore controlled by changes in N turnover and availability.

Coady, J.W., 1975. Bioenergetics of the brown lemming (*Lemmus sibiricus*), University of Alaska, Fairbanks, 117 p *INCOMPLETE (need abstract); POPULATION; mammals; lemming; metabolism; seasonality; nutrition*

Cody, W., Kennedy, C., and Bennett, B., 1998. New records of vascular plants in the Yukon Territory. *Canadian field-naturalist* 112 (2), 289-328. *VEGETATION; distribution; climate;*
Thirteen native taxa including *Alisma plantago-aquatica* var. *americana*, *Carex aquatilis* spp. *stans*, *C. lenticularis* var. *lipocarpa*, *Cassiope mertensiana*, *Dryopteris carthusiana*,

Lathyrus ochroleucas, **Lonicera dioica** var. **glaucescens**, **Maianthemum canadense** spp. **interius**, **Papaver alboroseum**, **Platanthera orbiculata**, **Potamogeton strictifolius**, **Salix raupii** and **Vaccinium membranaceum** are reported new to the known flora of the Yukon Territory. Nine introduced taxa are also reported as new to the known flora. Significant range extensions within the Territory are reported for 287 native and 17 introduced taxa. Most of the range extensions involve the eastern portion of the Territory. Comments are presented on 11 native taxa and two native taxa are deleted from the Territory.

2000. New records of vascular plants in the Yukon Territory II. *Canadian field-naturalist* 114 (3), 417-443. *VEGETATION; distribution; climate*

Nine native taxa including **Carex oligosperma**, **C. pauciflora**, **C. pellita**, **Chimaphila umbellata** ssp. **occidentalis**, **Draba densifolia**, x **Elyleymus hirtiflorus**, **Eriophorum vaginatum** ssp. **spissum**, **Impatiens ? capensis**, and **Rhus radicans** are reported new to the known flora of the Yukon Territory. Eight introduced taxa are also reported as new to the known flora. Significant range extensions within the Territory are reported for 180 native and 17 introduced taxa. Comments are presented on three native taxa and two native taxa are deleted from the Territory.

2001. New records of vascular plants in the Yukon territory III. *Canadian field-naturalist* 115 (2), 301-322. *VEGETATION; distribution; climate*

Ten native taxa including **Arabis boivinii**, **Carex aquatilis** ssp. **stans**, **Descurainia incisa** var. **incisa**, **Draba lonchocarpa** var. **vestita**, **Isoetes maritima**, **Lepidium densiflorum** var. **macrocarpum**, **Malaxis paludosa**, **Phyllodoce X intermedia**, **Scirpus acutus**, **Stipa hymenoides** and **Taraxacum carneocoloratum** are reported new to the known flora of the Yukon Territory. Three introduced taxa including **Centaurea cyanus**, **Lolium perenne** ssp. **multiflorum**, **Rheum rhaponticum** and **Sorbaria sorbifolia** are also reported as new to the known flora. Significant range extensions within the Territory are reported for 127 native and 21 introduced taxa and comments are presented on four native taxa. Of these, 10 native and three introduced are new for the Territory. The total vascular flora is now 1163 species.

Coffing, M., Scott, C., and Utermohle, C., 1998. The subsistence harvest of seals and sea lions by Alaska Natives in three communities of the Yukon-Kuskokwim Delta, Alaska, 1997-98.

Technical paper no. 255. Alaska Dept. of Fish and Game, Division of Subsistence, Juneau.

<http://www.arlis.org/> *INCOMPLETE (need abstract); PEOPLE; subsistence; marine mammal*

Coffing, M., Scott, C.L., and Utermohle, C.J., 1999. The subsistence harvest of seals and sea lions by Alaska Natives in three communities of the Yukon-Kuskokwim Delta, Alaska, 1998-99.

Technical Paper 257. Alaska Dept. of Fish and Game, Division of Subsistence, *INCOMPLETE*

(need abstract); PEOPLE; subsistence; marine mammal

Coleman, R.W., 1954. [Arthropods of medical and veterinary importance in Alaska].

POPULATION; invertebrates; insects; crustaceans; habitat selection; reproduction; health (effects)

"Summary: Reports from Coleman, a special consultant to the Arctic Health Research Center, U.S. Public Health Service, Anchorage, Alaska, to the Center and to the Surgeon General. Included are two preliminary reports on collections in breeding areas of arthropods in Alaska and in the Yukon and British Columbia during the summer of 1954, and the first and second parts of a final report on certain arthropods and other organisms in Alaska in 1954." Title and summary supplied by UAF/Gnosis cataloger

Collins, G.V., 1987. An economic evaluation of stumpage appraisal [estimating the monetary value of standing timber] methods used in the interior of Alaska, British Columbia and Yukon Territory, University of Alaska Fairbanks, M.S., 118 p *INCOMPLETE (need abstract);*

VEGETATION; white spruce; forestry; economics

Collins, C.M., 1988. Morphometric analyses of recent channel changes on the Tanana River in the vicinity of Fairbanks, Alaska, University of Alaska Fairbanks, M.S., 129 p *INCOMPLETE (need abstract); HYDROLOGY; surface water; modeling; mapping; climate*

Collins, C., Racine, C., and Walsh, M., 1994. The physical, chemical, and biological effects of crude oil spills after 15 years on a black spruce forest, interior Alaska. *Arctic* 47 (2), 164-175. *CONTAMINANTS; POL (petroleum/oil/lubricants = hydrocarbons); vegetation; ground ice / permafrost; recovery*

The effects of two large experimental crude oil spills conducted in the winter and summer of 1976 in a permafrost-underlain black spruce forest of interior Alaska were assessed 15 years after the spills. Effects on permafrost, as determined from measurements of active layer thaw depths and of the total amount of ground subsidence, were far more pronounced on the winter spill due to a larger surface-oiled area. The winter spill also had a more drastic effect on the vegetation. Where the black, asphalt-like surface oil was present, black spruce mortality was 100% and there was very little live plant cover except for cotton grass tussocks. Changes in oil chemistry varied with depth; surface samples had signs of microbiological degradation, whereas some subsurface samples taken just above the permafrost had no evidence of degradation and still contained volatile fractions.

Conant, B., Hodges, J., and King, J., 1991. Continuity and advancement of trumpeter swan *Cygnus buccinator* and tundra swan *Cygnus columbianus* population monitoring in Alaska. *Wildfowl Supplement* 1, 125-136. *INCOMPLETE (need abstract); POPULATION; birds; waterfowl; swan*

Conant, B., and Groves, D., 1994. Alaska-Yukon waterfowl breeding population survey, 15 May to 13 June 1994. U.S. Fish and Wildlife Service, Migratory Bird Management, Juneau. <http://biology.usgs.gov/s+t/SNT/noframe/ak177r.htm> *INCOMPLETE (need abstract); POPULATION; birds; waterfowl; reproduction*

Conference, 1970. Man's Health in a Changing Environment. Arctic Health Research Center, Fairbanks. *PEOPLE health (condition)*

Conn, J., and DeLapp, J., 1983. Changes in weed-species assemblage with increasing field age. *Agroborealis* 15, 39-47. *AGRICULTURE; vegetation; distribution; succession*

In the summer of 1981 the authors surveyed the weed vegetation in agricultural fields of southcentral and interior Alaska in order to determine the current agricultural weed flora and to discern possible relationships between environmental variables and weed-species assemblage. A one-way analysis of variance showed that the location of fields on the Decorana x axis is related to the number of years the field was in cultivation ($p < .0001$, $r^2 = 0.83$). In contrast, multiple regression analysis did not identify any soil-chemical properties significantly related to the ordination x or y axis. Thus, weed-species assemblage in the fields sampled seems to be related more to field age than to any other environmental factor studied. There is a shift in composition of weed species from mostly native species in fields that have just been cleared to mostly introduced species by the time the fields have been in cultivation for only three to five years. The authors also demonstrate that total weed cover (contributed by both native and introduced species) is initially low on newly cleared lands but increases dramatically with increasing time in cultivation.

Cooper, D., and Van Haveren, B., 1994. Establishing felt-leaf willow from seed to restore Alaskan, U.S.A., floodplains. *Arctic and Alpine Research* 26 (1), 42-45. *MINING; reclamation; vegetation; willow; soil; flooding*

During 1991 and 1992 we conducted field experiments to determine the factors limiting the establishment and survival of felt-leaf willow (*Salix alaxensis*) seedlings on dry abandoned placer mine tailings along Birch Creek in interior Alaska. Study plots were used to test two variables, supplemental soil, and water. Willow establishment was highest on watered and topsoiled plots with very few seedlings established in unwatered plots. Seedling densities of up to 100 per m² occurred for plots watered daily with 5 cm of topsoil. Seedling survival through 1992, however, was highest in plots that did not receive topsoil and lowest in plots with 5 cm topsoil. Seedling shoot and root weights were nearly 2x and 3x, respectively, greater on plots with no topsoil than plots with 5 cm topsoil. In addition, seedling shoot lengths were similar for both plot types, while root lengths were more than twice as long in the mineral soil plots as a 5 cm topsoil plot. Felt-leaf willow seedlings are readily established on placer tailings well above the water table by removing the limiting factor of summer drought. Addition of native organic-rich soils enhances establishment, but reduces survival. Willow seedling establishment is recommended for restoration sites where the water table is less than 1 to 2 m from the soil surface. We estimate that seedlings will root to the water table in approximately 5-yr.

Crane, P.A., Seeb, L.W., and Gates, R.B., 1994. Yukon River Chum Salmon: progress report for genetic stock identification studies July 1, 1992 - June 30, 1994. Regional Information Report No. 5J94-19. Alaska Department of Fish and Game, Anchorage, AK. *POPULATION; fish; salmon; chum; genetics; distribution; INCOMPLETE (need abstract)*

Creed, I., Havas, M., and Trick, C., 1989. The influence of nutrient status on the metabolism of arsenic by *Chlorella vulgaris* isolates. *Journal of Phycology* 25 (suppl. 2), 11. *CONTAMINANTS; metals; arsenic; remediation; microbes; algae; nutrition; metabolism*

The metabolism of arsenic by five strains of the freshwater alga, *Chlorella vulgaris*, was investigated. Two strains originated from arsenic contaminated field sites (Yukon Territories, Canada and Japan); one strain was selected for arsenic tolerance in the laboratory; and two reference strains from an algal culture collection. The effect of nutrient status and pre-exposure to arsenic on arsenic metabolism was examined in cells grown under nitrogen- or phosphorus-limited continuous culture. Metabolic pathways, including cellular exclusion, storage, extrusion and biotransformation to non-toxic forms were considered for their possible roles in tolerance. Findings suggest that two independent mechanisms may be involved in tolerance. The mechanism that was activated depended on the nutrient history of the cell. The efficiency of the mechanism depended on the historical exposure to arsenic.

1990. Effects of arsenate on growth of nitrogen- and phosphorus-limited *Chlorella vulgaris* (Chlorophyceae) isolates. *Journal of Phycology* 26 (4), 641-650. *CONTAMINANTS; arsenic; remediation; microbes; algae; growth/development*

The effects of arsenate on the growth characteristics of five isolates of the freshwater alga, *Chlorella vulgaris*, were examined. Two field isolates originated from arsenic-contaminated sites in Yukon, Canada and Kyushi, Japan; two reference isolates were obtained from the University of Texas Culture Collection. One isolate was selected for arsenic-tolerance in the laboratory. All five strains survived in culture solutions containing high arsenate concentrations. Arsenate (1-25 mM As) reduced photosynthesis and cell growth, as reflected by induced lag periods, slower growth rates, and lower stationary cell yields. Field isolates had shorter lag periods, higher growth rates, and enhanced cell yields compared to lab isolates when exposed to the same arsenic concentrations. Growth of the phosphorus-limited field strains was stimulated by the

addition of arsenic. The cell yield of phosphorus-limited *C. vulgaris* Yukon, when treated with arsenic, was two times that of the phosphorus-limited control. This pattern was not evident when photosynthesis was used as a measure of cell response.

Criddle, K., 1996. Predicting the consequences of alternative harvest regulations in a sequential fishery. *North American Journal of Fisheries Management* 16 (1), 30-40. *POPULATION; fish; salmon; chinook; chum; management*

Management of the fishery for chinook salmon *Oncorhynchus tshawytscha* on the Yukon River is complicated by the lack of accurate preseason forecasts, limited information on the determinants of the dynamics of unit stocks, harvesting effort directed at a mixture of stocks, joint harvesting of chum salmon *O. keta*, and the sequential availability of the returning fish to subsistence, commercial, and sport fishers in Alaska and Canada. A stochastic simulation model was developed and used to examine the consequences of eight alternative strategies for setting commercial catch limits. The merit of each strategy was judged by three criteria: probability of satisfying escapement objectives, probability of simultaneously satisfying escapement and subsistence harvest objectives and the probability of also reaching commercial harvest goals. The results indicate that without improved preseason forecasts, subsistence and commercial catch objectives cannot be consistently achieved in the upper Yukon River unless catches in the lower Yukon River are restricted below their 1980-1993 average.

Crock, J., Gough, L., Wanty, R., Day, W., Wang, B., Gamble, B., Henning, M., Brown, Z., and Meier, A., 2000. Regional Geochemical Results from the Analyses of Rock, Water, Soil, Stream Sediment, and Vegetation Samples -- Fortymile River Watershed, East-Central Alaska, 1998 Sampling. open file report 00-0511. US Geological

Survey, <http://greenwood.cr.usgs.gov/pub/open-file-reports/ofr-00-0511/> *MINING; gold; WATER QUALITY; surface water; soil; sediment; vegetation; flooding*

INTRODUCTION

This report briefly describes and presents geochemical and biogeochemical data for a cooperative study in the Fortymile Mining District, east central Alaska. This study is being funded by the U.S. Geological Survey (USGS) Mineral Resources Program through Fiscal Year 2001. Cooperative funds are being provided from various State of Alaska sources through the Alaska Department of Natural Resources. Results for the first field season completed in June 1997 are presented in Crock and others (1999). The study's second field season was completed in June 1998 and the results of the sample analyses for this phase of the study are presented here.

Primary objectives of this study are:

- * **Determine the regional baseline geochemistry (waters, soils, rocks, sediments, and selected terrestrial vegetation) for a section of the Fortymile River watershed currently being mined for placer gold (suction dredge and "cat" or dozer operations).**
- * **Determine regional watershed geochemical fluxes.**
- * **Assess the influence of geology on water-rock signatures, and using these signatures, try to differentiate sources of surface and hyporheic water (shallow groundwater near a streambed).**
- * **Determine the movement of metals through ecosystems of specific interest, such as permafrost muskeg terrain, upland alluvial forests, and riverine floodplain shrub systems.**
- * **Using both a geologic and a hydrologic framework, define the relative contribution of the various natural sources of arsenic and cadmium and other environmentally important metals to the landscape.**
- * **Assist the State of Alaska and the U.S. Environmental Protection Agency (USEPA) in the arsenic risk-assessment process.**

Background

The USGS and the Alaska Department of Natural Resources (AK-DNR) are currently investigating the environmental geochemistry of a portion of the Fortymile and Goodpaster River watersheds (fig. 1). The management of the region and its resources is complex due to diverse ownership and the many land-use options. In 1980, the Fortymile River and its major tributaries were designated a Wild and Scenic Corridor by the Alaska National Interest Lands Conservation Act (ANILCA). Jurisdiction of the land bordering the watershed continued to be the responsibility of the U.S. Bureau of Land Management (USBLM). The AK-DNR has jurisdiction over the management of the river's recreation (rafting, canoeing, and fishing) and mining. The USEPA is also involved because mining discharges require compliance with the National Pollutant Discharge Elimination System (NPDES) of the Clean Water Act. Finally, both sport and subsistence hunting are important in the region and are managed by several Federal and State agencies.

Placer gold was first discovered in the Fortymile River Mining District in 1886 and has been mined there ever since. Yeend (1996) provides a summary of the gold mining history of the placers of the Fortymile River region. Historically from 1886 to 1995, the Fortymile Mining District has produced about 16,640 Kg (534,974 oz) of gold (Swainbank and others, 1998). Along the North Fork of the Fortymile River, and just above its confluence with the South Fork, mining is currently limited to a small number of suction dredges which when combined produce only a few hundred ounces of gold per year. A cooperative effort between the USGS and the AK-DNR was initiated in 1997 to provide data to address water quality concerns, as well as to establish regional baseline geochemical and biogeochemical data (Crock and others, 1999; Wanty and others, 2000). In June 1998, we continued our work of the previous year (Crock and others, 1999) with field measurements of pH, turbidity, electrical conductivity, and stream discharge for the Fortymile River and many of its tributaries. At the same time, samples of soils, rocks, stream sediments, water, and vegetation were collected for chemical analysis, and sent to the USGS laboratories in Denver, Colorado. This report lists the analytical results of the 1998 sampling. Figure 2 depicts the sampling locations for the 1998 sampling efforts in the Fortymile watershed. The analytical results of the 1997 sampling are listed in Crock and others (1999). In addition, similar studies were initiated at and near the new Teck-Pogo gold discovery located about forty miles northeast of Delta Junction, Alaska in the Big Delta quadrangle (fig. 1).

Important to this study's assessment will be the evaluation of the flux and biogeochemical cycling of arsenic and cadmium between the terrestrial and aquatic phases. In addition to studying water-rock processes that mobilize arsenic and cadmium, this project is also examining other factors that affect their bioavailability to the environment (for example, in sites that are mined verses unmined; vegetated verses barren; saturated (permafrost) verses drained; forested verses muskeg) {Crock, Larison and Gough, 2000; Gough and Crock, 1999; Gough and others, 2001}.

Cronin, M., Spearman, W., Wilmot, R., Patton, J., and Bickham, J., 1993. Mitochondrial DNA variation in chinook (*Oncorhynchus tshawytscha*) and chum salmon (*O. keta*) detected by restriction enzyme analysis of polymerase chain reaction (PCR) products. *Canadian Journal of Fisheries and Aquatic Sciences/Journal Canadien des Sciences Halieutiques et Aquatiques* Ottawa 50 (4), 708-715. *POPULATION; fish; salmon; chum; chinook; genetics; distribution; biochemistry; enzymology*

We analyzed intraspecific mitochondrial DNA variation in chinook salmon (*Oncorhynchus tshawytscha*) from drainages in the Yukon River (Alaska and Yukon Territory), the Kenai River (Alaska), and Oregon and California rivers and chum salmon

(*O. keta*) from the Yukon River and Vancouver Island, and Washington rivers. For each species, three different portions of the mtDNA molecule were amplified separately using the polymerase chain reaction and then digested with at least 19 restriction enzymes. Intraspecific sequence divergences between haplotypes were less than 0.01 base substitution per nucleotide. Nine chum salmon haplotypes were identified. Yukon River chum salmon stocks displayed more haplotypes (eight) than the stocks of Vancouver Island and Washington (two). The most common chum salmon haplotype occurred in all areas. Seven chinook salmon haplotypes were identified. Four haplotypes occurred in the Yukon and Kenai rivers and four occurred in Oregon/California, with only one haplotype shared between the regions. Sample sizes were too small to quantify the degree of stock separation among drainages, but the patterns of variation that we observed suggest utility of the technique in genetic stock identification.

Culver, M., Johnson, W., Pecon-Slattery, J., and O'Brien, S., 2000. Genomic ancestry of the American puma (*Puma concolor*). *Journal of Heredity* 91 (3), 186-97. *POPULATION; mammals; distribution; genetics*

Puma concolor, a large American cat species, occupies the most extensive range of any New World terrestrial mammal, spanning 110 degrees of latitude from the Canadian Yukon to the Straits of Magellan. Until the recent Holocene, pumas coexisted with a diverse array of carnivores including the American lion (*Panthera atrox*), the North American cheetah (*Miracynonyx trumani*), and the saber toothed tiger (*Smilodon fatalis*). Genomic DNA specimens from 315 pumas of specified geographic origin (261 contemporary and 54 museum specimens) were collected for molecular genetic and phylogenetic analyses of three mitochondrial gene sequences (16S rRNA, ATPase-8, and NADH-5) plus composite microsatellite genotypes (10 feline loci). Six phylogeographic groupings or subspecies were resolved, and the entire North American population (186 individuals from 15 previously named subspecies) was genetically homogeneous in overall variation relative to central and South American populations. The marked uniformity of mtDNA and a reduction in microsatellite allele size expansion indicates that North American pumas derive from a recent (late Pleistocene circa 10,000 years ago) replacement and recolonization by a small number of founders who themselves originated from a centrum of puma genetic diversity in eastern South America 200,000-300,000 years ago. The recolonization of North American pumas was coincident with a massive late Pleistocene extinction event that eliminated 80% of large vertebrates in North America and may have extirpated pumas from that continent as well.

Cwynar, L., and Spear, R., 1991. Reversion of forest to tundra in the central Yukon. *Ecology* 72 (1), 202-212. *CLIMATE; VEGETATION; pollen; sediment*

Pollen and plant macrofossil analyses of sediments from three sites in the central Yukon that are presently in shrub tundra provided a record of former forest establishment. Shrub tundra with groves and gallery forest of balsam poplar occupied the region between 10 000 and 8000 BP. At 9400 BP white spruce (*Picea glauca*) populations expanded, and open white spruce woodlands persisted until 6500 BP when black spruce (*Picea mariana*) and green alder (*Alnus viridis*) populations increased, resulting in open spruce woodlands with a distribution of species probably similar to that commonly found today in the northern boreal forest: white spruce on drier south-facing slopes and on alluvial sites with balsam poplar, and black spruce on colder, wetter sites on north-facing slopes and valley bottoms. At 5000 BP forest began to revert to shrub tundra, abruptly at first but then more gradually. The modern groves of spruce in the region, which are mostly white spruce, therefore are probably relict populations surviving in favorable microsites. These results support the conclusion from other recent studies that Alaska and northwest Canada experienced warmer summers than today from as early as 10 000 BP to ~6000 BP in response to increased summer insolation arising from changes in

the earth's orbital parameters as predicted by the Astronomic Theory of climate change. The decline of forest after 5000 BP is not associated with any significant changes in the abundance of shrub or herb pollen types, suggesting that the ground vegetation has behaved independently of the tree populations.

Dahling, D., and Safferman, R., 1979. Survival of enteric [intestinal] viruses under natural conditions in a subarctic river. *Applied and Environmental Microbiology* 38 (6), 1103-10.

WATER QUALITY; waste (human); microbes; bacteria; virus

The survival of enteric [intestinal] viruses was studied in the vicinity of Fairbanks, Alaska at selected stations along a 317-km section of the Tanana River. This section was located downstream from all known domestic wastewater sources and was effectively sealed by a total ice cover. The mean flow time through the region was 7.1 days, during which initial viral population showed a relative survival rate of 34%. The tracing of native viruses at such great distances in the complete absence of other point and nonpoint viral sources has not been previously reported. Of the two methods of virus concentration used, viral recoveries from the disk adsorption virus elution procedure were far greater than those achieved with the Aquella system employed at that time. The fact the ratio of enteric viruses to fecal indicator bacteria was not constant clearly inferred that these bacteria were not an effectual measure of virus concentration. The persistence of fecal coliforms and fecal streptococci, however, attested to the microbiological health risk involved.

Dale, M., and Zbigniewicz, M., 1997. Spatial pattern in boreal shrub communities: Effects of a peak in herbivore density. *Canadian Journal of Botany/Revue Canadien de Botanique* 75 (8), 1342-1348. *VEGETATION; distribution; willow; schrub birch; herbivory (mammal); snowshoe hare; predation*

As part of a large-scale experiment on the dynamics of boreal forest communities, we examined the effects of experimental manipulations on the spatial pattern of two shrub species, *Salix glauca* and *Betula glandulosa*, before and after the population peak of the herbivore *Lepus americanus*, the snowshoe hare. Despite high rates of twig browsing during the peak, at most sites the basic characteristics of the spatial pattern recovered quickly. Only where food addition and predator exclosure enhanced and prolonged the hare density peak was there a sharp decline in the intensity of spatial pattern of the preferred winter food plant *Betula*. The spatial pattern of these shrubs is resilient to normal changes in herbivory and may persist, therefore, for decades through several hare population cycles.

Damstra, T., Barlow, S., Bergman, A., Kavlock, R., and Van Der Kraak, G., eds., 2002. Global Assessment of the State-of-the-Science of Endocrine Disruptors (WHO/PCS/EDC/02.2).

International Programme on Chemical Safety (<http://www.who.int/pcs/>), Geneva. *health (effects); health (condition); PEOPLE; mammals; birds; fish; invertebrates; CONTAMINANTS; endocrinology*

Danyluk, L.S., 1997. Shallow Insulated Foundation at Galena, Alaska; A Case Study. Special Report 97-7. CRREL (Cold Regions Research and Engineering Laboratories, US Army Corps of Engineers), http://www.crrel.usace.army.mil/techpub/CRREL_Reports/reports/SR97_07.pdf *INFRASTRUCTURE; engineering; ground ice / permafrost*

Abstract: A 2000-ft addition to an aircraft control tower was constructed at Galena, Alaska, during the summer of 1990. Because of limited resources, a shallow insulated foundation (SIF) was specified instead of a traditional foundation (one in which the bottom of the footing is placed lower than the anticipated depth of frost penetration). An SIF design allows the footing to be placed at a much shallower depth by incorporating the use of strategically placed insulation around the foundation. The insulation utilizes

heat from the building and surrounding soil, redirects it to the area around the foundation, and thus reduces the frost penetration.

Dau, C.P., 1974. Nesting biology of the spectacled eider *Somateria fischeri* (Brandt) on the Yukon-Kuskokwim Delta, Alaska, University of Alaska, Fairbanks, M.S., 72: ill., maps p *POPULATION; birds; waterfowl; eider; reproduction; behavior (reproductive/nesting)*

Daum, D., and Osborne, B., 1998. Use of Fixed-Location, Split-Beam Sonar to Describe Temporal and Spatial Patterns of Adult Fall Chum Salmon Migration in the Chandalar River, Alaska. *North American Journal of Fisheries Management* 18 (3), 477-486. *POPULATION; fish; salmon; chum; migration; distribution; modeling*

Fixed-location, split-beam hydroacoustics was used to describe temporal and spatial patterns of upstream-swimming fall chum salmon *Oncorhynchus keta* in the Chandalar River, a tributary of the Yukon River, Alaska. Split-beam techniques allow for three-dimensional tracking of fish targets as they pass through the sonar beam. Elliptical-beam transducers were deployed from opposite river banks to optimize acoustic coverage and were aimed perpendicular to the current. Sonar systems were operated continuously from August 8 through September 22, 1996. Acoustic data on positional information of 204,153 upstream-traveling chum salmon were collected. Diel patterns in hourly passage rates differed between banks. On the left bank, chum salmon passage was highest during nighttime hours. On the right bank, fish did not show any consistent trend in diel passage rates. Chum salmon were generally shore oriented and swam near the river bottom. During daylight hours, fish were further offshore and closer to the bottom than during night. Besides providing accurate counts of fish passage, riverine split-beam hydroacoustics proved a nonintrusive method for studying the migratory behavior of fish.

Davidge, D., and Snider, R., 1996. Baseline study of stream water quality and sediments of Laura and Carolyn Creek, Yukon, Loki Gold Corporation. NTIS/MIC-97-04505; Regional program report no. 96-01. Environmental Protection Service, Pacific & Yukon Region, Whitehorse, Yukon. *MINING; gold; WATER QUALITY; SEDIMENT; contaminants; hydrology; metals; nutrient cycling; fish*

Describes a baseline study conducted in May 1995 at the Laura Creek watershed near a proposed heap leach gold mine 60 kilometres east of Dawson City, Yukon. The study continues a 1991 baseline study with the purpose of addressing more site-specific concerns associated with the proposed development. Five study sites were selected along Laura Creek, Carolyn Creek, and the Klondike River near the Laura Creek outlet. Water at all sites was sampled and analyzed for dissolved and total metals, nutrients, and other physical parameters, and sediments were analyzed for metals. A preliminary fisheries survey, relying only on visual observations, was also carried out to determine whether fish were present in Laura Creek.

Davidge, D., 1997. Report on the suspended sediment and heavy metals loading in Vangorda Creek downstream of the Vangorda Mine site near Faro, Yukon during spring freshet in 1991, 1992 and 1993. NTIS/MIC-97-02848; Regional program report no. 95-09. Environmental Protection Service; Pacific & Yukon Region, Whitehorse. *MINING; WATER QUALITY; SEDIMENT; contaminants; hydrology; metals; arsenic?*

A routine inspection of mine water drainages in the vicinity of the Vangorda open pit mine near Faro, Yukon in May 1991 revealed unusually high concentrations of suspended sediments and certain heavy metals at a location 200 meters downstream of the pit. This report presents results of a follow-up inspection later in 1991 and of a sampling program in spring 1992 and 1993 to collect several weeks of daily composite samples from four locations for suspended sediment and total metals analysis. Results indicate the relationship between heavy metals loading, suspended sediment loading,

and onset of significant increases in daily temperature and stream flow. The data also point to the source of the metals-laden sediments.

Davidson, M., Schraer, C., Parkinson, A., Campbell, J., Facklam, R., Wainwright, R., Lanier, A., and Heyward, W., 1989. Invasive pneumococcal disease in an Alaska native population, 1980 through 1986. *Journal of the American Medical Association* 261 (5), 715-8. *PEOPLE; adults; infants; children; health (comparative); respiratory infection; pneumonia; anemia; alcohol; mortality*

From 1980 through 1986, one hundred fourteen Alaska Native patients from the Yukon-Kuskokwim Delta had community-acquired invasive pneumococcal disease confirmed by isolates of *Streptococcus pneumoniae* from normally sterile body sites. The annual bacteremia rates per 100,000 persons were 105 cases for all ages, 1195 cases for infants under 2 years of age, and 130 cases for adults over 59 years of age. These were six to 34 times higher than rates reported for other US populations. The most common underlying conditions in infants diagnosed before 24 months of age were previously diagnosed anemia and pneumonia, while alcoholism and anemia were most common in adults. The case-fatality rate for infants under 2 years of age was 3.2%, and the case-fatality rate for adults over 59 years of age was 30%. Serotyping of more than half the isolates identified 96% of these isolates to be present in the currently available pneumococcal polysaccharide vaccine. The pneumococcal disease rates reported herein are likely to be underestimates since most diseases that occur in this region are treated at the village level without laboratory confirmation.

Davidson, S., 1991. The Yukon's dirty little secret [waste disposal practices]. *Arctic Circle* 2 (3), 37-39. *CONTAMINANTS; waste (hazardous); waste (human); INCOMPLETE (need abstract)*
Draws attention to Yukon Territory's disposal practices for human and industrial waste. Claims that there are at least 500 known waste dump sites and that much inadequately treated sewage is dumped into Yukon River.

Demboski, J.R., 1999. Molecular systematics and biogeography of long-tailed shrews (Insectivora: Sorex) and northern flying squirrels (Rodentia: Glaucomys), University of Alaska Fairbanks, Ph. D., 150 p *POPULATION; mammals; rodents; squirrel; shrew; marten; distribution; genetics; migration; climate; glaciation*

Summary: "Insight into phylogenetic and biogeographic relationships among several mammalian taxa in western North America was provided with DNA sequences of two mitochondrial genes (cytochrome b and ND4). Members of two species complexes of long-tailed shrews (genus *Sorex*) and northern flying squirrels (genus *Glaucomys*) were examined, and a common theme of responses to past climate change and glacial cycles was evident. Diversification events indicated by the DNA sequences provide new perspectives regarding the deep and shallow history of these taxa. Analysis of seven species of the *Sorex cineres* complex (and related species) revealed two major clades within the complex, Northern and Southern. These generally corroborate proposed morphological relationships and correspond to broadly defined habitat affiliations (xeric and mesic), respectively. Within the Northern clade, amphiberian species represented a monophyletic group suggesting Beringia was a center of endemism. Next, five species of the *S. vagrans* complex and related species were assessed. Significant molecular variation was revealed that does not correspond to morphological differences within the complex. Two major clades within *S. monticolus* were observed, a widespread Continental clade (Arizona to Alaska, including *S. neomexicanus*) and a restricted Coastal clade (Oregon to southeast Alaska, including *S. bairdi* and *S. pacificus*). A regional examination of genetic variation in the northern flying squirrel in southeast Alaska was also performed. Results suggested that southern islands in the Alexander Archipelago were the result of recent colonization (founder event). Finally, a comparative phylogeographic analysis of a reduced data set (*S. monticolus*), a molecular data set for

the American Pine Marten, *Martes americana*, and other [?!] biogeography of the north Pacific coast. Previous ideas regarding purported refugia may be overstated and may be the result of limited geographic sampling. This thesis provides new perspectives on processes (e.g., post-glacial colonization) driving mammalian phylogenetic and biogeographic structuring in western North America"

Densmore, R., 1994. Succession on regarded placer mine spoil in Alaska, USA, in relation to initial site characteristics. *Arctic and Alpine Research* 26 (4), 354-363. *MINING; VEGETATION; willow; alder; recovery; succession; hydrology; soil; nutrition; nitrogen*

This study evaluated the rate and pattern of natural succession on regarded placer mine spoil in relation to initial substrate characteristics. The study site was the Glen Creek watershed of the Kantishna mining area of Denali National Park and Preserve, Alaska. After regarding twelve 0.01-ha plots were established and substrate characteristics were measured. Natural plant succession was evaluated after five growing seasons. Three successional patterns were identified on the basis of plant community characteristics. First, a riparian plant community with vigorous *Salix alaxensis* [flatleaf willow] and *Alnus crispa* [green alder] grew rapidly on topsoil that had been spread over the regarded spoil. Second, a similiar plant community with less vigurous *S. alaxensis* developed more slowly on unprocessed spoil and spoil amended with a small amount of topsoil. Third, processed spoil remained almost bare of vegetation, although *S. alaxensis* was able to establish on processed spoil, but the few established seedlings grew very well. Several substrate variables, including the proportion of silt and clay vs. sand, total nitrogen, and water retention capacity, were good predictors for the number of vigorous *S. alaxensis*.

1997. Effect of day length on germination of seeds collected in Alaska. *American Journal of Botony* 84, 274-278. *VEGETATION; growth/development; labrador tea; prickly saxifrage; pin cushion; leather leaf; reproduction; seasonality; climate*

Day length control can effectively limit seed germination to favorable seasons, but this phenomenon has been studied in relatively few wild plants. I tested species from interior Alaska for day length control of germination under controlled conditions, and I also monitored germination phenology in natural habitats. Unstratified and cold-stratified seeds were germinated on short (13 h) and long (22 h) day length and in the dark at constant and alternating temperatures. On long day length, unstratified *Ledum decumbens* [labrador tea] and *Saxifraga tricuspidata* [prickly saxifrage] seeds germinated from 5°C and 10°C and germination was reduced at higher temperatures. Unstratified seeds of *Diapensia lapponica* [pin cushion] and *Chamaedaphne calyculata* [leather leaf] germinated only at 14°C and 20°C on long day length, and short day length completely inhibited germination. Cold stratification widened the temperature range for germination on both long and short day lengths, but germination was still lower on short than long day length. Germination phenology in natural habitats was consistent with germination in controlled conditions. In these species, short day length and low temperatures interact to inhibit germination in the fall. After overwintering, seeds germinate in the spring at low temperatures and on long day lengths. The inhibitory effect of short day length is not important in the spring because day length is already long at snowmelt.

Densmore, R., Juday, G., and Zasada, J., 1999. Regeneration alternatives for upland white spruce after burning and logging in interior Alaska. *Canadian Journal of Forest Research* 29 (4), 413-423. *VEGETATION; white spruce; forestry; logging; wildfire; recovery*

Site-preparation and regeneration methods for white spruce (*Picea glauca* (Moench) Voss) were tested near Fairbanks, Alaska, on two upland sites which had been burned in a wildfire and salvage logged. After 5 and 10 years, white spruce regeneration did not differ among the four scarification methods but tended to be lower without scarification. Survival of container-grown planted seedlings stabilized after 3 years at 93% with

scarification and at 76% without scarification. Broadcast seeding was also successful, with one or more seedlings on 80% of the scarified 6-m² subplots and on 60% of the unscarified subplots after 12 years. Natural regeneration after 12 years exceeded expectations, with seedlings on 50% of the 6-m² subplots 150 m from a seed source and on 28% of the subplots 230 m from a seed source. After 5 years, 37% of the scarified unsheltered seed spots and 52% of the scarified seed spots with cone shelters had one or more seedlings, but only 16% of the unscarified seed spots had seedlings, with and without funnel shelters. Growth rates for all seedlings were higher than on similar unburned sites. The results show positive effects of burning in interior Alaska, and suggest planting seedlings, broadcast seeding, and natural seedfall, alone or in combination, as viable options for similar sites.

Densmore, R., Vander Meer, M., and Dunkle, N., 2000. Native plant revegetation manual for Denali National Park and Preserve. Information and Technology Report USGS/BRD/ITR-2000-0006. U.S. Geological Survey, Biological Resources Division, *VEGETATION; disturbance; reclamation; INCOMPLETE (need abstract)*

Densmore, R., McKee, P., and Roland, C., 2001. Exotic plants in Alaskan National Park units. *INCOMPLETE (need abstract); VEGETATION; invasive species*

Deschu, N., 1985. Arsenic in sediments, water, and benthic fish in placer-mined and unmined streams, Denali National Park and Preserve, Alaska, University of Washington, M.S., 90 p *INCOMPLETE (need abstract); MINING; CONTAMINANTS; metals; arsenic; sediment; water quality; fish*

Deviche, P., 1997. Seasonal reproductive pattern of white-winged crossbills in interior Alaska. *Journal of Field Ornithology* 68 (4), 613-321. *POPULATION; white-winged crossbill; reproduction; seasonality; nutrition*

It has been proposed that crossbills (*Loxia* spp.) are opportunistic breeders that tune the onset of their reproductive cycle based on food availability rather than photoperiod [length of daylight], as is the case in most other bird species. Crossbills are able to nest throughout most of the year at middle latitudes, but the reproductive biology of these birds at high latitudes remains poorly known. A total of 469 White-winged Crossbills (*Loxia leucoptera*) was caught in Fairbanks, Alaska during a 2.5-yr period. Based on the proportion of juvenile birds in the sampled population, the proportion of adult females with a brood patch, and seasonal changes in adult male cloacal protuberance size, it appears that interior Alaska White-winged Crossbills breed only in spring and early summer. Timing of reproduction of crossbills breeding at high latitudes may be limited by environmental factors (potentially, ambient temperature and/or photoperiod) rather than by food availability.

Deviche, P., Wingfield, J., and Sharp, P., 2000. Year-class differences in the reproductive system, plasma prolactin and corticosterone concentrations, and onset of prebasic molt in male dark-eyed juncos (*Junco hyemalis*) during the breeding period. *General Comparative Endocrinology* 118 (3), 425-35. *POPULATION; birds; junco; morphology; biochemistry; reproduction; endocrinology*

Year-class differences in reproductive function were investigated in a free-living population of adult male Dark-eyed Juncos, *Junco hyemalis*, breeding in interior Alaska. Second-year males (SY, entering their first breeding season) were compared with after-second-year males (ASY, entering at least their second breeding season). We measured body mass, size of the cloacal protuberance (CP), testis mass, onset of prebasic molt, and concentrations of plasma luteinizing hormone (LH), testosterone (T), corticosterone (CORT), and prolactin (PRL) throughout the reproductive season (April to mid-July).

There were no differences in SY and ASY body weights but SY males had smaller CPs and testis masses than ASY males during gonadal recrudescence and at the end of the breeding season. Plasma LH was elevated from April until mid-June and then decreased in the same way in both year classes. In contrast, plasma T was high from April until mid-May and was lower in SY than in ASY juncos shortly after they arrived on their breeding grounds at the end of April, but not at other times. In July, SY males started to molt earlier, suggesting that they became photorefractory earlier than ASY males. Plasma PRL increased progressively in both year classes between April and early June and decreased in early July. At this time, plasma PRL decreased earlier in SY than in ASY males. Plasma CORT changed seasonally, but did not differ between SY and ASY juncos. Thus, year-class differences in CP sizes and testis mass apparently did not result from SY males secreting less LH or more PRL or CORT than ASY males. It is suggested that differences in reproductive condition in SY and ASY juncos are mediated by interactions with conspecific [same species] birds and do not result from an intrinsic effect of age.

Deviche, P., Greiner, E., and Manteca, X., 2001. Seasonal and age-related changes in blood parasite prevalence in dark-eyed juncos (*Junco hyemalis*, Aves, Passeriformes). *Journal of Experimental Zoology* 289 (7), 456-66. *POPULATION; birds; junco; biochemistry; endocrinology; growth/development; reproduction; parasitic infection*

We determined seasonal changes in blood parasite infections in a free-living population of Dark-eyed Juncos (*Junco hyemalis*) breeding in interior Alaska (65 degrees N; 148 degrees W). The common parasites found in blood smears were *Leucocytozoon fringillinarum* (56%), *Trypanosoma avium* (33%), and *Haemoproteus fringillae* (9%). In males, parasite prevalences were relatively high at arrival on breeding grounds and increased during the breeding season. Intensity of infection with *Leucocytozoon* also increased between spring and summer, and then decreased at the time of migration (September). This decrease did not occur in adult females. Elevated prevalences during the breeding season probably reflected the addition of new cases via vector activity to positive status resulting from spring relapse. We observed neither an association between parasite species nor a consistent relationship between parasite intensity and body condition. To further study relationships between reproductive system activity and parasite infections, we compared prevalences in adult males that were undergoing their first cycle of gonadal development and regression (males in their second calendar year, or SY) with those of older males (males in their third or more calendar year, i.e., after-second-year males or ASY). Circulating testosterone concentrations declined in both groups between arrival on breeding grounds (end of April-early May) and the end of the reproductive period (July), and they were higher in May in ASY than in SY males. At the peak of the breeding season (June), ASY males also had a higher parasite prevalence than SY males. This difference may have resulted from immunosuppressive effects of gonadal hormones and/or from behavioral differences between SY and ASY males such that older males were exposed to more insect vectors than younger males. *J. Exp. Zool.* 289:456-466, 2001. Copyright 2001 Wiley-Liss, Inc.

DIAND, 1993. Wolf Creek research basin, Yukon. SSCR71511993E; ISBN: 0662212231; NTIS/MIC9502124. Indian and Northern Affairs Canada, Ottawa (Ontario). <http://www.yukia.yk.net/libraries20/SpLib24/DetailsMD.cfm?CtlNum=0059%2D56660&LibCode=YWIN> *HYDROLOGY; ecology; water quality; snow; climate; vegetation; monitoring; contaminants*

The Wolf Creek Research Basin project was initiated in 1992 to provide a dedicated site to carry out applied research in the Yukon sub-Arctic. The project used an ecosystem approach through contaminants, waste, water, and environment/economy integration. This report describes the Wolf Creek area, the project's objectives, the background to the project's establishment, and research activities in 1992/93, 1993/94, and 1994/95.

Research projects included watershed characterization, water quality monitoring, snow and vegetation survey, streamflow monitoring, snowpack monitoring, wind redistribution of snow, snow accumulation and depletion, snowmelt, evapotranspiration, and runoff modelling.

1994. Acid rock drainage potential in the Yukon Territory: An evaluation of active and abandoned mines. NTIS/MIC-94-07369. Indian and Northern Affairs Canada, Ottawa (Ontario). *MINING; water quality; acidification*

Inventory of quantitative information on active and abandoned mines in Yukon Territory to assess the potential for acid rock drainage (ARD) within waste and rock tailings deposits. Analyses were performed to determine the potential for ARD and to identify the major factors contributing to ARD at 10 mines and two additional properties that were developed but never brought into production. There is insufficient information on the remaining 56 of the total of 68 mining properties and deposits for the assessment of ARD potential. Analysis included geologic and mineralogic assessment, waste disposal and management, water chemistry data, chemical characteristics of tailings and waste rock, and chemical composition of wastes. Appendices include data summary sheets for each of the 12 mines examined and a summary of the geology, histories, and locations of all the underground and open pit mines. Northern mine environment neutral drainage studies no. 3.

1994. Yukon minerals industry bibliography. NTIS/MIC9506801. Aurum Geological Consultants Inc.; Northern Affairs Program, Yukon Region, Whitehorse. *MINING; management; acidification; sediment; metals; geology; land use; economics*

This document contains 2,741 bibliographic references of published and unpublished data relevant to the Yukon minerals industry. The references are numbered and arranged alphabetically by title, and separate indexes provide access by citation number according to subject and author (both corporate and individual). Subjects covered in the bibliography include acid mine drainage, placer mining, geology, environmental aspects, economic development, industrial minerals, legal aspects, mineral exploration, tailings, smelting, energy, native land claims, mineral processing, mining methods, and resource management.

1995. Research design for northern acid rock drainage. NTIS/MIC-95-05356; Agency Project ID: SSC-R71-50/4E. Department of Indian Affairs and Northern Development, *MINING; management; engineering; water quality; acidification; hydrology; climate; ground ice / permafrost; geology; precipitation*

Prevention of acid rock drainage (ARD) is probably the single most important environmental issue facing mines in Canada. Indian and Northern Affairs Canada commissioned this research plan to ensure that ARD prevention, control, and treatment technologies are developed for mines operating in northern Canada. The plan design is based on division of the Yukon and Northwest Territories into distinctive subregions primarily based on geological features, extent of surficial deposits, degree of permafrost formation, and annual precipitation and evaporation patterns. The plan identifies several high-priority areas for ARD research, and identifies research themes based on the specific ARD management opportunities and constraints in those areas. The plan also presents research project outlines, schedule, and budget requirements. An appendix includes research project outlines. Northern mine environment neutral drainage studies no. 4.

1997. Use of diffuser systems for dispersion of placer mining effluent. NTIS/MIC-97-01097; Open file no. 1996-2(T). Fortymile Placers; Northern Affairs Program, Whitehorse, Yukon. *MINING; water quality; sediment; modeling; engineering*

This study examines the applicability of introducing placer effluent through a diffuser to lessen the environmental impact. The study discusses diffuser design and employs

CORMIX (Cornell Mixing Zone Expert System) to model two series of scenarios using receiving water data for the Fortymile River, Yukon. In one series, the concentration of suspended solids in the effluent was varied; in the other, the effluent flow rate was varied. Results showed the distance downstream at which a water quality objective of 12.5 milligrams/liter of suspended sediment was achieved. The CORMIX model was also used to predict effluent behavior in some hypothetical receiving streams, showing the effect of stream size on the diffusion rate. The question of sedimentation was examined by comparing background to introduced sediment levels, calculating the shear/fall velocity ratio for the sediment, and comparing model results to flume testing and other field investigations.

Dingman, S., 1970. Hydrology of the Glenn Creek Watershed, Tanana River drainage, central Alaska [microform], Harvard University, Ph. D., 122 p *INCOMPLETE (need abstract)*; *HYDROLOGY*; *ground water*; *surface water*; *ground ice / permafrost*

Diversity, B., and Perez, C., 1998. The health of northern residents. *Health Reports* 9 (4), 49-58(Eng); 51-61(Fre). *PEOPLE*; *health (condition)*; *health (comparative)*; *alcohol*; *tobacco*; *health care*

OBJECTIVES: This article examines differences in health status and health determinants between residents of the North (Yukon and Northwest Territories) and of the provinces, and between Aboriginal and non- Aboriginal territorial residents. The use of health services and medications is also analyzed. **DATA SOURCE:** The data are from the 1994/95 National Population Health Survey (NPHS), both the territorial and provincial components. The population analyzed consists of household residents aged 12 and older. **MAIN RESULTS:** Compared with non- Aboriginal Northerners, Aboriginal people in the territories more frequently rated their health poorly. However, they reported fewer injuries and diagnosed chronic conditions. The prevalence of alcohol consumption was lower among Aboriginal people, while the proportion of smokers was substantially higher. A lower proportion of Aboriginal territorial residents had consulted a general practitioner in the previous year, and a higher proportion had consulted a nurse. Aboriginal people also had a low rate of medication use.

Dloniak, S.M., 2000. Neuroendocrine control of song in the dark-eyed junco (*Junco hyemalis*), University of Alaska Fairbanks, M.S., 97 p *POPULATION*; *birds*; *songbirds*; *junco*; *biochemistry*; *endocrinology*; *seasonality*

This dissertation includes three discrete projects addressing various aspects of the neuroendocrine control of song in the Dark-eyed Junco (*Junco hyemalis*), a migratory songbird. Specifically, the roles of testosterone, photoperiodic condition [length of daylight], opioids, and age were investigated with respect to song production and neural plasticity in the regions of the brain that control song (vocal control regions, VCRs). I found that, in males photoperiodic condition and testosterone interact to regulate seasonal VCR volume plasticity, whereas testosterone alone controls song production. The opioid system is probably not involved in VCR plasticity or song production, but is indicated to play a role in song learning or auditory processing. Finally, VCR volumes and song production do not differ with age in photostimulated adult male juncos

Doran, K., 2000. Photosynthetic acclimation of white spruce (*Picea glauca*) to canopy microhabitats, University of Alaska Fairbanks, Ph. D., 113 p *VEGETATION*; *white spruce*; *alder*; *NUTRIENT CYCLING*; *nitrogen*; *succession*; *growth/development*; *seasonality*; *photosynthesis*
Slow growing white spruce (*Picea glauca*) seedlings and saplings often become established early in succession and mature through several succession seres. During early succession, spruce often germinate in mineral soils and become established in alder (*Alnus tenuifolia* or *A. crispa*) thickets, with the potential for both competitive and facilitative relationships. Although competitive and facilitative plant interactions are often

identified by changes in the growth or density of the interacting species, the result of the interaction will depend upon the individual plant's physiological acclimation to abiotic changes caused by neighboring plants. This study analyzes components of photosynthesis to provide information about the effects of alder on spruce. To isolate the responses of components of the photosynthetic process to neighbors, gas exchange techniques, needle chemical analysis, and observations of environmental parameters were utilized in growth chamber experiments, with individual plants in the field, and in controlled density plantations of alder and spruce. Growth at high light in all experiments resulted in components of the photosynthetic process to neighbors, gas exchange techniques, needle chemical analysis, and observations of environmental parameters were utilized in growth chamber experiments, with individual plants in the field, and in controlled density plantations of alder and spruce. Growth at high light in all experiments resulted in lower maximum photosynthetic rates in current year shoots. Light response curves showed lower incident quantum yields in spruce seedlings growing at the high light levels typical on the floodplain. Increased soil nitrogen did not increase photosynthetic rates per gram needle in any of the experiments. However, increased seedling growth at high light in growth chamber experiments, and increased plant density in spruce/alder plantations, resulted in dilution of needle nitrogen. High needle nitrogen concentrations did not result in higher maximum net assimilation rates, although needle nitrogen was positively correlated with dark respiration rates. Concentrations of rubisco, a potentially [?something is missing!] responsive to changes in irradiance, but constituted only a small part of the needle nitrogen pool and did not appear to be limited by nitrogen availability. This work suggests that on a physiological level, spruce is a stress adapted plant with a low capacity to up-regulate photosynthetic physiological processes in response to increased light or nitrogen conditions. [White spruce do not grow faster with increased light or nitrogen.]

Contents: Ch. 1. Photosynthetic and biomass responses of white spruce (*Picea glauca*) seedlings to variation in growth irradiance and nitrogen -- Ch. 2. Photosynthetic responses of white spruce saplings (*Picea glauca*) to controlled density gradients of spruce and green alder (*Alnus crispa*) -- Ch. 3. Photosynthesis and photoprotection in sun and shade acclimated white spruce (*Picea glauca*) saplings -- General conclusions.

Downey, J.S., and Sinton, P., O, 1990. Geohydrology and ground-water geochemistry at a sub-arctic landfill, Fairbanks, Alaska. Water-resources investigations report ; 90-4022. US Geological Survey; Fairbanks North-Star Borough, *INCOMPLETE (need abstract); waste (solid); WATER QUALITY; hydrology; ground water*

Downie, D., and Fenge, T., eds., 2003. Northern Lights Against POPs: Combating Toxic Threats in the Arctic. McGill-Queen's University Press, Montreal. *REFERENCE; CONTAMINANTS; POPs (persistent organic pollutants); management; native perspective; international law*
Representatives of 111 nations gathered in Stockholm in May 2001 to sign a legally binding convention to eliminate or reduce emissions of pesticides, insecticides, and other industrial combustion by-products. Long-range transport by air and water carries many of these pollutants to the circumpolar north, where they threaten the health and cultural survival of Inuit and other northern Indigenous peoples.

Northern Lights against POPs tells the many-faceted scientific, policy, legal, and advocacy story that led to the Stockholm convention. Unique in its perspective, scope, and breadth, it reveals the key links among environmental and health science, international politics, advocacy, law, and global negotiations. Never before have public health concerns articulated by northern Indigenous peoples in Canada and throughout

the circumpolar Arctic had such a direct impact on global policy-making. Authors show how research on POPs (persistent organic pollutants) in the Arctic from the mid-1980s influenced international negotiations and analyze the potential for the convention to be effective. Contributors include elected representatives, researchers, civil servants, Indigenous people who participated in the negotiations, and scientists who provided the compelling Arctic data that prompted the United Nations Environment Programme to sponsor negotiations. Contributors include David Anderson (Minister of the Environment, Canada); Nigel Banks (University of Calgary); John Buccini (Consultant, former chair of the Global POPs Negotiations); Sheila Watt-Cloutier (Inuit Circumpolar Conference-Canada); Barry Commoner, Paul Woods Bartlett, Holger Eisl, Kimberly Couchot (Center for the Biology of Natural Systems, Queens College, City University of New York); Eric Dewailly (Laval University); David Downie (Director of Educational Partnerships, Columbia Earth Institute, Columbia University, New York); Terry Fenge (Inuit Circumpolar Conference-Canada); Henry Huntington (Consultant, Anchorage) and Michelle Sparck (Circumpolar Conservation Union, Washington, D.C.); Harriet Kuhnlein, Laurie Chan (Centre for Indigenous Peoples' Nutrition and Environment, McGill University), and Olivier Receveur (formerly Centre for Indigenous Peoples' Nutrition and Environment, McGill University); Lars-Otto Reiersen (Arctic Monitoring and Assessment Programme Secretariat, Oslo); Henrik Selin (Massachusetts Institute of Technology); David Stone, Russell Shearer (Northern Contaminants Program, Department of Indian Affairs and Northern Development, Canada); Klaus Topfer (Executive Director, United Nations Environment Programme).

Terry Fenge is strategic counsel to the president of Inuit Circumpolar Conference (Canada). David Downie is director of Educational Partnerships, Columbia Earth Institute, Columbia University, New York.

Doyle, F., 1995. Bald eagle, *Haliaeetus leucocephalus* and Northern Goshawk, *Accipiter gentilis*, nests apparently preyed upon by a Wolverine(s), *Gulo gulo*, in the southwestern Yukon Territory. *Canadian field-naturalist* 109 (1), 115-116. *POPULATION; mammals; birds; predation; wolverine; eagle; goshawk*

I present evidence of apparent Wolverine (*Gulo gulo*) predation on one Bald Eagle (*Haliaeetus leucocephalus*) and one Northern Goshawk (*Accipiter gentilis*) nest in Kluane Lake area of the Yukon Territory.

DRR, 1997. Survey of trappers working in the Yukon, winter 1995-96. NTIS/MIC-97-06110INW. Department of Renewable Resources, Yukon Territory; Bureau of Statistics, Yukon Territory, Whitehorse. *PEOPLE; trapping; economics*

Describes and presents results of a survey of Yukon trappers, conducted to aid in the development of a profile of trapping and its importance as a territorial lifestyle. The survey was also to help in the assessment of the effectiveness of fur-bearer management & support programs to the trapping industry. Survey questions related to such matters as: Time spent trapping; income from trapping; types of traps used & how many; trapping costs; pelt sales; length of trapping trails; membership in trapping associations; participation in trapper education programs; and the perceived importance of certain trapping-related issues. A copy of the survey questionnaire is appended.

Duffy, L.K., Rodgers, T., and Patton, M., 1998. Regional health assessment relating to mercury content of fish caught in the Yukon-Kuskokwim Delta rivers system. *Alaska Medicine* 40 (4), 75-77, 89. *CONTAMINANTS; metals; mercury; fish; salmon; chum; chinook; coho; sockeye; pike; burbot; risk assessment; bioaccumulation*

Seven species of fish were surveyed for muscle tissue mercury content across a broad area of western Alaska. Total mercury levels were determined by cold vapor atomic

fluorescence spectroscopy in 66 fish sampled during 1997. Methylmercury in sampled fish amounted to 97 to 100% of total mercury values. Using mercury consumption risk levels derived from U.S. Environmental Protection Agency hazard assessment models, mean total mercury was determined to be above the human critical value of 0.2 g/g (ppm) in 29% of the fish species, and 62% of the fish species contained mercury exceeding the wildlife critical value for piscivorous mammals. Overall, 24% of the fish exceed the critical value for human consumption and 58% the wildlife critical value. Similarly 31% of sites sampled exceeded the human consumption critical value. Based on the mean of all fish sampled and a small number of river otters, a biomagnification factor of 12 was calculated for the Yukon-Kuskokwim Delta Region of Alaska. Erratum in: *Alaska Med* 1999 Jan-Mar;41(1):15

Duffy, L., Scofield, E., Rodgers, T., Patton, M., and Bowyer, R., 1999. Comparative baseline levels of mercury, Hsp 70 and Hsp 60 in subsistence fish from the Yukon-Kuskokwim delta region of Alaska. *Comparative biochemistry and physiology Part C, Pharmacology, toxicology & endocrinology* 124 (2), 181-186. *PEOPLE; CONTAMINANTS; mercury; subsistence; fish; pike; burbot; whitefish; grayling; inconnu [sheefish]; biochemistry; endocrinology*
In subsistence fish; northern pike (*Esox lucius*), burbot (*Lota lota*), whitefish (*Coregonus nelsoni*), grayling (*Thymallus arcticus*) and sheefish (*Stenodus leucichthys*), we determined the Hsp [heat shock protein] 60 and Hsp 70 levels in 31 samples from adult fish gills. A dot-blot analysis using antibodies to either Hsp 70 or Hsp 60 showed the average Hsp 70 concentration was 9.1 microg/mg protein, while the average Hsp 60 concentration was 147.4 microg/mg protein. Mercury levels in muscle tissue in these fish averaged 0.382 ppm. Using a subset of samples (n = 24), we determined that the major component in the muscle of Alaskan subsistence fish was methyl mercury. No correlation was observed between Hsp 60 or Hsp 70 expression in gill tissue and mercury concentrations in muscle tissue. Hsp 60 and Hsp 70 protein levels in the gills were correlated.

Eamer, J., 1988. The use of climate data in environmental impact assessment at Curragh Resources' lead-zinc mine. *Proceedings Third Meeting on Northern Climate*, Yarranton Holdings Ltd., under contract to the Natural Resources and Economic Development Branch of DIAND, p. 82-89 *INCOMPLETE (need abstract); CLIMATE; MINING; HYDROLOGY; WATER QUALITY; economics; zinc*

Edwards, M., Mock, C., Finney, B., Barber, V., and Bartlein, P., 2001. Potential analogues for paleoclimatic variations in eastern interior Alaska during the past 14,000 yr: Atmospheric-circulation controls of regional temperature and moisture responses. *Quaternary Science Reviews* 20 (1-3), 189-202. *CLIMATE; precipitation; pollen; modeling*

The paleoclimatic history of a region can be viewed as a series of surface temperature and moisture anomalies through time. The effects of changes in large-scale climatic controls (e.g., insolation, major circulation controls) can be mediated by the influence of smaller-scale controls (e.g., topographic barriers, coastlines); this may result in heterogeneous surface climatic responses at the regional and sub-regional scale. Divergent paleoclimatic trajectories between regions may be explainable in terms of such meso-scale patterns. Using modern analogues for paleoclimate we examine how the sequence of climatic variations in eastern interior Alaska during the interval 12,000-0 ¹⁴C yr BP could have been generated by specific atmospheric circulation patterns. Fossil-pollen and lake-level records document the long-term trends in temperature and effective moisture for the region. Water-balance modelling provides additional estimates of paleoprecipitation. Synoptic climatological patterns are described using the modern (instrumental) record of upper-level and sea-level pressure, surface temperature, and precipitation. At 12,000 ¹⁴C yr BP, eastern interior Alaska was cooler and drier than

present, a situation generated today by a southward displacement of the jet stream. Conditions warmer and drier than present at 9000 ¹⁴C yr BP may have been generated by increased ridging north of Alaska and a weakened westerly circulation. Warmer, wetter conditions than present possibly prevailed in the late-middle Holocene; these might reflect ridging over Alaska and troughing further west. Cool, wet conditions feature enhanced westerly flow into Alaska through an eastward shift in the east Asian trough and positive pressure anomalies in the North Pacific; they may be analogous to cold periods of the Little Ice Age. The analogues demonstrate how surface conditions in other parts of Beringia may sometimes be similar to, while at other times different from those in the eastern interior. These broader spatial patterns provide hypotheses about past climates that can be tested with paleoclimatological data. For example, the widespread positive temperature anomalies associated with the warm/dry (9000 ¹⁴C yr BP) analogue fit with the expansion northward of the eastern Siberian treeline. The anomalously cool conditions in northeast Siberia associated with the warm/wet analogue may explain the continued (late-middle Holocene) treeline advance in Alaska while there was retreat in Siberia. (copyright) 2000 Elsevier Science Ltd.

Eggers, D., 2002. Run forecasts and projections for 2002 Alaska salmon fisheries and review of the 2001 season. Regional Information Report 5J02-01. Alaska Department of Fish and Game, Juneau. <http://www.cf.adfg.state.ak.us/geninfo/pubs/rir/5j02-01.pdf> *INCOMPLETE (need abstract); POPULATION; fish; salmon; chinook; chum; coho; sockeye*

Eichholz, M., and Sedinger, J., 1998. Factors affecting duration of incubation in Black Brant. *Condor* 100 (1), 164-168. *POPULATION; birds; waterfowl; brant; behavior (reproductive/nesting); reproduction; growth/development*

We investigated factors affecting duration of incubation in Black Brant (*Branta bernicla*) during 1992 and 1993 on the Yukon-Kuskokwim Delta, Alaska. Duration of incubation varied with clutch size and decreased with later nest initiation. In contrast to other studies, we found no relationship between incubation period and ambient temperature, mean egg size, or nest attentiveness. We hypothesize that a decrease in incubation length with later first egg date is an adaptation by females to reduce disadvantages of hatching late. We suggest that potential costs of reduced embryonic development time outweigh benefits for females that are able to initiate nesting early because their eggs hatch early enough to maximize recruitment of hatched young. For females that nest late, however, advantages to reproductive success of hatching earlier may outweigh costs of reduced development time.

Eichholz, M.W., 2001. The implications of agriculture in Interior Alaska for population dynamics of Canada geese, University of Alaska Fairbanks, Ph. D., 162 p *POPULATION; birds; waterfowl; goose; nutrition; biochemistry; migration; subsistence; hunting; agriculture*

Understanding how environmental change affects demography is essential for understanding and managing populations. An anthropogenic change in the environment that has affected wildlife populations is widespread agricultural development. Agriculture has both negatively and positively impacted abundance of species by affecting a variety of vital rates that influence population abundance. In this study, I describe the migration ecology of Canada geese (*Branta Canadensis*) that nest and stage in Interior Alaska. I also describe how the introduction of agriculture has potentially positively impacted population dynamics of Canada geese by increasing nutrient acquisition, thereby improving their fecundity and survival. Two subspecies of Canada geese used Interior Alaska for staging and at least partially segregated themselves during spring and fall staging. I documented difference in survival between two age classes of Canada geese, primarily lesser Canada geese (*B. c. parvipes*), and attributed it to the higher susceptibility to harvest of hatch-year (HY) geese. Estimates of annual survival of

Canada geese in this study are among the lowest, and estimates of recovery rates are among the highest, for a migratory population of geese, likely due to behavioral traits and habitat selection that make lesser Canada geese more susceptible to harvest. Survival of after-hatch-year (AHY) female Canada geese was positively associated with the amount of endogenous nutrient reserves females had at the time of banding in fall. An experimental manipulation of migratory population of geese, likely due to behavioral traits and habitat selection that make lesser Canada geese more susceptible to harvest. Survival of after-hatch-year (AHY) female Canada geese was positively associated with the amount of endogenous nutrient reserves females had at the time of banding in fall. An experimental manipulation of nutrient reserves, however, suggested that the association between nutrient reserves and survival results from variation in individual quality (not measured), not a direct relationship between nutrient reserves and survival. Female geese in our study gained fat and minerals, but not protein, had fat levels greater than or equal to spring staging geese, suggesting fat reserves are important during early fall staging in this population of geese. Although I concluded that the introduction of agriculture has likely increased fecundity and decreased natural mortality in Canada geese that stage and breed in Interior Alaska, I also concluded that mortality due to harvest is sufficient to offset those changes, preventing an increase in the population.

Elliott, J., and Martin, P., 1998. Chlorinated hydrocarbon contaminants in grebes and seaducks wintering on the coast of British Columbia, Canada: 1988 -1993. *Environmental Monitoring and Assessment* 53 (2), 337-362. *CONTAMINANTS; POPs (persistent organic pollutants); birds; waterfowl; grebe; merganser; risk assessment*

Grebe and seaduck species were collected during late winter at industrial and reference sites along coastal British Columbia, and during spring migration in the Yukon Territory, from 1988 to 1993. Liver and/or breast muscle were analyzed for polychlorinated dibenzo-p-dioxins (PCDDs), dibenzofurans (PCDFs), biphenyls (PCBs), organochlorine (OC) pesticides, and chlorophenol-related compounds. Piscivorous species, including western grebes (*Aechmophorus occidentalis*) and common mergansers (*Mergus merganser*), contained highest levels of all contaminants. DDE and PCBs were detectable in all species analyzed, but were at low levels (<50 and 100 microg/kg [sum PCBs] wet weight, respectively) in all but some grebe and merganser samples. Highest DDE concentration (229 mu g/kg) was in liver of common mergansers collected at Port Alberni in 1989, and that of PCB (2300 mu g/kg) in breast muscle of western grebes collected in 1992 from the same site. The interspecific PCDD/PCDF pattern was similar to that of the OC pesticides and PCBs, with the fish-eating species containing highest concentrations. The only congener detected in all samples was 2,3,7,8-TCDF, although 2,3,7,8-TCDD was regularly present. Generally, of all samples collected in 1989, those from the bleached-kraft pulp mill (BKPM) site at Port Alberni were the most contaminated with PCDDs and PCDFs. Of the chlorophenolic compounds measured, only pentachlorophenol was routinely detected, typically at levels below 5 mu g/kg. Traces of 3,4,5,6-tetrachloroguaiacol, 5-chloroguaiacol and 4,5-dichloroguaiacol were also detected in a few samples, mainly from a BKPM site at Prince Rupert. By 1992, after changes to pulp mill bleaching processes and restrictions in chlorophenolic anti-sapstain use, PCDD and PCDF concentrations were substantially lower compared to 1989 in all species sampled and no longer posed a concern for human consumers. International TCDD-toxic equivalents (I-TEQs) in some western grebe samples were within the range of concentrations associated with sublethal effects in waterbird species (200-400 ng/kg).

Elser, D., and Grand, J., 1993. Factors influencing depredation of artificial duck nests. *Journal of Wildlife Management* 57 (2), 244-248. *POPULATION; birds; waterfowl; duck; researcher impact; predation; reproduction; behavior (reproductive/nesting); flooding; vegetation*

Because artificial nests can facilitate controlled experiments of nest success, we used them to assess whether human visitation, nest density, vegetation structure, and proximity to habitat edge could affect depredation of duck nests on Yukon Flats National Wildlife Refuge, Alaska. More ($P < 0.01$) nests in a plot visited daily (100%) were depredated than those in plots visited at intervals of 7 (40%), 14 (35%), or 28 days (45%). More ($P < 0.01$) nests were depredated in a plot with 10 nests/ha (95%) than nests in a plot of a lower density (2/ha; 40%). Vegetation height, vegetation density, distance to a wetland, distance to forest edge, or distance to the nearest ecotone did not differ ($P > 0.05$) between depredated and undisturbed nests. We suggest that daily visitation of duck nests increases depredation, but longer intervals, typical of most nest studies, do not. High nesting densities, which could occur when flooding limits nesting habitat, may result in higher depredation rates.

Ely, C.R., 1979. Breeding biology of the white-fronted goose (*Anser albifrons frontalis*) on the Yukon-Kuskokwim Delta, Alaska, University of California Davis, M.S., 110 p *POPULATION; birds; goose; behavior (reproductive/nesting); habitat selection; reproduction; INCOMPLETE (need abstract)*

Ely, C., Budeau, D., and Swain, U., 1987. Aggressive encounters between tundra swans and greater white-fronted geese during brood rearing. *Condor* 89 (2), 420-422. *POPULATION; birds; waterfowl; goose; swan; behavior (reproductive/nesting); behavior (territorial?)*

Interspecific aggression in waterfowl (*Anatidae*) is relatively common. The authors report here aggressive encounters between Greater White-fronted Geese (*Anser albifrons*) and Tundra Swans (*Cygnus columbianus*) during brood rearing on the Yukon-Kuskokwim Delta, Alaska, which on two occasions resulted in the death of a White-fronted Goose gosling.

Ely, C., and Takekawa, J., 1996. Geographic variation in migratory behavior of greater white-fronted geese (*Anser albifrons*). *Auk* 113 (4), 889-901. *POPULATION; waterfowl; goose; migration; habitat selection; genetics*

We studied the migration and winter distribution of adult greater white-fronted geese (*Anser albifrons frontalis*) radio-marked on the Yukon-Kuskokwim Delta (YKD) and Bristol Bay Lowlands (BBL) of Alaska from 1987 to 1992. The major autumn staging site for geese from both breeding areas was the Klamath Basin on the California/Oregon border. However, temporal use of this area differed markedly between populations. Geese from the BBL arrived at the Klamath Basin nearly 30 days before geese from the YKD and departed before most YKD geese had arrived. Ninety percent of BBL geese used the Klamath Basin in autumn, whereas 30% of YKD geese bypassed the Klamath Basin during autumn and instead flew directly to the Central Valley of California. Nearly all BBL geese migrated directly from the Klamath Basin to wintering areas in Mexico, bypassing the Central Valley. Ninety percent of the BBL geese wintered in Mexico, as opposed to <20% of the YKD geese. Wetlands of the Interior Highlands in the state of Chihuahua, particularly Laguna Babicora, were used by >90% of the radio-marked geese in Mexico. Marshes along the West Coast comprised the other important wintering habitat in Mexico. The Sacramento Valley of California was the predominant wintering area for YKD geese. BBL geese migrated north from Mexico into the San Joaquin Valley or Sacramento-San Joaquin Delta of California by the last week of January. Fifty-five percent of the BBL population used the Klamath Basin in spring, but many birds staged in eastern Oregon and western Idaho. In contrast, geese from the YKD staged almost exclusively in the Klamath Basin during spring before flying to staging areas in Alaska. Breeding allopatry and temporal partitioning on staging and wintering areas likely has contributed to the evolution of previously described phenotypic differences between these populations. These two populations, along with the Tule greater white-fronted

goose (*A. a. gambeli*), may constitute a portion of a Rassenkreis, a group of subspecies connected by clines [genetic variation in a group of related organisms usually due to environmental or geographic factors], each ecotype of which has independent conservation needs.

Ely, C., Douglas, D., Fowler, A., Babcock, C., Derksen, D., and Takekawa, J., 1997. Migration behavior of tundra swans from the Yukon-Kuskokwim Delta, Alaska. *Wilson Bulletin* 109 (4), 679-692. *POPULATION; birds; waterfowl; swan; migration; habitat selection; imaging (remote sensing)*

Tundra Swans (*Cygnus columbianus columbianus*) fitted with satellite transmitters (PTTs) on the outer coast of the Yukon-Kuskokwim (Y-K) Delta, Alaska, migrated eastward across the Y-K Delta in late September and stopped at wetlands on the west side of the Alaska Range during early October. After crossing the Alaska Range, swans stopped briefly on the Susitna Flats of Upper Cook Inlet. They then migrated eastward into the Yukon, Canada, and from there flew southward, paralleling the Wrangell Mountains through the interior of the Yukon to a staging area in northeastern British Columbia. They gradually migrated through central Alberta and southwest Saskatchewan and across Montana to a staging area in southeastern Idaho. They remained in southeastern Idaho from mid-November until early December when they migrated across Nevada to the Sacramento-San Joaquin Delta of California. Spring migration routes were similar to those used in autumn. Band returns and observations of neck-banded swans corroborated the general autumn and spring migration routes of PTT-marked birds. Swans stopped only briefly (<3 days) at staging areas in Alaska and northern Canada but lingered at migration areas in Alberta, Saskatchewan, and Idaho.

Ennis, G., Cinader, A., McIndoe, S., and Munsen, T., 1982. An annotated bibliography and information summary on the fisheries resources of the Yukon River basin in Canada. Canadian Manuscript Report of Fisheries and Aquatic Sciences #1657. Department of Fisheries & Oceans, Pacific Region, Vancouver, B.C. (Canada). *BIBLIOGRAPHY; POPULATION; fish*
This annotated bibliography provides a listing of 223 fisheries reports pertaining to the Canadian portion of the Yukon River and its tributaries (exclusive of the Porcupine River). Sources for the bibliography include periodicals, government and industrial technical reports and government records. Identification of source materials was facilitated by a computer search of several data bases.

ENRI, 1998. Alaska Rare Plant List. Environment and Natural Resources Institute, University of Alaska Anchorage: <http://www.uaa.alaska.edu/enri/rareguide/rarelist.html> *VEGETATION; distribution*

Eppinger, R., 1995. Geochemical data for environmental studies at Nabesna and Kennecott, Alaska: water, leachates, stream-sediments, heavy-mineral-concentrates, and rocks. Open-file report ; 95-645. US Geological Survey, Denver, CO. *MINING; gold; copper; geology; WATER QUALITY; sediment; contaminants; metals; acidification*

Contains a report describing the geology, types of samples, collection and preparation procedures, analytical techniques, and description of the data files and seven figures showing the study area and sample site locations. The data files are in Microsoft Access 97 format and as Lotus 1-2-3 worksheet .wkl files.

Epstein, H., Walker, M., Chapin III, F., and Starfield, A., 2000. A transient, nutrient-based model of arctic plant community response to climatic warming. *Ecological Applications* 10 (3), 824-841. *REFERENCE; CLIMATE; modeling; vegetation; succession; growth/development; nutrition; ecology*

We developed a nutrient-based, plant community and ecosystem model (ArcVeg) designed to, simulate the transient effects of increased temperatures on the biomass and community composition of a variety of arctic ecosystems. The model is currently

parameterized for upland, mesic ecosystems in high Arctic, low Arctic, treeline, and boreal forest climate zones. A unique feature of ArcVeg is that it incorporates up to 18 plant functional types including a variety of forbs, graminoids, shrubs, and nonvascular plants that are distinguished by a set of five parameters. Timing and rate of growth, as well as nutrient use, are particularly important in defining competitive interactions in the model and in explaining coexistence in complex communities. Simulations of climatic warming, which increase nitrogen mineralization and growing season length, suggest an increase in total biomass for high and low Arctic zones over 200 yr, and an increase in shrub biomass at the expense of other plant functional types. The initial community response to warming was a function of the initial dominance structure, whereas the long-term response reflected adaptations of plant functional types to the new environment. Therefore, long-term responses (decades to centuries) differed in both direction and magnitude from initial responses. In addition, warming resulted in the formation of novel, stable plant communities after 200 simulation years that were not typical of current zonal vegetation types in the Arctic of northwestern North America.

Esler, D., 1999. Time of day of ovulation by three duck species in subarctic Alaska. *Condor* 101, 422-425. *POPULATION; birds; waterfowl; duck; pintail; wigeon; scaup; reproduction; growth/development*

I examined variation in ovulation times of Northern Pintails (*Anas acuta*), American Wigeon (*A. americana*), and Lesser Scaup (*Aythya affinis*) breeding in subarctic Alaskan wetlands. Ovulation times and, by extension, egg-laying times were highly variable in all three species, with ovulations occurring during all hours of the day. Only Lesser Scaup demonstrated a morning peak in ovulations, within a broad range of ovulation times. Lack of a distinct time of day of ovulation suggests that fitness is not related to egg-laying time for these species, particularly at subarctic latitudes with nearly perpetual daylight. Egg-laying interval may have more adaptive significance than egg-laying time for these species. Ovulation intervals were estimated to be approximately 24 hr, which is short relative to the range of intervals documented in birds, despite high energetic and nutritional costs of egg formation in these species. Evidence of approximately 24-hr ovulation intervals, particularly in the absence of a distinct time of day for egg laying, supports hypotheses that a shortened period of egg production in waterfowl may have selective advantage due to reduction in the period of nest exposure to predation, earlier hatch dates, reduced hatch asynchrony, or improved viability of early-laid eggs.

Esler, D., Grand, J., and Afton, A., 2001. Intraspecific variation in nutrient reserve use during clutch formation by lesser scaup. *Condor* 103 (4), 810-820. *POPULATION; birds; waterfowl; scaup; nutrition; reproduction; migration*

We studied nutrient reserve dynamics of female Lesser Scaup (*Aythya affinis*) to identify sources of intraspecific variation in strategies of nutrient acquisition for meeting the high nutritional and energetic costs of egg formation. We collected data from interior Alaska and combined these with data for Lesser Scaup from midcontinent breeding areas, allowing a range wide analysis for the species. We found little evidence that nutrient reserve use differed between Alaskan and midcontinent Lesser Scaup, except that subarctic birds used a small amount of protein reserves when forming eggs, whereas midcontinent birds did not. Mineral reserves contributed relatively little to the clutch, but endogenous lipid accounted for approximately two-thirds of the lipid in the clutch. Levels of endogenous lipid and protein at initiation of clutch formation declined with date of initiation. Also, absolute amounts of lipid and protein reserves used declined through the season, corresponding to smaller clutch sizes. Our data are consistent with a seasonally variable threshold of lipid reserves for initiation of clutch formation and considerable reliance on lipid reserves, suggestive of lipid control of productivity via effects on clutch size and initiation dates. However, our data cannot refute the hypothesis that clutch size

or initiation dates are set by other factors that in turn dictate the amount of lipid reserves that are stored and used. Despite uncertainty regarding the role of nutrient limitations on productivity, maintenance of adequate food resources on winter, migration, and breeding areas should be a management concern, given the high costs of clutch formation by Lesser Scaup, evidence of recent population declines, and potential links between nutrition and productivity.

Estensen, J.L., 2001. Winter vertebrate browsing of birch: effects on the use of leaf litter leachates by stream microorganisms, University of Alaska Fairbanks, M.S., 70 p *LIMNOLOGY; water quality; population; invertebrates; microbes; bacteria; vegetation; birch; soil; herbivory (mammal)*

Winter browsing of birch leads to chemical changes in leaves of the following growing season, potentially generating differences in the quality of leachates derived from leaf litter and in leachate use by stream microorganisms. The effects of moose browsing were tested on leachates from leaves collected from browsed and unbrowsed trees and inoculated with microbial communities. Respiration and bacterial abundance were used to assess qualitative differences in leachates. Microbes cultured in leachates derived from leaves of browsed trees had significantly higher rates of oxygen uptake. There were no significant differences in bacterial abundance between treatments. The basis for the qualitative difference in leachates is likely due to an 89% greater concentration of amino acids in leachates derived from leaves of previously browsed trees. This study provides evidence that winter herbivory of birch can influence the use of leaf leachates by stream microbes, demonstrating coupling between riparian zones and stream ecosystems.

Evenson, M.J., 1993. A summary of abundance, catch per unit effort, and mean length estimates of burbot sampled in rivers of interior Alaska, 1986-1992. Fishery Data Series 93-15. Alaska Department of Fish and

Game, <http://www.sf.adfg.state.ak.us/statewide/divreports/html/details.cfm?id=1043>
POPULATION; fish; burbot; distribution; morphology

This report compiles all catch per unit effort and mean length estimates obtained from sampling during 1986-1992 in 67 river sections located throughout the Tanana River drainage. Estimates were calculated for three length categories: partially recruited "small" burbot (300 to 449 millimeters total length), fully recruited "medium" burbot (450-799 millimeters total length), and partially recruited "large" burbot (>800 millimeters total length). In addition, seven estimates of abundance for burbot >450 millimeters total length from five different river sections are presented. The specific objectives of this report were to estimate mean length and mean CPUE in one 24 kilometer section of the Tanana River and in one 24 kilometer section of the Chena River sampled during August and September, 1992. Estimates of mean CPUE in the Tanana River section were 0.21 (number of burbot caught per 24 hour set of one hoop trap) (SE = 0.03) for small burbot, 0.96 (SE = 0.08) for medium burbot, and 0.06 (SE = 0.01) for large burbot. Estimates of mean CPUE in the Chena River section were 0.07 (SE = 0.02) for small burbot, 0.41 (SE = 0.05) for medium burbot and 0.004 (SE = 0.004) for large burbot. Estimates of mean length for burbot sampled in the Tanana River section were 398 (millimeters total length) (SE = 6) for small burbot, 557 (SE = 5) for medium burbot, and 864 (SE = 16) for large burbot. Estimates of mean length for burbot sampled from the Chena River section were 388 (millimeters total length) (SE = 10) for small burbot and 575 (SE = 7) for medium burbot.

1993. Seasonal movements of radio-implanted burbot in the Tanana River drainage. Fishery Data Series 93-47. Alaska Department of Fish and

Game, <http://www.sf.adfg.state.ak.us/statewide/divreports/html/details.cfm?id=1078>
POPULATION; fish; burbot; monitoring; morphology; distribution; river ice

Radio telemetry was used to study the movements of burbot in the Tanana River drainage. Fifty-five burbot were surgically implanted with high frequency (148-149 MHz) transmitters. Forty burbot were large (greater than 650 mm total length) and considered sexually mature, while 15 were small (less than 450 mm total length) and considered sexually immature. All burbot were released in the Tanana and Chena rivers near Fairbanks. Tracking was conducted from a fixed-wing aircraft on 13 occasions between September, 1992 and July, 1993. Forty-one of the 55 burbot were found on 10 or more occasions, and 53 burbot were found during at least one occasion. Small burbot moved shorter distances than did large burbot between all consecutive tracking periods. Total ranges, measured as the linear distance between the most downstream and upstream points, of small burbot averaged 17 km, and were all less than 40 km. Total ranges of large burbot averaged 57 km and ranged between 5 and 255 km. Movements of small burbot did not vary between tracking periods, but movements of large burbot did. Mean movements of large burbot were greatest during periods coinciding with river freeze-up and river ice-out, and were smallest during periods coinciding with spawning. All 14 small burbot located during the study remained in the area of the mid-river fishery. However, the proportion of large burbot remaining in the area of the fishery varied between 0.66 and 0.93. There was substantial interchange of burbot between the Tanana and Chena rivers, but no movements into any other tributaries were documented. Fourteen general spawning locations were identified in the Tanana and Chena rivers. No more than six implanted burbot were located in any one of these areas. Results of this study are at odds with information obtained from tag returns in that a high frequency of downstream movements were documented in this study, whereas tag returns indicated that movements tended to be upstream. Possible explanations for this discrepancy are discussed.

Ewald, G., Larsson, P., Linge, H., Okla, L., and Szarzi, N., 1998. Biotransport of organic pollutants to an inland Alaska lake by migrating sockeye salmon (*Oncorhynchus nerka*). *Arctic* 51 (1), 40-47. *REFERENCE; CONTAMINANTS; POPs (persistent organic pollutants); fish; salmon; sockeye; long range transport;*

Persistent organic pollutants such as polychlorinated biphenyls (PCBs) and the pesticide DDT, known to harm wildlife, have been shown to reach pristine Subarctic and Arctic areas by global atmospheric transport. Another transport route for pollutant entry into these ecosystems is provided by migrating salmon. Pollutant transport was studied in a population of sockeye salmon (*Oncorhynchus nerka*) in the Copper River, Alaska during their 410 km spawning migration. Pollutants accumulated by the salmon during their ocean life stage were not eliminated during migration, but were transported to the spawning lakes and accumulated in the freshwater food web there. The influence of the biotransported pollutants was investigated by comparing pollutant levels and compositions in atmospheric deposition as well as in two different populations of arctic grayling (*Thymallus arcticus*). One grayling population was in the salmon spawning lake and the other in a nearby lake not hosting anadromous fish, but receiving pollutants only via atmospheric deposition. The grayling in the salmon spawning lake were found to have concentrations of organic pollutants more than two times higher than those of the grayling in the salmon-free lake, and the pollutant composition resembled that found in salmon. Thus, in the studied Alaska river system, biotransport was found to have a far greater influence than atmospheric input on the PCB and DDT levels in lake biota.

Farris, A., 1996. Numerical modeling of contaminant transport in discontinuous permafrost - Ft. Wainwright, Alaska, University of Alaska, MS, 109 p *INCOMPLETE (need abstract); CONTAMINANTS; HYDROLOGY; transport; ground water; ground ice / permafrost; military*

Feist, D., and Rosenmann, M., 1976. Norepinephrine thermogenesis in seasonally acclimatized and cold acclimated red-backed voles in Alaska. *Canadian Journal of Physiology and Pharmacology* 54 (2), 146-153. *POPULATION; mammals; rodents; vole; physiology; biochemistry; endocrinology; metabolism; seasonality*

The calorogenic response (millilitres O₂ per gram pre hour) to injected norepinephrine (NE) was compared as an index of nonshivering thermogenesis (NST) in the following groups of the Alaska red-backed vole (*Clethrionomys rutilus*): (1) summer, (2) fall acclimatized, (3) winter acclimatized, (4) 20 degrees C acclimated and (5) 5 degrees C acclimated. The metabolic response was tested at thermoneutrality (25 degrees C) and during cold exposure (5 degrees C). Winter acclimatized voles showed a significantly greater metabolic response to NE than summer voles at both 25 degrees C and 5 degrees C. In summer or winter voles the total metabolic rate after NE (M_{NE}) was similar at 25 degrees C and 5 degrees C but the fraction of the total caused by exogenous NE was lower at 5 degrees C. Thus, thermogenesis during cold exposure and resulting from exogenous NE appear to be based on the same mechanism, and NE has thermoregulatory significance in these voles. The magnitude of the NE response in winter voles was comparable to the highest values reported for bats and exceeded levels reported for other adult small mammal species. Summer acclimatized voles and those acclimatized to 20 degrees C in the laboratory were comparable in their response to NE but winter acclimatized voles were significantly more sensitive to NE than voles acclimated to 5 degrees C. The seasonal winter peak in M_{NE} coincided with peaks previously found for maximum metabolic capacity (M_{MAX}), maximum brown fat, and the period of coldest temperature in December-January. the ratio of M_{NE} to M_{max} was similar throughout the year. The results suggest that small arctic-subarctic rodents have a greater capacity for NE stimulated NST than rodents from temperate latitudes probably because they are acclimatized to colder seasonal conditions.

Feist, D., and Feist, C., 1986. Effects of cold, short day and melatonin on thermogenesis, body weight and reproductive organs in Alaskan red-backed voles. *Journal of Comparative Biochemistry and Physiology Part B, Biochemical, Systemic, and Environmental Physiology* 156 (5), 741-746. *POPULATION; mammals; rodents; vole; physiology; biochemistry; endocrinology; reproduction; seasonality*

This study examined whether cold, short day or melatonin causes reproductive regression and stimulates nonshivering thermogenesis [production of heat] in a subarctic rodent *Clethrionomys rutilus*. Red-backed voles born and raised at 23 degrees C and 22 h light per day (LD 22:2) at Fairbanks, Alaska (65 degrees N) were exposed in one of six groups to: 1) long day (LD 22:2), 23 degrees C, injected daily with melatonin or saline 2 h before lights out, 2) long day, 3 degrees C, injected daily with melatonin or saline, 3) short day (LD 8:16), 23 degrees C or 3 degrees C. Voles were tested for nonshivering thermogenesis (NST) prior to and after 8 wk exposure. Body weight, testes weight and female reproductive tract weight were assessed after 8 wk in long day and 12 wk in short day. NST was not altered by short day or melatonin but cold (3 degrees C) caused an increase in NST which was similar in long day and short day. Body weight of males and females was not affected by short day but was decreased by melatonin. Short day did not alter mean testes weight (about 20% voles regressed) but reduced mean female reproductive tract weight (more than 40% voles regressed). Melatonin reduced testes weight and female reproductive tract weight (more than 50% of voles of both sexes regressed). The results suggest that in northern red-backed voles: the pineal does not mediate seasonal changes in thermogenic capacity, the pineal may mediate reduction of body weight and regression of reproductive organs but, in addition to day-length, other cues or factors may be important, populations may exhibit variability in sensitivity of reproduction to photoperiod which could allow for opportunistic breeding.

Fleming, R.S., 1968. Phytosociology [plant communities] of birch-spruce forests on the Tanana upland, interior Alaska, University of Alaska, M.S., 86 p *INCOMPLETE (need abstract); VEGETATION; ecology; birch; spruce; succession; nutrition*

Fleshman, J., 1972. Disease prevalence in the Alaskan Arctic and subarctic. *Acta Socio - Medica Scandinavica* Supplement 6, 217-226. *PEOPLE; health (condition); INCOMPLETE (need abstract)*

Flint, P., and Grand, J., 1996. Variation in egg size of the northern pintail. *Condor* 98 (1), 162-165. *POPULATION; birds; waterfowl; pintail; reproduction; health (condition); growth/development*

Our goal in this study was to describe egg size variation in Northern Pintails (hereafter pintails) with regard to female age, body size, clutch size, year, initiation date, and nesting attempt. We compare our results to those from other populations of nesting pintails and discuss whether phenotypic clutch-size trade-offs exist for pintails.

1997. Survival of spectacled eider adult females and ducklings during brood rearing. *Journal of Wildlife Management* 61 (1), 217-221. *POPULATION; birds; waterfowl; eider; reproduction; lead; mortality*

We studied survival of adult female and thickling spectacled eiders (*Somateria fischeri*) during brood rearing on the Yukon-Kuskokwim Delta, Alaska from 1993 to 1995. Duckling survival to 30 days of age averaged 34% with a 95% confidence interval from 25 to 47%. Half (49%) of radiomarked adult females had lost all their ducklings by 30 days after batch. Most (74%) duckling mortality occurred in the first 10 days. Adult female survival during the first 30 days of brood rearing was 93 plus or minus 3% (SE). Females died from lead poisoning, as a result of ingesting lead shot, and predation. Mortality of adult females during brood rearing is probably higher than during other times of the year. Low adult female survival during the breeding season may be contributing to the overall population decline of spectacled eiders.

Flint, P., Petersen, M., and Grand, J., 1997. Exposure of spectacled eiders and other diving ducks to lead in western Alaska. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 75 (3), 439-443. *POPULATION; birds; waterfowl; eider; CONTAMINANTS; metals; lead; mortality*
Lead poisoning, resulting from ingestion of spent shot, has been identified as a cause of mortality in Spectacled Eiders (*Somateria fischeri*) on the Yukon-Kuskokwim Delta, Alaska. We examined lead-exposure rates of adult and juvenile Spectacled Eiders and other diving ducks, using atomic absorption spectrophotometry of blood samples. Additionally, we X-rayed birds in the field to identify ingested shot. We detected shot in the gizzards of 11.6% of Spectacled Eiders X-rayed. During the period from arrival through incubation, 13.0% of adult females and 6.6% of adult males had elevated blood lead levels when captured. During the brood-rearing period, 35.8% of adult females and 12.2% of ducklings were exposed to lead when captured. There was an increase in the probability of exposure of adult females with date sampled. We predict that 50% of the successfully breeding hens were likely exposed to lead, and 25-37% of the Spectacled Eider breeding population was exposed to lead. The long-term effects of sublethal doses on Spectacled Eiders are unknown; however, exposure of nesting females and young birds to lead may result in reduced over-winter survival and (or) reduced fecundity.

Flint, P., 1998. Settlement rate of lead shot in tundra wetland. *Journal of Wildlife Management* 62 (3), 1099-1102. *CONTAMINANTS; lead; metals; waterfowl; sediment*

Several species of breeding waterfowl have been shown to be exposed to lead shot on the Yukon-Kuskokwim (Y-K) Delta, Alaska. I "seeded" experimental plots with number 4 lead shot to determine the settlement rate of shot in wetland types commonly used by foraging waterfowl. I resampled plots for 3 years, using a suction dredge to remove

sediment in 4-cm layers. There was no consistent change in the proportion of shot recovered in the 0-4-cm layer among years or habitat types. My results suggest lead shot is available to feeding waterfowl for many years, and that exposure of waterfowl to lead poisoning will likely occur for >3 years after the use of lead shot is curtailed.

Flint, P., Fowler, A., Bottitta, G., and Schamber, J., 1998. Observations of Geese Foraging for Clam Shells During Spring on the Yukon-Kuskokwim Delta, Alaska. *Wilson Bulletin* 110 (3), 411-413. *POPULATION; birds; waterfowl; goose; behavior (feeding); reproduction; biochemistry; calcium; river ice*

We studied the behavior of geese on exposed river ice during spring on the Yukon-Kuskokwim Delta. The predominant behavior while on the ice for both sexes was foraging; however, females foraged more than males. Visual inspection of the ice revealed no potential plant or animal food items. However, numerous small (<20 mm) clam shells (*Macoma balthica*) and pieces of shell were noted. It appeared that geese were foraging on empty clam shells. This potential source of calcium was available to breeding geese just prior to egg formation and geese likely stored this calcium in the form of medullary bone for use during egg formation.

Flint, P., Grand, J., and Rockwell, R., 1998. A model of northern pintail productivity and population growthrate. *Journal of Wildlife Management* 62 (3), 1110-1118. *POPULATION; birds; waterfowl; pintail; reproduction; mortality*

Our objective was to synthesize individual components of reproductive ecology into a single estimate of productivity and to assess the relative effects of survival and productivity on population dynamics. We used information on nesting ecology, reneating potential, and duckling survival of northern pintails (*Anas acuta*) collected on the Yukon-Kuskokwim Delta (Y-K Delta), Alaska, 1991-95, to model the number of ducklings produced under a range of nest success and duckling survival probabilities. Using average values of 25% nest success, 11% duckling survival, and 56% reneating probability from our study population, we calculated that all young in our population were produced by 13% of the breeding females, and that early-nesting females produced more young than later-nesting females. Further, we calculated, on average, that each female produced only 0.16 young females/nesting season. We combined these results with estimates of first-year and adult survival to examine the growth rate (λ) of the population and the relative contributions of these demographic parameters to that growth rate. Contrary to aerial survey data, the population projection model suggests our study population is declining rapidly ($\lambda = 0.6969$ [70%, or losing 30% per year]). The relative effects on population growth rate were 0.1175 for reproductive success, 0.1175 for first-year survival, and 0.8825 for adult survival. Adult survival had the greatest influence on λ for our population, and this conclusion was robust over a range of survival and productivity estimates. Given published estimates of annual survival for adult females (61%), our model suggested nest success and duckling survival need to increase to approximately 40% to achieve population stability. We discuss reasons for the apparent discrepancy in population trends between our model and aerial surveys in terms of bias in productivity and survival estimates.

Flint, P., and Grand, J., 1999. Patterns of variation in size and composition of greater scaup eggs: Are they related? *Wilson Bulletin* 111 (4), 465-471. *POPULATION; birds; waterfowl; scaup; reproduction; growth/development; biochemistry*

We studied egg size variation of Greater Scaup (*Aythya marila*) nesting on the Yukon-Kuskokwim Delta, Alaska from 1991-1996. Mean egg size was 64.36 plus or minus 0.03 (SE) ml. Egg size did not vary with clutch size or serve as an index of body size. There was less than 2% overlap in total clutch volumes for clutches of different sizes indicating that phenotypic clutch size-egg size trade-offs are not occurring among individuals. [Larger clutches are not composed of smaller eggs.] At the population level. Greater

Scaup have less variation in egg size than other species of waterfowl. The proportion of variation in egg size caused by differences among females was 0.20, caused by differences within females among years was 0.25, and caused by differences within females and years (i.e., clutches) was 0.56. The proportion of egg lipid decreased with increasing egg size while the proportion of egg protein increased with egg size. Thus, Greater Scaup appear to trade-off lipid for protein as egg size increases. The proportion of variation that was due to differences among females in total egg protein was 0.79 and in total egg lipid was 0.49. We conclude that in the absence of a fitness trade-off between clutch size and egg size, selection has reduced among-individual variation in egg size.

1999. Incubation behavior of spectacled eiders on the Yukon-Kuskokwim Delta, Alaska. *Condor* 101 (2), 413-416. *POPULATION; birds; waterfowl; eider; reproduction; behavior (reproductive/nesting)*

We studied incubation behavior of Spectacled Eiders (*Somateria fischeri*) on the Yukon-Kuskokwim Delta in 1996. We trapped 19 females on their nests and weighed them in early incubation and again at hatch. Average daily weight loss for incubating females was 16.6 plus or minus 1.0 g day⁻¹, which resulted in a cumulative loss of 26% of body weight throughout incubation. Nest attendance was monitored for a portion of the incubation period using temperature sensing artificial eggs. Incubation constancy averaged 90 plus or minus 1%. Average recess length was 37.1 plus or minus 0.9 min, and nests cooled an average of 4.2 plus or minus 0.1 degree C during recesses. Recess frequency averaged 2.5 plus or minus 0.1 recesses per day, and most recesses (70%) occurred between 10:00 and 22:00. Incubation constancy varied among females, but was not related to changes in body weight or incubation period. There was no influence of ambient temperature on incubation recess length, however most recesses were taken during the warmest part of the day. We found considerable variation among females in patterns of daily incubation constancy, nest cooling, recess frequency, and recess length. It is not clear from our results what factors constrain incubation behavior of Spectacled Eiders, but we suggest that individual females respond to a complex suite of variables.

Flint, P., and Herzog, M., 1999. Breeding of Steller's eiders, *Polysticta stelleri*, on the Yukon-Kuskokwim Delta, Alaska. *Canadian field-naturalist* 113 (2), 306-308. *POPULATION; distribution; birds; waterfowl; eider; reproduction*

Historically, an unknown number of Steller's eiders nested along the outer coastal fringe of the Yukon-Kuskokwim Delta, Alaska, but no nests had been found since 1975. Six nests were located from 1991-1998 and it is concluded that Steller's eiders are still a regular breeder at low densities on the Yukon-Kuskokwim Delta.

Flint, P., Grand, J., Morse, J., and Fondell, T., 2000. Late Summer Survival of Adult Female and Juvenile Spectacled Eiders on the Yukon-Kuskokwim Delta, Alaska. *Waterbirds* 23 (2), 292-297. *POPULATION; birds; waterfowl; eider; reproduction; mortality; contaminants; metals; lead*

We used radio-telemetry to examine survival of adult female and juvenile Spectacled Eiders (*Somateria fischeri*) from 30 days after hatch until departure from the Yukon-Kuskokwim Delta (YKD) during 1997-1999. Juvenile survival was 71.4%; adult female survival was 88.5%. Mink (*Mustela vison*) were the most common predator identified for both adults and juveniles. Detectable levels of lead were found in bones of 74% of juvenile carcasses recovered and 21% had levels indicative of acute exposure. Average age at departure was 59 plus or minus 1 days old for juveniles and 56 plus or minus 1 days after hatch for adults. Most broods (60.5%) departed the YKD synchronously. Overall our data indicate that mortality during the latter half of brood-rearing is higher than previously thought. We conclude that brood rearing is a period of high mortality for brood-rearing females and that lead poisoning is responsible for reductions in juvenile survival to fledging.

Folkard, N., and Smith, J., 1995. Evidence for bottom-up effects in the boreal forest: Do passerine birds respond to large-scale experimental fertilization? *Canadian Journal of Zoology/Revue Canadien de Zoologie* 73 (12), 2231-2237. *POPULATION; birds; songbirds; warbler; junco; thrush; nutrition*

Boreal plant communities are strongly nutrient limited, and the animals of the boreal forest may therefore experience bottom-up nutrient limitation. We conducted a 5-year experimental study of the impact of aerial nitrogen fertilization on birds of the boreal forest near Kluane Lake, southwestern Yukon, to test for such bottom-up effects. Specifically, we test if avian abundance and species richness increased after fertilization. Variable circular-plot point counts were made to estimate bird numbers and species richness each summer from 1988 to 1992. Fertilization had no effect on abundance for the first two summers, but total abundances of the seven commonest passerine bird species increased by an average of 46% over the final 3 yrs. Fertilization had no effect on bird species richness. Population densities and species richness were both low at Kluane compared with patterns seen in temperate forest. Yellow-rumped warblers (*Dendroica coronata*), dark-eyed juncos (*Junco hyemalis*), and Swainson's thrushes (*Catharus ustulatus*) dominated the passerine community at Kluane. There was only moderate spatial and temporal-variation in songbird humors on control plots over the 5-yr study period.

Fortuine, R., 1990. Health of Alaska Natives around the time of European contact. *Caduceus* 6 (1), 1-30. *PEOPLE; health (condition); health (comparative); INCOMPLETE (need abstract)*

1991. Medical aspects of arctic exploration. 11. A scientist in the Yukon Valley: William Healy Dall (1865-1868). *Arctic Medical Research* 50 (2), 83-8. *PEOPLE; non-indigenous; INCOMPLETE (need abstract)*

1996. Traditional remedies of the Yukon-Kuskokwim Delta (1842-1844). *Alaska Medicine* 38 (3), 110-. *INCOMPLETE (need abstract); VEGETATION; traditional medicine*

1997. Pipe-smoking along the Yukon (1867). *Alaska Medicine* 39 (2), 53. *PEOPLE; tobacco; INCOMPLETE (need abstract)*

Foscolos, A., Rutter, N., and Hughes, O., 1977. The use of pedological [soil] studies in interpreting the quaternary history of central Yukon Territory. *Bulletin* 271. Geological Survey of Canada, <http://136.159.147.171/scripts/minisa.dll/545/1/1?SEARCH> *CLIMATE; SOIL; geology; vegetation*

Soils and paleosols were investigated from pre-Reid (early Pleistocene), Reid (Illinoian or early Wisconsinan) and McConnell (classical Wisconsinan) surfaces in central Yukon. Paleosols on the pre-Reid surface indicate that it was subjected to two distinct climates, an initial one which was warm and subhumid with grassland-shrub vegetation and later a more temperate and humid climate the climate became colder, resulting in the Reid glaciation. ... During the subsequent Reid-McConnell interglacial, a cool, subhumid climate prevailed as evidenced by the Brunisolic characteristics of paleosols on deposits of Reid age. This was followed by a cold period which climaxed with the advent of the McConnell glaciation. ... During retreatal stages of the McConnell glaciation, a thin blanket of loess was deposited ... covering the soils on the Reid and pre-Reid surfaces during post-glacial (Holocene) time. Finally, Brunisolic soils developed (Au)

Fowler, A., and Ely, C., 1997. Behavior of cackling Canada geese during brood rearing. *Condor* 99 (2), 406-412. *POPULATION; birds; waterfowl; goose; nutrition; reproduction; behavior (feeding); behavior (reproductive/nesting)*

We studied behavior of Cackling Canada Goose (*Branta canadensis minima*, cacklers) broods between 1992 and 1996 on the Yukon Delta National Wildlife Refuge in western Alaska. An increase in time spent foraging by goslings during our study was weakly correlated with an increase in the size of the local breeding population. Amount of time spent feeding by adults and goslings increased throughout the brood rearing period. Overall, goslings spent more time feeding than either adult females or males, and adult males spent the most time alert. Time alert varied among brood rearing areas and increased with brood size, but there was no variation in time spent alert among years. Increases in feeding or alert behaviors were at a cost to time spent in all other behaviors. We suggest that there is not a simple trade-off between feeding and alert behavior in cacklers, but instead that time spent feeding and alert are optimized against all other behaviors. We suggest that forage quality and availability determines the amount of time spent feeding, whereas the threat of predation or disturbance determines the amount of time spent alert.

Fox, I.K., 1984. An assessment of legal and administrative arrangements related to placer mining in the Yukon River basin. Yukon River Basin Study. Project report: Socio-economic; no. 5b. *INCOMPLETE (need abstract); MINING; economics; management*

Franson, J., Petersen, M., Meteyer, C., and Smith, M., 1995. Lead poisoning of spectacled eiders (*Somateria fischeri*) and of a common eider (*Somateria mollissima*) in Alaska. *Wildlife Disease* 31 (2), 268-271. *CONTAMINANTS; metals; lead; birds; waterfowl; eider; mortality*
Lead poisoning was diagnosed in our spectacled eiders (*Somateria fischeri*) and one common eider (*Somateria mollissima*) found dead or moribund at the Yukon Delta National Wildlife Refuge, Alaska (USA) in 1992, 1993, and 1994. Ingested lead shot was found in the lower esophagus of one spectacled eider and in the gizzard of the common eider. Lead concentrations in the livers of the spectacled eiders were 26 to 38 ppm wet weight, and 52 ppm wet weight in the liver of the common eider. A blood sample collected from one of the spectacled eiders before it was euthanized had a lead concentration of 8.5 ppm wet weight. This is the first known report of lead poisoning in the spectacled eider, recently listed as a threatened species by the U.S. Fish and Wildlife Service.

Franson, J., Petersen, M., Creekmore, L., Flint, P., and Smith, M., 1998. Blood lead concentrations of spectacled eiders near the Kashunuk River, Yukon Delta National Wildlife Refuge, Alaska. *Ecotoxicology* 7 (3), 175-181. *CONTAMINANTS; metals; lead; birds; waterfowl; eider; reproduction*

We collected 342 blood samples from spectacled eiders (*Somateria fischeri*) on their breeding grounds in western Alaska from late May through to early August 1993-1995. Lead concentrations of greater than or equal to 0.50 p.p.m. wet weight were found in the blood of 20% of the adult female eiders, 2% of the adult males and 6% of the ducklings. Lead was detected (greater than or equal to 0.02 p.p.m.) more frequently in the blood of adult females than in adult males or ducklings and the maximum concentrations were 14.37, 0.50 and 4.28 p.p.m. wet weight, respectively. In adult females, there was a significant difference in the proportion of detectable blood lead concentrations between three collection times (arrival/nesting, hatch and brood rearing), with the highest proportion (92%) occurring at hatch. Nine hens with blood lead concentrations of greater than or equal to 0.50 p.p.m. were captured a second time several weeks to 1 year later. In the hens sampled twice at intervals of several weeks, the blood lead concentrations increased and declined at mean daily rates of 1.10 and 0.94, respectively. The lead concentrations in the blood of adults were not correlated with body weights. Radiographs were taken of 119 eiders and corresponding blood samples from 98 of these birds were analysed for lead. Ingested shot was seen in X-rays of 12 adults and

three ducklings and, of the 13 blood samples tested, all had detectable lead concentrations. Of the birds without radiographic evidence of ingested shot, 84% of the adult females, 19% of the adult males and 17% of the ducklings had detectable lead concentrations in their blood. Breeding ground exposure of waterfowl to lead shot is unusual and is of particular concern in spectacled eiders because of their threatened status and declining numbers in western Alaska.

Franson, J., Schmutz, J., Creekmore, L., and Fowler, A., 1999. Concentrations of selenium, mercury, and lead in blood of emperor geese in western Alaska. *Environmental Toxicology and Chemistry* 18 (5), 965-969. *CONTAMINANTS; metals; selenium; mercury; lead; birds; waterfowl; goose; reproduction*

We found up to 10 ppm wet weight of selenium in blood samples collected from emperor geese (*Chen canagica*) on their breeding grounds on the Yukon-Kuskokwim Delta in western Alaska, USA. Incubating adult females captured in late May through mid-June 1997 had significantly higher concentrations of selenium in their blood (mean = 5.60 ppm) than adult females captured during wing molt in late July 1996 (mean = 2.78 ppm). Females that nested early or were in good body condition had higher concentrations of selenium in their blood than did other nesting females. Blood samples from 4 of 29 goslings had detectable levels of selenium (mean = 0.14 ppm). Our findings suggest that emperor geese are exposed to more selenium in the marine environment of their wintering and staging areas on the Alaska Peninsula than on the breeding grounds. The highest concentration of mercury found in the blood of emperor geese was 0.24 ppm. One bird had a blood lead concentration of 0.67 ppm, but 82% had no detectable lead in their blood, suggesting that lead exposure from the ingestion of lead shot poses little threat for emperor geese in western Alaska, contrary to findings reported for sympatric spectacled eiders (*Somateria fischeri*).

Franson, J., Hoffman, D., and Schmutz, J., 2002. Blood selenium concentrations and enzyme activities related to glutathione metabolism in wild emperor geese. *Environmental Toxicology and Chemistry* 21 (10), 2179-2184. *POPULATION; birds; waterfowl; goose; CONTAMINANTS; metals; selenium; biochemistry; enzymology; endocrinology; reproduction*

In 1998, we collected blood samples from 63 emperor geese (*Chen canagica*) on their breeding grounds on the Yukon-Kuskokwim Delta (YKD) in western Alaska, USA. We studied the relationship between selenium concentrations in whole blood and the activities of glutathione peroxidase and glutathione reductase in plasma. Experimental studies have shown that plasma activities of these enzymes are useful biomarkers of selenium-induced oxidative stress, but little information is available on their relationship to selenium in the blood of wild birds. Adult female emperor geese incubating their eggs in mid-June had a higher mean concentration of selenium in their blood and a greater activity of glutathione peroxidase in their plasma than adult geese or goslings that were sampled during the adult flight feather-molting period in late July and early August. Glutathione peroxidase activity was positively correlated with the concentration of selenium in the blood of emperor geese, and the rate of increase relative to selenium was greater in goslings than in adults. The activity of glutathione reductase was greatest in the plasma of goslings and was greater in molting adults than incubating females but was not significantly correlated with selenium in the blood of adults or goslings. Incubating female emperor geese had high selenium concentrations in their blood, accompanied by increased glutathione peroxidase activity consistent with early oxidative stress. These findings indicate that further study of the effects of selenium exposure, particularly on reproductive success, is warranted in this species.

Freeman, C., and Schaefer, J., 2001. Alaska Resource Data File; Fairbanks Quadrangle. open file report 01-426. USGS, Fairbanks, Alaska. <http://ardf.wr.usgs.gov> *MINING; INFRASTRUCTURE; geology; gold*

Descriptions of the mineral occurrences shown on the accompanying figure follow [155 total mineral occurrences]. See U.S. Geological Survey (1996) [?!] for a description of the information content of each field in the records. The data presented here are maintained as part of a statewide database on mines, prospects and mineral occurrences throughout Alaska.

French, N., Kasischke, E., Bourgeau-Chavez, L., Harrell, P., and Christensen, N.J., 1994. Relating soil water measurements at fire disturbed sites in Alaska to ERS-1 SAR image signature. *Proceedings IGARSS '94: International Geoscience and Remote Sensing Symposium*, Pasadena, CA, USA; August 8-12, International Geoscience and Remote Sensing Symposium, Institute of Electrical and Electronics Engineers, PISCATAWAY, NJ, (USA), p. 246-248 *VEGETATION; willow; black spruce; soil; hydrology; wildfire; ground ice / permafrost; imaging (remote sensing)*

Studies of ERS-1 imagery have shown that fire scars in the Alaskan boreal forest are significantly (3-6 dB) brighter than surrounding unburned forest. Additionally, studies have shown that soil moisture increases in black spruce (*Picea mariana* [Mill.] B.S.P.) forests when fire disturbs the site, due to changes in evapotranspiration rates and changes in the ground permafrost conditions. The purpose of this study was to relate soil water content at six fire scars in interior Alaska to ERS-1 SAR backscatter measurements. Results show that for younger burns (<4 yrs) a positive linear relationship exists between measured soil water and radar cross-section. Results from older burns do not indicate this relationship.

Friedman, B.F., 1981. Fire ecology and population biology of two taiga shrubs, lingonberry, *Vaccinium vitis-idaea* and alpine blueberry, *Vaccinium uliginosum*, University of Alaska, Fairbanks, M.S., 162 p *VEGETATION; low bush cranberry; blueberry; wildfire; succession; reproduction; INCOMPLETE (need abstract)*

Fritz, S.A., 2002. The Role of Alaskan Missile Defense in Environmental Security: Fairbanks, University of Alaska, M.A., maps, 199 p *MILITARY; INFRASTRUCTURE; CONTAMINANTS; waste (hazardous); economics; history*

In 2002, the United States abandoned the Anti-Ballistic Missile Treaty and began constructing a missile defense system in Alaska. Questions about how missile defense will contribute to U.S. security remain. Moreover, beliefs about what constitutes security are expanding to include considerations of global environmental stability. According to environmental security theories on arms control, non-proliferation, and environmental degradation, deploying missile defense may make the U.S. and the world less secure. This analysis addresses the issue by exploring the military's role in Alaska and resulting environmental damage, followed by a history of missile defense systems and a description of the Alaskan project's components. Arguments for and against missile defense are explained, and the history of Kodiak Island's rocket launch facility illustrates how these issues are evolving in Alaska. The conclusion discusses why pursuing the system is seen by many as a risky policy choice in both traditional and environmental security contexts.

Furniss, M., Holsten, E., Foote, M., and Bertram, M., 2001. Biology of a Willow Leafblotch Miner, *Micrurapteryx salicifoliella*, (Lepidoptera: Gracillariidae) in Alaska. *Environmental Entomology* 30 (4), 736-741. *POPULATION; insects; distribution; reproduction; vegetation; willow; herbivory (insect)*

During 1991-1993 and 1998-1999, a leafblotch miner, *Micrurapteryx salicifoliella* (Chambers), infested willows (*Salix* spp.) throughout a vast area in drainages of the Yukon and Kuskokwim Rivers, AK. The insect's biology had not been studied and it was unknown from Alaska. Eggs were laid singly, cemented to the epidermis of undersides of leaves. Hatched larvae mined directly into leaves beneath the chorion. Five instars

occurred. Mining by the first three instars created little external evidence of their presence. Fourth and fifth instars, however, created conspicuous necrotic, reddish, blotches that often covered the upper leaf surface of susceptible host willows. Mature larvae exited through slits made on the undersides of leaves and spun cocoons on either leaf surface before pupating from mid-July into August. Adults emerged in late July and August and overwintered in that stage. Ten species of willows were infested, severity of which differed somewhat between localities and species. Feltleaf willow, *S. alaxensis* (Andersson) Coville, was not infested, apparently due to its under leaf surface being covered by a protective felt-like mat of hairs that prevented attachment of eggs to the epidermis, a condition deemed to be critical to survival of larvae upon hatching.

Galster, W., 1976. Mercury in Alaskan Eskimo mothers and infants. *Environmental Health Perspectives* 15, 135-40. *PEOPLE; adults; infants; CONTAMINANTS; metals; mercury; risk assessment*

The potential danger of natural mercury accumulation in the diet of the Eskimo is evaluated through mercury levels determined in cord blood, placenta, maternal blood, hair, and milk of 38 maternal-infant pairs from Anchorage and the Yukon-Kuskokwim Delta. Although mercury levels are not discernably dangerous, trends to larger accumulations in maternal and fetal RBC and placental tissue with proximity to the sea and consumption of seals during pregnancy provide the basis for considering possible indicators of neonatal involvement. Mercury level in RBC from cord blood appeared as the best potential indicator of this involvement, although relationships with the mother's diet and level of mercury in the placenta also appear useful. In this area, average and maximal mercury levels in cord blood are 39 and 78 ng/ml, respectively, far below the acknowledged toxic level in infants of these mothers who eat seals or fish every day during their pregnancy.

Gamberg, M., and Scheuhammer, A.M., 1994. Cadmium in caribou and muskoxen from the Canadian Yukon and Northwest Territories. *Science of the Total Environment* 143 (2-3), 221-34. *CONTAMINANTS; metals; cadmium; zinc; copper; metallothionein; mammals; caribou; muskoxen; traditional food; risk assessment; dietary advisory*

Cadmium, zinc, copper and metallothionein concentrations were measured in liver and kidney tissue of caribou and muskoxen collected from various sites in the Canadian Yukon and Northwest Territories. Cadmium concentrations in caribou tissues were substantially higher than in muskoxen for all age classes and were comparable to concentrations reported for caribou from northern Quebec and Norway. No geographical site differences in cadmium concentration were observed. Cadmium concentrations were positively correlated with age for both caribou and muskoxen. The highest cadmium concentration observed (166 micrograms/g dry wt.) was in renal [kidney] tissue of a 15-year-old caribou. Metal concentrations tended to be higher in spring than in fall for animals of comparable age. Renal cadmium concentrations were highly correlated with metallothionein concentrations, especially for cadmium concentrations exceeding 20 micrograms/g (dry wt.). It is estimated that the regular weekly consumption of KIDNEY tissue from Arctic caribou of any age, and from muskoxen older than 1 year, will probably cause the WHO provisional weekly tolerable intake of cadmium to be exceeded.

Gamberg, M., and Braune, B., 1999. Contaminant residue levels in arctic wolves (*Canis lupus*) from the Yukon Territory, Canada. *Science of the Total Environment* 243-244, 329-338.

CONTAMINANTS; POPs (persistent organic pollutants); metals; arsenic; cadmium; copper; lead; mercury; selenium; zinc; mammals; wolf; metabolism

Kidney, liver and bone samples were taken from 19 wolves (*Canis lupus*) collected from two locations in the Yukon Territory. Liver samples pooled by age and sex were analyzed for 22 organochlorine pesticides and 101 PCB congeners. Individual kidney and liver samples were analyzed for arsenic, cadmium, copper, lead, total mercury, selenium and

zinc. Thirteen individual bone samples were analyzed for lead. While most organochlorines were not present at detectable levels in wolf liver, some chlorobenzenes, dieldrin and sigma [total] PCB were present at low levels. PCB congeners 149, 153, 170/190, 180 and 187/182 made up 86% of the total PCBs measured in wolf liver. The hexa- and heptachlorobiphenyls dominated the pattern in wolf liver, while congeners containing less than five chlorine atoms were not detected. The pattern of chlorobenzene and PCB homologues found in wolf liver are more similar to those found in marten (*Martes americana*) and other carnivores than caribou (*Rangifer tarandus*), perhaps reflecting similarities in food habits and metabolic capacities. With the exception of cadmium, average element concentrations in all wolf tissues are similar to those found in other arctic carnivores. Cadmium concentrations in wolf liver and kidney were somewhat higher in Yukon wolves than other arctic wolves. This may reflect high cadmium concentrations found in livers and kidneys of moose and some caribou herds in the Yukon. Renal arsenic and bone lead decreased significantly with age in wolves, while renal mercury increased with age. Because the ranges seen are relatively small, and all values are within the range normally seen in wildlife, it is difficult to determine the biological significance of these relationships. Contaminant levels in Yukon wolves are generally low and are similar to those found in other arctic terrestrial carnivores. They do not approach levels that are known to potentially cause adverse effects in animals. Contaminant concentrations found in this study should be considered baseline levels.

Ganns, R., 1977. Germination and survival of artificially seeded white spruce on prepared seedbeds on an interior Alaskan floodplain site, University of Alaska, Fairbanks, M.S. *INCOMPLETE (need abstract); VEGETATION; trees; white spruce; growth/development; flooding; forestry*

Gara, R., Werner, R., Whitmore, M., and Holsten, E., 1995. Arthropod associates of the spruce beetle *Dendroctonus rufipennis* (Kirby) (Col., Scolytidae) in spruce stands of south-central and interior Alaska. *Journal of Applied Entomology* 119 (9), 585-590. *POPULATION; invertebrates; insects; wood borers; spruce beetles; white spruce; herbivory (insect); predation*
The impact of competitors, parasites and predators on spruce beetle *Dendroctonus rufipennis* (Kirby) broods was studied at an endemic population site near Fairbanks, Alaska, as well as at an epidemic area near Summit Lake and Cooper Landing. Logs of white spruce, *Picea glauca* (Bong.) Carr., at the endemic area and Lutz spruce, *Picea lutzii* Little, at the endemic site, were infested by spruce beetles. As logs became infested, associated insects were identified and their impact on the development of *D. rufipennis* broods evaluated. Competing *Dryocoetes affaber* Mann. broods were the most important interspecific mortality factor of larval *D. rufipennis*. The impact of dipteran and coleopteran predators and hymenopteran parasites on spruce beetle survival was of less importance than this interspecific competition.

Gasaway, W.C., 1974. Cecal function in ptarmigan, University of Alaska, Fairbanks, 125 p *INCOMPLETE (need abstract); POPULATION; birds; ptarmigan; metabolism; nutrition*

Gill, R.J., and Handel, C., 1990. The importance of subarctic intertidal habitats to shorebirds: A study of the central Yukon-Kuskokwim Delta, Alaska. *Condor* 92 (3), 709-725. *POPULATION; birds; shorebirds; dunlin; sandpiper; habitat selection; distribution; migration; management*
A 6-year study of shorebird use of intertidal habitats of the Yukon-Kuskokwim Delta revealed this area to be one of the premiere sites for shorebirds throughout the Holarctic and worthy of designation as a Hemispheric Shorebird Reserve in the Western Hemisphere Shorebird Reserve Network. The study area, which covered 10% (300 km²) of the delta's intertidal flats, regularly hosted 17 species of shorebirds between late April

and mid-October. The greatest use was during the postbreeding period (late June-October), when Dunlins (*Calidris alpina*), Western Sandpipers (*C. mauri*), and Rock Sandpipers (*C. ptilocnemis*), each with large local nesting populations, accounted for 95% of the shorebirds recorded. Peak counts during autumn approached 300,000 birds. Considering the seasonal occurrence and turnover of populations, we estimate 1-2 million shorebirds use the central delta each year. Temporal segregation among species and age groups may minimize competition for food and thereby allow the delta to support high diversity and numbers of shorebirds.

Gillis, E., and Krebs, C., 2000. Survival of dispersing versus philopatric juvenile snowshoe hares: do dispersers die? *Oikos* 90 (2), 343-346. *POPULATION; mammals; snowshoe hare; distribution; mortality; predation; monitoring*

We used radio-telemetry to monitor the survival of dispersing and philopatric juvenile snowshoe hares (*Lepus americanus*) in southwestern Yukon Territory, Canada, during a cyclic population increase. Neither 28-day survival nor the proportion of hares surviving to breed differed significantly between juvenile hares that dispersed and those that did not, nor was there a significant relationship between dispersal distance and fate (dead or alive). Our results indicate that the overall survival cost associated with natal dispersal is low for snowshoe hares during the early increase of the hare cycle.

Gilvear, D., Waters, T., and Milner, A.M., 1995. Image analysis of aerial photography to quantify changes in channel morphology and instream habitat following placer mining in interior Alaska. *Freshwater biology* 34 (2), 389-398. *MINING; gold; hydrology; surface water; imaging (remote sensing); monitoring; disturbance; recovery*

'Placer' mining for alluvial deposits of gold in a number of stream systems in interior Alaska represents a major disturbance to the stream bed and affects habitat. The potential of analysing aerial photographs to map changes in channel habitat and morphology within gravel-bed rivers is outlined with reference to the impact and recovery of Faith Creek, a stream with a history of placer mining. A strong correlation between the reflectance of the channel bed and water depth is necessary to use the technique successfully, together with a knowledge of the effects of 'broken' water on the spectral characteristics. Image analysis demonstrated that a wide range of water depths and instream mesoscale habitats existed prior to mining. During mining, the stream was confined to a channelized reach with negligible deep water or habitat diversity. Since mining ceased the stream has abandoned its channelized course and formed a new channel with few deep pools.

Glaspell, B.S., 1998. The effects of campground establishment and use on radial growth of white spruce in interior Alaska, University of Alaska Fairbanks, M.S., 46 p *VEGETATION; white spruce; growth/development; recreation; forestry*

Glaze, R., Hoefs, M., and Bunch, T., 1982. Aberrations of the tooth arcade and mandible in Dall's sheep from southwestern Yukon. *Wildlife Disease* 18 (3), 305-309. *POPULATION; mammals; sheep; bacteria; deformity; infection*

Nine Dall's sheep (*Ovis dalli dalli*) collected in the Ruby Mountains of southwestern Yukon were examined for aberrations of the tooth arcade and mandible [jaw]. Missing and displaced teeth were common in older sheep (greater than or equal to 6 yr). Necrosis [death of tissue] of the mandible was observed in five of eight rams and in one ewe. *Corynebacterium pyogenes* [bacteria] was cultured from exudates from two rams with enlarged fistulated mandibles. The sequence of events leading to lesions of the tooth arcade and to "lumpy jaw" is postulated to be associated with abnormal wearing of teeth and a disrupted alignment of the tooth arcade, impaction of vegetable matter between teeth and between the gingiva [gums] and the root of the tooth, and penetration of the

traumatized gingiva membrane and alveolus by oral bacteria which induce a necrotizing infection.

Gobelman, S., 1985. Sublimation from reconstituted frozen silt, University of Alaska, Fairbanks, M.S., 106 p *INCOMPLETE (need abstract); HYDROLOGY; soil; ground ice / permafrost; ground water; surface water; climate*

Graham, S., and Turkington, R., 2000. Population dynamics response of *Lupinus arcticus* to fertilization, clipping, and neighbour removal in the understory of the boreal forest. *Canadian Journal of Botany/Revue Canadien de Botanique* 78 (6), 753-758. *VEGETATION; lupine; white spruce; nutrition; soil; herbivory*

A demographic study was conducted on field populations of *Lupinus arcticus* S. Wats. [Arctic lupine] growing in the understory of a white spruce dominated forest, near Kluane Lake, Yukon. The relative effects of soil fertility level, neighbours, and herbivory were assessed using a factorial experiment of plus or minus fertilizer (N-P-K [nitrogen, phosphorus, potassium]), plus or minus neighbour removal, and plus or minus clipping. We monitored the dynamics of leaves and collected data on reproduction, survival, and size for two growing seasons. Fertilizing increased the incidence of disease on leaves and reduced reproductive efficiency. Clipping reduced leaf cohort survivorship, total leaf density, and the incidence of disease on leaves. Removing neighbours increased the percent cover of *L. arcticus* and decreased total leaf mortality. Treatments had no effect on the survival of leaves in early cohorts. Although there were some significant responses to treatments, the overall tendency was a lack of response, especially pertaining to leaf population dynamics. This low response to the treatments imposed is consistent with the argument that plants growing in low productivity, infrequently disturbed habitats should show little response to short-term changes in local environmental conditions. The results are also consistent with suggestions that plants in moderately stressed habitats should be more adapted to withstand grazing than competition.

Grand, J., and Fondell, T., 1994. Decoy trapping and rocket-netting for northern pintails in spring. *Journal of Field Ornithology* 65 (3), 402-405. *POPULATION; birds; waterfowl; pintail; monitoring*

Decoy traps and rocket-nets were compared for capturing Northern Pintails (*Anas acuta*: hereafter pintails) during May 1991 on the Yukon Flats, Alaska. Males were captured at similar rates using both methods (1.38 vs. 1.07 males/trap d, respectively), but baited rocket-nets were more efficient than decoy traps for capturing females (0.52 vs. 0.12 females/trap d). There were no significant differences in masses of pintails captured by each method.

Grand, J., 1995. Nesting success of ducks on the central Yukon Flats, Alaska. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 73 (2), 260-265. *POPULATION; birds; waterfowl; duck; mallard; pintail; northern shoveler; teal; scaup; behavior (reproductive/nesting); reproduction; mortality*

Nesting success was studied at Canvasback Lake and Mallard Lake on the Yukon Flats in interior Alaska in 1989-1991. Simple estimates of nesting success were computed using two techniques that assume a constant daily survival rate (DSR). Maximum-likelihood estimates of nesting success for all ducks, assuming constant DSR, ranged among years and sites from near zero to 12%. However, DSRs were not constant but increased with nest age and initiation date. Nesting success was near zero for nests initiated 1-10 May and increased to 100% for nests initiated after 30 June. Therefore, species nesting in early to mid season, such as Mallard (*Anas platyrhynchos*), Northern Pintail (*A. acuta*), and Northern Shoveler (*A. clypeata*), had lower success than later nesting species such as Green-winged Teal (*A. crecca*) and Lesser Scaup (*Aythya affinis*). In 1990 and 1991,

combined nesting success of all species, allowing for variation in DSR with nest initiation date and age of nest, was 12.50%.

Grand, J., and Flint, P., 1996. Renesting ecology of northern pintails on the Yukon-Kuskokwim Delta, Alaska. *Condor* 98 (4), 820-824. *POPULATION; birds; waterfowl; duck; pintail; behavior (reproductive/nesting); reproduction; nutrition*

We used radio telemetry to study renesting by wild, free-ranging Northern Pintails (*Anas acuta*) on the coastal Yukon-Kuskokwim Delta in 1994 and 1995. Fifty-six percent of females (n = 39) renested at least once. Propensity to renest declined among females that initiated later first nests. Renesting interval was not related to female weight, year, or initiation date of first nests. Mean interval between first and second nests was 11.4 plus or minus 1.0 days, and mean interval between second and third nests was 11.3 plus or minus 1.5 days. Median distance observed between first and second nest attempts was 276 m (range 33-6,098 m). Clutch size declined 2.3 plus or minus 0.4 eggs between first and second nests. Weight of females captured on first nests in early incubation declined with nest initiation date. Our results suggest that food availability does not limit renesting ability of pintails in coastal tundra.

1996. Survival of northern pintail ducklings on the Yukon-Kuskokwim Delta, Alaska. *Condor* 98 (1), 48-53. *POPULATION; birds; waterfowl; duck; pintail; reproduction; behavior (reproductive/nesting); mortality; nutrition*

We studied survival rates of Northern Pintail (*Anas acuta*; hereafter pintail) broods and ducklings along the lower Kashunuk River on Yukon-Kuskokwim Delta, Alaska. Survival rates were determined for 770 ducklings in 111 broods. Brood sizes at hatch were smaller in 1993 versus 1991 and 1992. Duckling survival rates were lower than those reported in previous studies and differed among years. Survival rates of ducklings declined with hatching date at a rate of 0.6% per day. Most mortality occurred during the first 10 days after hatch. Duckling survival rates were correlated with reported annual and seasonal variation in nesting success. This covariation probably results in large geographic and annual fluctuations in pintail production on the Yukon-Kuskokwim Delta. Early nesting pintails had better nesting success and duckling survival, which may offset higher nutritional costs of early nesting through higher recruitment.

1997. Productivity of nesting Spectacled Eiders on the lower Kashunuk River, Alaska. *Condor* 99 (4), 926-932. *POPULATION; birds; waterfowl; eider; reproduction; behavior (reproductive/nesting)*

We studied the chronology and success of nesting Spectacled Eiders (*Somateria fischeri*) along the lower Kashunuk River on the Yukon-Kuskokwim Delta from 1991-1995. Nest initiation dates ranged from 16 May-22 June. Median nest initiation dates were correlated with the break-up of ice on the Kashunuk River. Clutch sizes declined seasonally, and mean clutch size varied among years ranging from 4.8-5.6 eggs. The frequency of nests containing inviable eggs (24% of successful nests, mean = 0.6 unhatched eggs per successful nest) did not differ among years or nest initiation dates, and may be related to exposure to contaminants. The rate of partial depredation also did not vary among years or initiation dates (23% of nests, $x_{\text{super}(-)} = 0.5$ eggs taken/successful nest). We detected no effect of marking or visitation on daily survival rate of nests. Nests initiated early in the year were more successful than late nests; thus, early nesting females laid larger clutches and were more likely to nest successfully than late nesters. Nest success varied among years and declined from 73% in 1991 to 18% in 1994. Nest success increased to 76% in 1995 when we reduced the Mew Gull (*Larus canus*) population on the study area. While inviability and partial depredation averaged over 1 egg per successful nest, the production lost in nests that were abandoned or completely destroyed by predators was much greater. Our data indicate that Spectacled Eiders nesting on our study area experience relatively high production; however, without

information regarding annual survival and recruitment. It is not possible to draw conclusions about population growth rates.

Grand, J., Flint, P., and Heglund, P., 1997. Habitat use by nesting and brood rearing northern pintails on the Yukon-Kuskokwim Delta, Alaska. *Journal of Wildlife Management* 61 (4), 1199-1207. *POPULATION; birds; waterfowl; duck; pintail; behavior (reproductive/nesting); reproduction; habitat selection; distribution*

We studied habitat use by nesting and brood-rearing northern pintails (*Anas acuta*) on the coastal Yukon-Kuskokwim (Y-K) Delta, 1991-93. We used a digital habitat map constructed from color infrared aerial photos to assign habitat types to nest and brood locations and estimate habitat availability. Sixty-nine percent of females nested on slough banks in highly saline, tidally influenced habitats where we observed few mammalian predators. Nesting pintails likely preferred slough banks because they were higher and well drained early in the nesting season. Radiomarked females selected moderately saline habitats that were only occasionally or rarely influenced by tides for brood rearing. Eighty percent of females that nested in saline habitats moved their broods to less saline habitats, and those that nested in preferred brood-rearing habitats never moved to more saline habitats to rear their broods. Managers should be aware that in coastal wetlands the proximity of good-quality nesting and brood rearing habitats is important, and the distribution of nesting pintails may not reflect the distribution of broods and vice versa.

Grand, J., Flint, P., Petersen, M., and Moran, C., 1998. Effect of lead poisoning on spectacled eider survival rates. *Journal of Wildlife Management* 62 (3), 1103-1109. *CONTAMINANTS; lead; population; waterfowl; eider; hunting; management*

Spectacled eider (*Somateria fischeri*) populations on the Yukon-Kuskokwim Delta (Y-K Delta), Alaska, declined rapidly through the 1980s, and low adult female survival was suggested as the likely cause of the decline. We used mark-resighting techniques to study annual survival rates of adult female spectacled eiders at 2 sites on the Y-K Delta during 1993-96. Our data suggest survival rates may differ among sites. However, a model fit to a subset of data on females for which we knew lead levels in blood suggests lead exposure influences survival. Adult females exposed to lead prior to hatching their eggs survived at a much lower rate (0.44 plus or minus 0.10) each year than females not exposed to lead before hatch (0.78 plus or minus 0.05). We suggest most mortality from lead exposure occurs over winter, and the related reduction in adult survival may be impeding recovery of local populations. We encourage managers to curtail input of lead shot into the environment.

Grand, J., Franson, J., Flint, P., and Petersen, M., 2002. Concentrations of trace elements in eggs and blood of spectacled and common eiders on the Yukon-Kuskokwim Delta, Alaska, USA. *Environmental Toxicology and Chemistry* 21 (8), 1673-1678. *CONTAMINANTS; arsenic; cadmium; lead; mercury; selenium; population; birds; waterfowl; eider; metabolism; reproduction; mortality*

We examined the relations among nesting success, egg viability, and blood and egg concentrations of As, Cd, Pb, Hg, and Se in a threatened population of spectacled eiders (*Somateria fischeri*) and a sympatric population of common eiders (*S. mollissima*) on the Yukon-Kuskokwim Delta, Alaska, USA, during 1995 and 1996. During the early breeding season, males and females had mean Se concentrations in their blood of 19.2 microg/g and 12.8 microg/g wet weight, respectively. Blood Se concentrations of females were correlated with egg concentrations. During brood rearing, blood Se levels were higher in adult females than in ducklings. Blood concentrations of Pb in spectacled eider females were higher than in common eider females captured at hatching, but blood concentrations of Se were similar. Trace element concentrations were not related to nest success or egg viability. We submit that nest success and egg viability of spectacled

aiders are not related to concentrations of the trace elements we measured. Because blood Se concentrations declined rapidly through the breeding season and were not related to nest success or egg viability, we suggest that spectacled eiders are exposed to high concentrations of Se during winter that pose little threat to this population.

Green, T.P., 1986. Resin chemistry of several birches, University of Alaska, Fairbanks, M.S., 40 p *VEGETATION; birch; shrub birch; chemical defense; herbivory*

The resins (ether soluble fractions) of several birch species from northern Asia, Europe, and Alaska were quantified and chemically analyzed... The palatabilities of these birches to hares were determined by feeding trials and compared to the results of the resin quantification and chemical analysis studies to discern the relationship between herbivory and resin or individual chemical compound concentration. Birch species with high levels of resin and suspected herbivore deterring compounds were avoided by hares in feeding trials. The production of these substances may be a recessive trait.

Gregor, D., 1999. Klukshu Environmental Study Follow-up and Wolf Creek Snow Chemistry Study – Final Report. MDA Consulting Limited Environmental Scientists, Burlington, ON (prepared for Champagne - Aishihik Enterprises; Whitehorse, Yukon). *CONTAMINANTS; POPs (persistent organic pollutants); POL (petroleum/oil/lubricants = hydrocarbons); MILITARY; infrastructure; pipeline; VEGETATION; POPULATION; fish; soil; sediment; mammals; air quality; long range transport; snow*

Executive Summary

An investigation of the extent of dioxin/furan contaminants in the vicinity of Klukshu Camp on Klukshu Lake has been undertaken to assess the extent of contamination and the possible exposure pathways to the environment and the local population. This study included sampling and analysis of fish tissue, lake sediments, terrestrial mammals and air and smoke. In addition, this study reviewed earlier data for soils and fish tissue and fish organs. The driving force behind this study is the concern that the use of dioxin contaminated herbicides along the Haines-Fairbanks pipeline, through the Canadian section, may have contaminated the soil and vegetation and may be entering the environment and ultimately, contaminating traditional foods and ultimately, humans. The main conclusions of this study are:

- The tell-tale 2,3,7,8-T4CDD, which would suggest a direct link to the use of dioxin contaminated herbicides in the area, was not detected in the lake sediments and thus there does not seem to be measurable contamination of the lake sediments by dioxin/furan runoff from contaminated soils
- The terrestrial mammals do not have high levels of dioxin/furans although the voles did show the presence of 2,3,7,8-T4CDD, suggesting a direct link between the food of this species and the contaminated soils.
- A comparison of the available fish tissue data indicate that the presence of dioxin/furans in fish are very low and less than concentrations in fish from a limited number of other northern lakes for which data are available. Only Lake Trout revealed detectable levels of 2,3,7,8-T4CDD. Fish tissue concentrations are below the published guidelines.
- Wood chips have high concentrations of dioxin/furans but again the marker compound, 2,3,7,8-T4CDD, is not detectable.
- The wood smoke data are equivocal. The air blank indicates measurable concentrations of dioxin/furans in the village but 2,3,7,8-T4CDD is absent. As well, both of the smoke samples released dioxin/furans but there is no indication that the application of dioxin contaminated herbicides has contaminated the wood.
- Surprisingly, background air samples at Klukshu (inside of the smoke/drying house) are higher than background air samples in Hamilton, Ontario and comparable to the air

quality at Windsor, Ontario. True background air quality during the winter time (i.e. outside of the smokehouse) is likely better than Hamilton but this was not determined.

- The smoke in the smoke house is producing dioxin/furans, as do most combustion sources, but these are low in comparison to other combustion sources where dioxin/furan emissions have been measured.

- The soils along the pipeline right of way are the only media sampled with significant levels of dioxin/furans. Notably, 2,3,7,8-T4CDD is dominant in the soils suggesting that the source is the application of contaminated herbicides. Clearly, dioxin/furans are not degrading very quickly in these soils. Nevertheless, the TEQ concentrations of the soil are an order of magnitude less than the CCME soil criteria for residential soils. They do exceed the CCME guideline for agricultural soils although this guideline does not seem relevant to this site.

As a result of this study and the conclusions outlined above, the only follow-up work that is justified for this site is a community awareness and education program to encourage avoidance of the pipeline right of way. In addition to minimizing potential exposure, this will encourage natural re-vegetation. In addition, we recommend a continued watch of this site relative to the evolving dioxin/furan knowledge base. If future work identifies more stringent dioxin/furan soil residue guidelines, then reassessment of the site may be required.

A second component of this study was to analyse and summarize available snow chemistry and surface water quality data for the Wolf Creek basin. This watershed is an important research basin in the Yukon and these data provide additional information regarding atmospheric deposition of trace organic contaminants and the quality of the runoff water. Snow samples were collected in a large area snow collector during the winter of 1997/98 while the surface water samples were collected in the summer of 1994. The chemistry of the snow in the Wolf Creek basin is generally typical of that seen elsewhere in the north. Over the 100 days that were represented by these snow samples, an estimated 57 ng/m² of Sum PCB was deposited. This is approximately one order of magnitude less than previous estimates. It can not be determined whether this is a trend or the result of an abnormally short accumulation season. The distribution of PCB congeners is indicative of northern atmospheric deposition as it is dominated by the lower chlorinated PCBs.

The dominant organochlorine compound in the snow is the pesticide HCH of which approximately 65% consists of the active ingredient lindane ((-HCH). The seasonal deposition of Sum HCH of 18 ng/m²/season is also an order of magnitude less than has been previously observed in the Whitehorse area. Similarly Sum DDT is as much as 2 orders of magnitude lower than previous estimates. These data alone should not be interpreted as evidence of a reduction of atmospheric deposition of contaminants in the Yukon.

The limit of three samples for surface water trace organic chemistry of Wolf Creek precludes extensive interpretation. The predominance of (-HCH in the runoff water is consistent with previous studies that have shown preferential volatilization of lindane and degradation of lindane to HCH. The chlorobenzenes are the dominant trace organics in the runoff water.

The PCB congener distribution for the three samples is entirely comparable to that for the snow supporting the conclusion that the primary, if not only source, of PCBs in the [Wolf Creek] watershed is atmospheric deposition.

Gregory-Eaves, I., Smol, J., Finney, B., and Edwards, M., 1999. Diatom-based Transfer Functions for Inferring Past Climatic and Environmental Changes in Alaska, U.S.A. Arctic, Antarctic, and Alpine Research 31 (4), 353-365. *CLIMATE; population; invertebrates; microbes; diatom; nutrition; nutrient cycling; phosphorus; modeling; sediment*

Surface sediment diatom assemblages from 51 Alaskan lakes, distributed along a north-south transect, were enumerated in order to develop transfer functions that could be used to make inferences of past climatic and environmental change. Environmental variables that were found to be the strongest predictors of the diatom assemblages, identified through Canonical Correspondence Analyses, were ionic and nutrient concentrations, as well as lake depth. A number of weighted-averaging (WA) regression-calibration techniques were employed to develop transfer functions for lake water conductivity, total phosphorus concentration, and lake depth, but simple WA with classical deshrinking produced the most robust models for all variables. The strength of these models (r^2 boot ranged between 0.52 and 0.53) is comparable to those generated from other northern calibration studies. Application of our models to fossil diatom assemblages could provide information on the magnitude of past environmental change, and may serve as a basis for assessing anthropogenically induced impacts.

Griffith, B., Douglas, D., Walsh, N., Young, D., McCabe, T., Russell, D., White, R., Cameron, R., and Whitten, K., 2002. The Porcupine caribou herd. Biological Science Report USGS/BRD/BSR-2002-0001. U. S. Geological Survey, Biological Resources Division, <http://www.absc.usgs.gov/1002/index.htm> POPULATION; mammals; caribou; reproduction; habitat selection; stress; nutrition; mortality; predation; INFRASTRUCTURE; pipeline; POL (petroleum/oil/lubricants = hydrocarbons); seasonality; demographics; snow Documentation of the natural range of variation in ecological, life history, and physiological characteristics of caribou (*Rangifer tarandus*) of the Porcupine caribou herd is a necessary base for detecting or predicting any potential effects of industrial development on the performance (e.g., distribution, demography, weight-gain of individuals) of the herd. To demonstrate an effect of development, post-development performance must differ from pre-development performance while accounting for any natural environmental trends.

We had 2 working hypotheses for our investigations: 1) performance of the Porcupine caribou herd was associated with environmental patterns and habitat quality, and 2) access to important habitats was a key influence on demography.

We sought to document the range of natural variation in habitat conditions, herd size, demography (defined here as survival and reproduction), sources and magnitude of mortality, distribution, habitat use, and weight gain and loss; and to develop an understanding of the interactions among these characteristics of the herd.

In addition, we investigated ways that we could use this background information, combined with auxiliary information from the adjacent Central Arctic caribou herd, to predict the direction and magnitude of any potential effects of industrial oil development in the 1002 Area of the Arctic National Wildlife Refuge on Porcupine caribou herd calf survival on the herd's calving grounds during June.

Conclusions

Our research has shown that the Porcupine caribou herd has significant annual variance in calving ground location (Fig. 3.13), faces annual variance in habitat conditions, selects areas with abundant high quality forage for calving, has increased survival of calves born in the concentrated calving areas, and shows a correlation between calf survival and both forage for females during peak lactation and predation risk in the annual calving grounds. All this implies that unrestricted access to annual calving grounds and concentrated calving areas maximized performance of lactating Porcupine caribou herd

females and their calves. Because the Porcupine caribou herd has shown limited capacity for growth, free access to calving ground habitats may have compensated for less than optimal wintering habitats.

Location of the concentrated calving areas during the past 19 years (1983-2001) is the best estimate of the area that has provided the highest quality calving habitat for females and their calves. Calf survival within the aggregate extent of concentrated calving areas has been higher than for calves born in areas never used as a concentrated calving area (83.8% vs.73.9%, respectively, 1983-1994, $P = 0.026$). Thus, the aggregate extent of all observed concentrated calving areas (Fig. 3.29) [see document] identifies the most valuable portion of the extent of calving in terms of calf survival during June.

Our model prediction of a reduction in calf survival when calving grounds were displaced supports the concept that caribou made a critical "decision" in locating their annual calving grounds within the extent of calving, 1983-2001. It appears that actual calving ground location maximized June calf survival given the habitat conditions within the extent of calving for a given year.

Weight-gain of calves provided further evidence for the importance of unrestricted location of annual calving grounds. The lack of a relationship between calf weight-gain and habitat use within annual calving grounds suggests that weight-gain was optimized by selection of the annual calving grounds, particularly during the first 3 weeks of life.

Comparative growth of captive and wild Porcupine caribou herd calves (Parker et al. 1990) has shown that wild Porcupine caribou herd calves attain their maximum genetic potential for daily weight-gain during early- to mid-lactation (Gerhart et al. 1996). Therefore unrestricted selection of the annual calving ground may optimize weight-gain of calves for a year. The matching rank orders of NDVI_621 in the annual calving grounds and calf weights at 3 weeks of age, 1992-1994, support this concept.

Unrestricted selection of annual calving grounds likely had significant implications for the parturient females as well as for their calves. The matching rank orders of 1) NDVI_621 within annual calving grounds, 2) parturient female weights, and 3) parturient female body condition scores during peak lactation, 1992-1994, suggest substantial contribution of the calving ground to parturient females' nutritional status. Because fall weights of parturient females influence their probability of conception (Cameron et al. 1993, Cameron and ver Hoef 1994, Russell et al. 1998), calving ground habitats may contribute to parturition rates in the following year.

Petroleum development will most likely result in restricting the location of concentrated calving areas, calving sites, and annual calving grounds. Expected effects that could be observed include reduced survival of calves during June, reduced weight and condition of parturient females and reduced weight of calves in late June, and, potentially, reduced weight and reduced probability of conception for parturient females in the fall.

Whether these factors are additive to annual performance or are compensated on winter range will determine the net value of the annual calving grounds to herd performance. Determining the additive/compensatory nature of annual calving ground value, through field and simulation studies, should be the first research priority in future work

Still unclear is the cause of the decline of the Porcupine caribou herd (Fig. 3.8) during a period when calving ground habitat conditions were favorable as a result of summer warming. Increased winter mortality was implicated by the herd decline because sub-adult and adult mortality on the calving ground has been inconsequential (Fancy et al. 1994, Walsh et al. 1995), and parturition rate and calf survival during June has remained high during the decline.

Possible mechanisms for this suspected increase in off-calving-ground mortality include: 1) reduced longevity of adult females as a result of the cumulative energetic costs of persistent high parturition and calf survival during climate warming, 2) increased energetic costs of insect harassment as the climate has warmed, 3) reduced availability of winter forage or other adverse effects associated with increasing frequency of freeze-thaw events, 4) the herd exceeded forage carrying capacity of winter range, or 5) an increase in some form of predation (human or natural) on the winter range.

Increased frequency of spring and fall icing events on non-calving habitats of the Porcupine caribou herd (Figs. 3.7a,b) supports the third hypothesis and may be implicated in the fifth hypothesis (increased predation mortality). Increased frequency of icing was not evident on the non-calving ranges of other Alaska barren-ground caribou herds that have not declined significantly during the 1990s (Central Arctic herd, Teshekpuk Lake herd, Western Arctic herd). Testing the remaining hypotheses will require substantial additional fieldwork.

In summary, 4 research-based ecological arguments indicate that the Porcupine caribou herd may be particularly sensitive to development within the 1002 portion of the calving ground:

Low productivity of the Porcupine caribou herd - The Porcupine caribou herd has had the lowest capacity for growth among Alaska barren-ground herds (Porcupine caribou herd = 4.9%, Central Arctic herd = 10.8%, Teshekpuk Lake herd = 13%, Western Arctic herd = 9.5%) and is the only barren-ground herd in Alaska known to be in decline throughout the 1990s. This low growth rate (Fig. 3.9) indicates that the Porcupine caribou herd has less capacity to accommodate anthropogenic, biological, and abiotic stresses than other Alaska barren-ground herds. Any absolute effect of development would be expected to have a larger relative effect on the Porcupine caribou herd than on the other herds. For example, an approximate 4.6% reduction in calf survival, all else held equal, would be enough to prevent Porcupine caribou herd growth under the best conditions observed to date (Walsh et al. 1995) or prevent recovery from the current decline. A similar reduction in calf survival, all else held equal, for other Alaska barren-ground herds, however, would not be sufficient to arrest their growth.

Demonstrated shift of concentrated calving areas of the Central Arctic caribou herd away from petroleum development infrastructures - It is assumed that the Porcupine caribou herd caribou will avoid roads and pipelines during calving in a manner similar to the Central Arctic herd if development of the 1002 Area occurs. Avoidance of petroleum development infrastructure by parturient caribou during the first few weeks of the lives of calves is the most consistently observed behavioral response of caribou to development.

Lack of high-quality alternate calving habitat - Calving areas in Canada and away from the Alaska coastal plain were used only when the Arctic Refuge coastal plain, including

the 1002 Area, were unavailable due to late snowmelt. Diet quality on the Canadian portions of the calving ground was substantially lower than on the Arctic Refuge coastal plain and 1002 portions of the calving ground. When snow cover reduced access by females to the Arctic Refuge coastal plain and 1002 Area for calving, calf survival during June was 19% lower than when they could calve on the Arctic Refuge coastal plain and 1002 Area.

Strong link between calf survival and free movement of females - The location of the annual calving grounds and concentrated calving areas was variable among years in response to variable habitat conditions and was often coincident with the 1002 Area. Empirical relationships between calf survival, forage available to females in the annual calving grounds, and predation risk derived from 17 years of ecological data predict that June calf survival for the Porcupine caribou herd will decline if the calving grounds are displaced, and that the effect will increase with displacement distance. This prediction (Fig. 3.28) [see document] is a function of displacement: 1) reducing access to the highest quality habitats for foraging and 2) increasing exposure to risk of mortality from predation during calving (first 3 weeks of June).

Grossman, A., 1975. Metabolism and temperature regulation of winter acclimatized black-capped chickadees of interior Alaska, University of Alaska, Fairbanks, M.S., 46 p *INCOMPLETE (need abstract); POPULATION; biochemistry; metabolism; endocrinology; birds; chickadee*

Groves, D., Conant, B., King, R., Hodges, J., and King, J., 1996. Status and trends of loon populations summering in Alaska, 1971-1993. *Condor* 98 (2), 189-195. *POPULATION; birds; waterfowl; loon; distribution; mortality*

Loons (*Gavia* spp.) were counted during the Alaska-Yukon Waterfowl Breeding Population Survey from 1971 to 1993 and the Arctic Coastal Plain Waterbird Breeding Population Survey from 1986 to 1993. Population indices for Alaska (not corrected for visibility bias) are presented by species for boreal forest, tundra, and both habitats combined. Minimum mean population estimates (1977-1993) with 95% confidence intervals were 15,360 (plus or minus 2,235) Red-throated Loons (*G. stellata*), 69,498 (plus or minus 5,596) Pacific Loons (*G. pacifica*), 8,886 (plus or minus 843) Common Loons (*G. immer*) and 2,636 (plus or minus 614) Yellow-billed Loons (*G. adamsii*). Populations of Pacific, Common and Yellow-billed Loons did not change significantly between 1977 and 1993, whereas Red-throated Loons declined by 53% to a 1993 level of 9,843 (plus or minus 2,447) ($r^2 = 0.65$, $P < 0.001$). Factors affecting results from aerial surveys are discussed.

Guillen Cabrera, E., and Barr, S., 1998. Comparison of Yukon Women by Weight Loss Effort and Body Mass Index: Self-reported Nutrition and Exercise Practices and Beliefs and Self-rated Health. *Canadian journal of dietetic practice and research/Revue canadienne de la pratique et de la recherche en dietetique* 59 (2), 67-74. *PEOPLE; nutrition; health (comparative); health (condition); obesity*

The purpose of this study was to determine the prevalence of weight loss efforts among women in the Yukon Territory and to assess relationships between weight loss effort (not trying/trying to lose weight) or weight status and self-reported nutrition and exercise practices and self-rated health. Data were obtained from 711 nonpregnant, noninstitutionalized women aged >15 y participating in the Yukon Health Promotion Survey. Over 50% of women were trying to lose weight at the time of the survey. These women were more likely to believe they ate well enough to maintain health, to report following certain recommended nutrition practices and to feel they didn't exercise as much as they needed. Self-rated mental and emotional health and physical health, however, were lower than among women not trying to lose weight. Overweight (Body

Mass Index (BMI) >27) and normal weight (BMI 20-25) women reported similar nutrition practices and beliefs, whereas underweight women (BMI <20) were less likely to report following certain recommended nutrition practices or to believe they ate well enough to maintain health. Overweight women reported lower overall quality of life, physical health and social relationships than women with BMI = 25. These results suggest that weight loss should not be emphasized as the primary benefit of sound nutrition and that dietitians should reinforce that eating well and being active are important to everyone, regardless of weight.

Guillette, E., Meza, M., Aquilar, M., Soto, A., and Garcia, I., 1998. An anthropological approach to the evaluation of preschool children exposed to pesticides in Mexico. *Environmental Health Perspectives* 106 (6), 347-353. *REFERENCE; CONTAMINANTS; POPs (persistent organic pollutants); health (effects); PEOPLE; children; infants; risk assessment*

In this comparative study, we compensated for many of the known variables that influence children's growth and development by selecting two groups of 4-5-year-old Yaqui children who reside in the Yaqui Valley of northwestern Mexico. These children share similar genetic backgrounds, diets, water mineral contents, cultural patterns, and social behaviors. The major difference was their exposure to pesticides. Pesticides have been applied to the agricultural area of the valley since the late 1940s. In 1990, high levels of multiple pesticides were found in the cord blood of newborns and in breast milk. Building on anthropological methods for rapid rural appraisal of problems within the environment, a Rapid Assessment Tool for Preschool Children (RATPC) was developed to measure growth and development. The children of the agrarian region were compared to children living in the foothills, where pesticide use is avoided. The RATPC measured varied aspects of physical growth and abilities to perform, or function in, normal childhood activities. No differences were found in growth patterns. Functionally, the exposed children demonstrated decreases in stamina, gross and fine eye-hand coordination, 30-minute memory, and the ability to draw a person. The RATPC also pointed out areas in which more in-depth research on the toxicology of pesticides would be valuable.

Gulledge, J., and Doyle, A., 1997. Different NH_4^+ inhibition patterns of soil CH_4 consumption: A result of distinct CH_4 oxidizer populations across sites? *Soil Biology and Biochemistry* 29 (1), 13-21. *SOIL; nutrient cycling; invertebrates; microbes; biochemistry; enzymology; metabolism; vegetation; birch; spruce*

The short- and long-term effects of NH_4^+ [ammonium] fertilization on soil CH_4 [methane] oxidation were examined in two upland taiga forests in interior Alaska. Both sites were fertilized for five consecutive snow-free seasons. A paper birch (*Betula papyrifera*) stand exhibited a delayed inhibition response that became severe (60-70%) by the third season. CH_4 flux was not affected in a white spruce (*Picea glauca*) stand. In laboratory incubations, $(\text{NH}_4)_2\text{SO}_4$ [ammonium sulfate] additions had no effect on extant CH_4 oxidation rates in either soil, indicating that neither direct enzymatic inhibition nor acute toxicity were responsible for inhibition in the field. In both sites, maximal CH_4 oxidation rates occurred within the upper 20 cm of the mineral soil profile. After the deeper birch soil (20-40 cm) was exposed to ambient atmospheric CH_4 (1.8 microliter/liter) for 10 d; however, oxidation increased to rates similar to shallower soils, suggesting that methanotrophs [methane eating microorganisms] in this soil experienced a physiological upshift in response to enhanced CH_4 [methane] supply. When $(\text{NH}_4)_2\text{SO}_4$ was added, however, methanotrophic activity did not increase. A similar upshift did not occur in the spruce soil. The CH_4 oxidizers in the two soils differed with respect to NH_4^+ sensitivity, salt-sensitivity, response to atmospheric CH_4 and maximum CH_4 oxidation capacities. Thus, the two different responses of CH_4 consumption in the field to NH_4^+ fertilization

may have resulted from physiologically distinct CH₄ oxidizer communities in the two study sites.

Gulledge, J., and Schimel, J., 1998. Moisture control over atmospheric CH₄ consumption and CO₂ production in diverse Alaskan soils. *Soil Biology and Biochemistry* 30 (8-9), 1127-1132.

SOIL; CLIMATE; nutrient cycling; carbon; nitrogen

Moisture is an important control on atmospheric CH₄ [methane] consumption and CO₂ [carbon dioxide] production in soil. Wet conditions limit these microbial activities by restricting CH₄ and O₂ diffusion and dry conditions limit microbial activity due to physiological water stress. We examined the relationship between soil moisture and these biogeochemical activities in five Alaskan soils with varying physical properties. Three expressions of soil moisture, absolute water content (g H₂O per g dry soil), water potential and percent of water-holding capacity (%WHC), were compared for their abilities to predict microbial activity in the different soils. We also examined the physiological responses of CH₄ oxidizers and the general microbial community to changes in water potential. The quantitative relationship between absolute water content and microbial activity varied widely among soils with different textures. The relationship between microbial activity and water potential was asymmetrical and differed between upland and wetland soils. In contrast, the parabolic relationship between %WHC and CH₄ consumption was symmetrical and similar among the five soils. CO₂ production also related to %WHC similarly across soils. Maximum atmospheric CH₄ consumption occurred between 20-40% WHC in all soils with a mean optimum of 34% WHC, whereas CO₂ production was maximal above 50% WHC. For CH₄ oxidation, optimum water potential was -0.3 to -0.2 MPa in upland soils, and about -0.02 MPa in a wetland soil. Our results demonstrate that %WHC is a powerful expression for quantitatively relating microbial activity responses to moisture across physically diverse soils and may be useful for modeling the response of biogeochemical processes, especially atmospheric CH₄ consumption, to climate change. Our data also suggest that CH₄ oxidizers in upland soils are adapted to growth on atmospheric CH₄ and that CH₄ consumption in upland taiga soils may be decreased by altered soil moisture, regardless of whether conditions become wetter or drier.

2000. Controls on Soil Carbon Dioxide and Methane Fluxes in a Variety of Taiga Forest Stands in Interior Alaska. *Ecosystems* 3 (3), 269-282. *SOIL; nutrient cycling; vegetation; alder; white spruce; birch; aspen; carbon; nitrogen; flooding*

CO₂ [carbon dioxide] and CH₄ [methane] fluxes were monitored over 4 years in a range of taiga forests along the Tanana River in interior Alaska. Floodplain alder and white spruce sites and upland birch/aspen and white spruce sites were examined. Each site had control, fertilized, and sawdust amended plots; flux measurements began during the second treatment year. CO₂ emissions decreased with successional age across the sites (alder, birch/aspen, and white spruce, in order of succession) regardless of landscape position. Although CO₂ fluxes showed an exponential relationship with soil temperature, the response of CO₂ production to moisture fit an asymptotic model. Of the manipulations, only N fertilization had an effect on CO₂ flux, decreasing flux in the floodplain sites but increasing it in the birch/aspen site. Landscape position was the best predictor of CH₄ flux. The two upland sites consumed CH₄ at similar rates (approximately 0.5 mg C per m² per day), whereas the floodplain sites had lower consumption rates (0-0.3 mg C per m² per day). N fertilization and sawdust both inhibited CH₄ consumption in the upland birch/aspen and floodplain spruce sites but not in the upland spruce site. The biological processes driving CO₂ fluxes were sensitive to temperature, moisture, and vegetation, whereas CH₄ fluxes were sensitive primarily to landscape position and biogeochemical disturbances. Hence, climate change effects on C-gas flux in taiga forest

soils will depend on the relationship between soil temperature and moisture and the concomitant [resulting] changes in soil nutrient pools and cycles.

Haber, G.C., 1977. Socio-ecological dynamics of wolves and prey in a subarctic ecosystem, University of British Columbia, 786 p *INCOMPLETE (need abstract); POPULATION; mammals; moose; caribou; wolf; predation; ecology; nutrition; behavior (feeding); behavior (defensive)*

Hadleigh-West, F., 1963. The Netsi Kutchin: an essay in human ecology, Louisiana State University, Ph. D., 419 p *PEOPLE; subsistence; anthropology; ecology; population; vegetation*
Contents: Abstract -- I. Introduction -- II. Identity and cultural position of the Netsi Kutchin -- Name and language -- Territory -- Population and villages -- Contact history -- Economy -- Dwellings -- Dress and ornament -- Transportation -- Social and political organization -- Life cycle -- Religion -- Culture type -- III. The vegetational milieu -- Important elements of the flora -- Uses of the plants -- Effects of man upon the vegetation -- Assessment of the culture type according to vegetational uses -- IV. The faunal milieu -- Representative fauna of Netsai -- Methods of taking -- The uses of animals and animal products -- Beliefs about animals and animal lore -- Dogs -- Miscellany -- The Netsi Kutchin and the faunal milieu -- V. The physiographic milieu -- General description -- Related cultural elements -- VI. The climatic milieu -- Classifications of North Alaskan climate -- A consideration of selected weather stations -- Related cultural elements -- VII. Comparison of the Netsi Kutchin with certain other Northern peoples -- Sources of information and locations of groups -- Responses to the biotic milieu -- Responses to the abiotic milieu -- Discussion - - Footnotes -- Selected bibliography -- Appendix A. Phonetic note -- Appendix B. Plant names -- Appendix C. Animal names.

Hadley, R.S., 1969. The effects of season and temperature on certain aspects of the physiology of the Alaskan wood frog, *Rana Sylvatica*: College [Fairbanks], University of Alaska, M.S., 42 p *INCOMPLETE (need abstract); POPULATION; frogs; seasonality; biochemistry; metabolism*

Haggstrom, D., 1979. The fall behavior of rock ptarmigan (*Lagopus mutus*) in interior Alaska, University of Alaska Fairbanks, M.S., 95 p *INCOMPLETE (need abstract); POPULATION; birds; ptarmigan; behavior*

Haley, S., and Frazier, R., 1999. Evaluation of the Alaska Native Health Board Sanitation Facility Operation and Maintenance Program [microform] : final report on phase I projects. Institute of Social and Economic Research, University of Alaska Anchorage, Anchorage. *waste (human); waste (solid); WATER QUALITY; INCOMPLETE (need abstract)*

Hall, J., 1995. Forest health monitoring in Canada: how healthy is the boreal forest? *Water, Air, & Soil Pollution* 82 (1-2 [The International Boreal Forest Research Association Conference, Saskatoon, Can, 09/25-30/94]), 77-85. *VEGETATION; white spruce; black spruce; birch; aspen; air quality; acidification; wildfire; succession; logging; forestry; monitoring*

The Canadian boreal forest covers 299.2 Mha which is two-thirds of Canada's forest and runs in a continuous belt from Newfoundland north and west to the Yukon. The major species are spruce, pines, balsam fir, white birch and trembling aspen often occurring in extensive monocultures [dominated by a single species]. Wildfire is the driving successional force in the boreal forest and has remained so despite fire suppression activities and extensive harvesting. Insects and diseases also cause extensive damage. In order to ensure the sustainability of forests, it is necessary for the forest manager to know the condition of the health of these forests. The CFS established in 1984 the Acid Rain National Early Warning System in order to monitor the health of the forests. National results show that mortality is generally in the normal range of 1-3% and is caused by known stresses; insects, diseases and abiotic damage. No signs of pollution

damage have been yet been detected in boreal forests by the system. An early warning system to detect and monitor conditions remains an essential part of our commitment to the sustainability of Canada's forests.

Halpin, L., 1987. Living Off the Land: Contemporary Subsistence in Tetlin, Alaska. Technical Paper No. 149. Alaska Department of Fish and Game, Fairbanks.

http://lexicon.ci.anchororage.ak.us/web2/tramp2.exe/see_hits/A0e8q9j6.003?server=aml&start=20
PEOPLE; subsistence; fishing; hunting; traditional food; distribution; land use; management
Originally written as a master's thesis in the Forest Resources Program at the University of Washington, this report examines the harvest and use of fish, wildlife, and plant resources in the predominantly Athabaskan Indian community of Tetlin in the upper Tanana River region. Information was collected on estimated harvest levels for a 12-month period in 1983-84, changes observed in harvest strategies, and resource issues of concern to the community. The purpose of the study was to document contemporary and recent historic land use patterns, so that local residents could more actively participate in land and resource management decision making, which affects their community.

Hamblin, P., 1990. Yukon River headwater lakes study, 1983 and 1985: Observations and analysis. SSCEN36502175E; ISBN0662184491; NTIS/MIC9103730. National Water Research Institute; Lakes Research Branch, Ottawa (Ontario). *HYDROLOGY; lake ice; engineering; reservoir; heat flux; INFRASTRUCTURE; dam*

In 1981, a study was initiated on the circulation and thermal regimes of the Yukon River headwater lakes and of the sensitivity of these lakes to possible future hydroelectric power development in the Yukon River basin. The first phase involved the determination of the bathymetry of the major lakes and their annual thermal and salinity cycles. Lake Laberge was selected as a typical example of a large northern reservoir. In 1983, flow and thermal structure were measured using a current meter and a temperature/conductivity profiler to study inflow region in greater detail during the ice-covered period. Part I of the report presents the results of this study. In 1985, a study of the outflow dynamics was conducted in Marsh and Tagish Lakes. Part II presents the detailed circulation and thermal structure observations, as well as the sensible heat transfer coefficient between the water and ice cover, indicated as a key unknown parameter from the early modelling results of Lake Laberge.

Hamblin, P., and Carmack, E., 1990. On the rate of heat transfer between a lake and an ice sheet. Cold Regions Science and Technology 18 (2), 173-182. *HYDROLOGY; surface water; lake ice; heat flux; climate*

The flux of heat between water and ice is either ignored or set to a constant value in present sea ice models. More accurate treatment of this flux may be desirable in the vicinity of polynyas and ice margins, and for more accurate thermal simulation of lakes and reservoirs. Observations of currents and temperatures under the ice in three large lakes of the headwater region of the Yukon River Basin permit the determination of the coefficient of sensible heat transfer between water and ice by various indirect methods. At a depth of 1 m and an estimated surface roughness of about 0.01 m, the coefficient of sensible heat transfer between water and ice was found to be $(0.8 \text{ plus or minus } 0.3) \times 10^3$. This value is within the limits of smooth and rough ice conditions found in laboratory investigations and appears to be somewhat less than that found in recent sea ice studies.

Hamilton, T.D., Reed, K.M., and Thorson, R.M., 1986. Glaciation in Alaska: the geologic record. Alaska Geological Society, Anchorage. <http://biology.usgs.gov/s+t/SNT/noframe/ak177r.htm>
INCOMPLETE (need abstract); HYDROLOGY; glaciation

Hamilton, A., and Moore, R., 1996. Winter streamflow variability in two groundwater-fed sub-Arctic rivers, Yukon Territory, Canada. Canadian Journal of Civil Engineering/Revue

Canadienne de Genie Civil 23 (6), 1249-1259. *HYDROLOGY; surface water; ground water; precipitation; snow; climate; modeling*

Frequent discharge measurements were made during the winter of 1994-1995 in two groundwater-fed streams near Whitehorse, Yukon Territory, to evaluate the nature and causes of winter discharge variability in sub-Arctic rivers. Observations were also made of near-stream hydraulic head, snowmelt percolation, and water quality. A linear reservoir model provided a poor fit to the streamflow recessions at both rivers, whereas three relatively complex models provided good fits to the data used for calibration. A pronounced discharge depression occurred at M'Clintock River associated with an increase in stage at freeze-up. The volume of water represented by the depression was about three times the maximum amount that could be accounted for by channel storage. This discrepancy could have been caused by stream-aquifer interactions. Piezometric observations were consistent with a reversal of hydraulic gradient across the stream bed, which would block or reduce groundwater inflow, as well as cause water to go into bank storage. A sustained discharge depression did not occur at Ibex River, probably because the volume of channel storage is small with respect to discharge and could be satisfied over the period of freeze-up without measurable deviation from the recession trend, and because the near-stream hydraulic gradients were strong enough not to be influenced by stage increases. Discharge at Ibex River was uncorrelated with air temperature. At M'Clintock River, residuals from the layered linear reservoir model appeared to be weakly correlated with air temperature.

Hammond, T.O., 1996. Mapping interior Alaskan forests with satellite imagery, University of Alaska Fairbanks, 136 p *INCOMPLETE (need abstract); VEGETATION; mapping; forestry; imaging (remote sensing)*

Handel, C., and Dau, C., 1988. Seasonal occurrence of migrant whimbrels and bristle-thighed curlews on the Yukon-Kuskokwim Delta, Alaska. *Condor* 90 (4), 782-790. *POPULATION; birds; whimbrels; curlews; migration; distribution*

Migrant Whimbrels (*Numenius phaeopus*) and Bristle-thighed Curlews (*N. tahitiensis*) were recorded during five summers along coastal tundra of the Yukon-Kuskokwim Delta, Alaska. From June to September, 1975-1979, 358 flocks totalling 1,265 curlews were observed; and additional 54 flocks were identified by vocalization alone. Among the 359 flocks identified to species, 52% were of Whimbrels, 47% were of Bristle-thighed Curlews, and 1% were of both species. Flocks as large as 48 Whimbrels and 33 Bristle-thighed Curlews were recorded, but 87% of the flocks contained five or fewer birds.

Hansen, H., ed., 1967. Arctic biology; ten papers presented at the 1957, and one presented at the 1965, Biology Colloquium at Oregon State University. (2nd ed ed.) Oregon State University Press, Corvallis. v. "Proceedings of the Biology Colloquium" *REFERENCE; VEGETATION; POPULATION; PEOPLE; ground ice / permafrost; health (condition); waste (human); waste (solid); parasitic infection; economics*

Contents: The Arctic; its discovery and past development, by I. L. Wiggins.--Permafrost and its effect on life in the North, by T. L. Pewe.--Vegetation of the Arctic tundra, by M. E. Britton.--Pleistocene and postglacial vegetation of Alaska and the Yukon Territory, by C. J. Heusser.--Some characteristics of microtine cycles in the Arctic, by F. A. Pitelka.--Wildlife in Arctic and subarctic Alaska, by J. L. Buckley.--Arctic and subarctic agriculture, by A. H. Mick.--Health and sanitation problems in the Arctic, by A. J. Alter.--American Arctic populations: their survival problems, by M. L. Lantis.--Observations on some host-parasite relationships among Arctic wildlife, by E. L. Schiller.--Potentialities for the future development of the American Arctic, by I. L. Wiggins.

Haraldson, S.S., 1994. Reflections on nomadic and scattered populations. *Journal of Community Health* 19 (5), 303-6. *INCOMPLETE (need abstract); PEOPLE; health care*

Haraldson, S., 1996. One inhabitant per fifty square kilometers, one grizzly bear per two persons--a field study of health services in Yukon, Canada, May-June 1993. *Arctic Medical Research* 55 (1), 32-42. *INCOMPLETE (need abstract); PEOPLE; health care*

Harrington, C., and Morlan, R., 2002. Evidence for human modification of a late Pleistocene bison (*Bison* sp.) bone from the Klondike District, Yukon Territory, Canada. *Arctic* 55 (2), 143-147. *PEOPLE; anthropology*

A 31000 BP bison limb bone from Nugget Gulch near Dawson City, Yukon, shows a "ring crack" considered to be a human-made impact mark resulting in exposure of marrow. This bone is approximately contemporaneous with wolf, horse, and Dall sheep specimens found on an ancient Mid-Wisconsinan terrain surface at this locality. Similar ring cracks, also interpreted as human-made, have been noted on late-glacial bison bones from Engigstciak, Yukon, and Lost Chicken Creek, Alaska.

Harris, S., 1990. Dynamics and origin of saline soils on the Slims River Delta, Kluane National Park, Yukon Territory. *Arctic* 43 (2), 159-175. *SOIL; hydrology; ground ice / permafrost; precipitation*

The saline soils of the Slims River Delta have developed on land formed in the last 100 years in an area of otherwise continuous permafrost. Deep seasonal frost on the delta prevents downward leaching of salts when the snow melts. Instead the salts accumulate at the surface as the ground dries, while additional salts are added from springs at the base of the surrounding mountains. Late summer rains can leach the soils if they are sufficiently heavy, producing a three- to fourfold variation in salinity from year to year.

Harris, S., and Schmidt, J., 1994. Permafrost aggradation and peat accumulation since 1200 years B.P. in peat plateaus at Tuchtua, Yukon Territory (Canada). *Journal of Paleolimnology* 12 (1), 3-17. *CLIMATE; monitoring; ground ice / permafrost; vegetation; peat; fen; limnology*

Floating and grounded peat plateaus were studied in fens in the Yukon Territory (Canada). The peat deposit may be over 4 m thick and consists of a lower bed of aquatic peat overlain by humic fen peat, mesic fen peat and woody peat. Permafrost in the grounded peat plateaus is older than the 1200 year old White River Ash, whereas permafrost in the floating peat plateau is younger. Peat accumulation rates since 1200 years B.P. were greater in the fens (85-100 cm) than on the surface of the peat plateaus (25-55 cm). Where the peat plateau is free-floating, it will persist until the climate changes, causing the icy core to thaw. Where the peat plateau is frozen to the mineral substrate, it slowly drowns since the fen peat accumulates faster than the woody peat. This drowning results in degradation of the landform independently of the climate. Only degradation of floating peat plateaus can be used to identify climatic changes.

Harris, K.C., 1996. The use of Alaskan fish meal as a nutrient source for bioremediation [microform], University of Alaska Anchorage, M.S., 71 p *INCOMPLETE (need abstract); CONTAMINANTS; POL (petroleum/oil/lubricants = hydrocarbons); soil; invertebrates; microbes; remediation*

Hawkins, D.B., and Glover, D., 1982. Hydrogeochemistry of the Caribou-Poker Creeks research watershed [microform]. IWR-102. Institute of Water Resources, UAF, Fairbanks. *INCOMPLETE (need abstract); WATER QUALITY; HYDROLOGY; ground water; surface water*

Haydon, D., Gillis, E., Stefan, C., and Krebs, C.J., 1999. Biases in the estimation of the demographic parameters of a snowshoe hare population. *Journal of Animal Ecology* 68 (3), 501-512. *POPULATION; mammals; snowshoe hare; demographics; mortality; modeling*
1. Survival rates and natalities for a population of snowshoe hares in the Yukon were estimated independently of and simultaneously with estimates of population change

during the increase phase of a hare cycle. 2. Simple demographic models are used to show that even though the estimated survival rates and natalities were high relative to previously published estimates, the observed demographic parameters are unable to explain the extent of population increase, and we conclude that some of these parameters must be underestimates. 3. A sensitivity analysis is used to examine the potential influence of changes in these demographic parameters on the population growth rate. During most years of the hare cycle the population growth rate is potentially most sensitive to changes in juvenile postweaning survival. Only during crash years is adult survivorship likely to be a more important determinant of the rate of population change. 4. Examination of previously published data sets on two full population cycles suggests that while survival rates are positively correlated with population growth rates, their incorporation into demographic models results in frequent underestimation of the rate of population increase.

Hayes, R., Baer, A., Wotschikowsky, U., and Harestad, A., 2000. Kill rate by wolves on moose in the Yukon. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 78 (1), 49-59.

POPULATION; mammals; wolf; moose; mortality; predation; modeling; snow

We studied the kill rate by wolves (*Canis lupus*) after a large-scale wolf removal when populations of wolves, moose (*Alces alces*), and woodland caribou (*Rangifer tarandus caribou*) were all increasing. We followed a total of 21 wolf packs for 4 winters, measuring prey selection, kill rates, and ecological factors that could influence killing behavior. Wolf predation was found to be mainly additive on both moose and caribou populations. Kill rates by individual wolves were inversely related to pack size and unrelated to prey density or snow depth. Scavenging by ravens decreased the amount of prey biomass available for wolves to consume, especially for wolves in smaller packs. The kill rate by wolves on moose calves was not related to the number of calves available each winter. Wolves did not show a strong switching response away from moose as the ratio of caribou to moose increased in winter. The predation rate by wolves on moose was best modeled by the number and size of packs wolves were organized into each winter.

Hayes, R., and Harestad, A., 2000. Demography of a recovering wolf population in the Yukon.

Canadian Journal of Zoology/Revue Canadien de Zoologie 78 (1), 36-48. *POPULATION;*

mammals; wolf; demographics; management

We studied the dynamics of a wolf (*Canis lupus*) population recovering from intensive reduction in the Finlayson Lake area, Yukon, Canada. Within 6 years, numbers increased from 29 wolves, then stabilized at 245. The colonization of vacant territories by young wolf pairs was the primary mechanism of early population recovery. Reproduction and a low dispersal rate increased pack size in later years, and pack splitting allowed dispersing wolves to remain near natal packs. The rate of increase in the wolf population was density-dependent and related to wolf density, but was also related to the dispersal rate. The dispersal rate was density-independent and related to mean pack size and prey biomass: wolf index. The survival rate was age-dependent and not related to wolf density. In the early years of recovery, the rate of increase was supported by high survival rates and low dispersal rates. In later years, dispersal rates increased, stabilizing mean pack size and wolf density. Wolf density stabilized at levels predicted by the prey supply, but whether the wolf population is regulated by the availability of prey resources remains unresolved. Wolf density, pack density, and mean pack size were similar in 1983 and 1996, despite a 2- to 3-fold difference in prey biomass. We suggest that the interaction of wolf density and mean pack size in stable prey systems needs to be studied to determine the roles played by food supply and wolf social behavior in regulating wolf abundance.

2000. Wolf functional response and regulation of moose in the Yukon. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 78 (1), 60-66. *POPULATION; mammals; wolf; moose; mortality; predation; modeling*

We studied kill rates by wolves (*Canis lupus*) on a rapidly growing moose population in the east-central Yukon. We added these data to the cumulative functional response curve obtained in other North American wolf studies. Our kill rates are higher than those predicted at low moose densities. The kill rate increases rapidly, reaching 2.4 moose per wolf per 100 days at 0.26 moose/km² and remains constant at this level. No data are available below 0.2 moose/km² to indicate the shape of the ascending curve. Based on moose distribution and the low prey-switching ability of wolves, we suggest that the functional response curve is of type II. Our wolf predation rate model predicts that moose are held to a low density equilibrium between 0.07 and 0.12/km², slightly below densities observed in interior Alaska and the Yukon.

Haynes, T., 1984. The Use of Copper River Salmon and Other Wild Resources by Upper Tanana Communities, 1983-1984. Technical Paper No. 115. Alaska Department of Fish and Game, *PEOPLE; subsistence; land use*

In response to a directive from the Alaska Board of Fisheries, households were surveyed in Northway, Tanacross, Tetlin, and Tok, focusing on the harvest and use of Copper River salmon by these communities. This report presents historical, social, and demographic data for each community, as well as information on salmon and other fish and wildlife resources utilized. Attention is given to the historical and contemporary linkages between upper Tanana and Copper River Basin communities, and the role played by Copper River salmon in affirming these ties.

Haynes, T.L., 1984. Rural aging and the use of social supports in the Upper Tanana Region, Alaska: San Francisco, University of California, Ph. D., 212 p *INCOMPLETE (need abstract); PEOPLE; anthropology; elders*

HDR, 1999. Alaska Sanitation Planning Guide for Small Communities. Alaska Department of Community and Economic Development; HDR Alaska, Inc, Anchorage.
<http://www.dced.state.ak.us/cbd/ruba/pub/ASPGFSC.pdf> *REFERENCE; waste (human); waste (solid); WATER QUALITY; surface water*

Introduction

Planning for sewer and water systems is called “sanitation planning.” The Governor’s Council on Rural Sanitation proposed this book about sanitation plans because they discovered that it is not enough to provide money and engineers and materials to rural communities. Building a good water and sewer system is part of building a good community, and it takes the whole community to do that, working as partners with agencies and consultants. To involve the community, residents need to know more about the planning process, and that is where this book can help...

Hebert, C.E., Gamberg, M., Elkin, B.T., Simon, M., and Norstrom, R.J., 1996. Polychlorinated dibenzodioxins, dibenzofurans and non-ortho substituted polychlorinated biphenyls in caribou (*Rangifer tarandus*) from the Canadian Arctic. *Science of the Total Environment* 183 (3), 195-204. *CONTAMINANTS; POPs (persistent organic pollutants); bioaccumulation; mammals; caribou*

The presence of contaminants in the Arctic environment has raised concerns regarding levels in wildlife and possible effects on the health of wildlife populations. In addition, contaminants in wild foods are of particular concern to those people who rely on these foodstuffs for a significant portion of their diet. Among the most toxic contaminants found in the environment are the polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and non-ortho substituted polychlorinated biphenyls (NOPCBs). Few data exist documenting the levels of these compounds in

Arctic terrestrial wildlife. In 1993, caribou samples were obtained from three herds in the Yukon Territory (Finlayson, Tay and Bonnet Plume) and from four herds in the Northwest Territories (Bathurst, Southampton Island, Cape Dorset and Lake Harbour). High resolution gas-chromatography/mass spectrometry was used to measure contaminant concentrations. Wet weight concentrations of PCDDs, PCDFs and NOPCBs were greater in fat tissue than in muscle and liver, however, concentrations in all tissues were extremely low. Lipid normalized concentrations were greater in muscle and liver than in fat, indicating that equilibrium partitioning is not the only process regulating tissue concentrations of these contaminants. There were no significant relationships between concentrations of individual congeners and caribou age.

Hébert, M., 2001. Strategic Plan for Noxious and Invasive Plants Management in Alaska. Cooperative Extension Service (CES), University of Alaska Fairbanks. *VEGETATION; distribution; invasive species; management*

The goal of the Strategic Plan is twofold: (1) to heighten the awareness among all citizens of the degradation that can be brought to Alaska lands and waters by the spread of non-native invasive plants; and (2) to bring about greater statewide coordination, cooperation and action that will halt the introduction and spread of such plants and restore infested lands and waters to a healthy and productive condition.

The goals and actions outlined in this plan provide a structure that, if supported and advanced through individual or cooperative efforts, will further the effective management of noxious and invasive plant species across all lands and jurisdictions of the state of Alaska. The participants in this strategic plan recognize that through the development of a statewide coordinated and cooperative approach to noxious and invasive plants management, they can more effectively advance the actions necessary to achieve both the strategic goals and actions and organizational responsibilities. The Alaska Strategic Plan addresses five broad issues critical to building a strong and successful statewide management program. These issues were identified and discussed at the February 1, 2001 Strategic Planning Workshop in Fairbanks.

- I. Coordination: Leadership, Partnerships and Cooperation
- II. Education: Awareness, Understanding and Participation
- III. Inventory and Monitor: Database Management and Mapping
- IV. Research: Biological Impacts, Economic Impacts and Management Options
- V. Management: Least Cost, Most Effective and Acceptable Management Options

Action items have been described for each issue. These provide guidelines for developing an implementation plan. A short implementation plan will be developed annually taking into consideration available resources and identified priorities. CNIPM is made up of individuals representing agencies and organizations statewide. The Cooperative Extension Service is chairing this committee. Committee membership is based on interest, availability for meetings and willingness to work towards the goal of the committee. There are no formal membership requirements. The goal of this committee is to launch and coordinated process for the development of a strategic plan and to manage noxious and invasive plants in Alaska.

CNIPM will seek funding to implement and keep track of the implementation process. Some of the action items in this plan are in the process or have already been implemented. How quickly all desired activities will commence will be determined by the level of participation and financial support.

The Strategic Plan supports the statewide formation of geographically defined Plant Management Areas (PMAs) and the application of Integrated Pest Management (IPM) practices to those areas. IPM is a holistic systems approach to pest management. It involves the use of management techniques to limit the impact and spread of the pest. IPM steps include identification of the pest, disruptions of the pest lifecycle and looking for the least toxic to the environment solution. This is a proven method for reducing the ecological, economic and social impacts of noxious invasive plants on the state's human and natural resources. The Federal Protection Act prohibits the movement of noxious weeds into the state.

Heglund, P., Jones, J., Frederickson, L., and Kaiser, M., 1991. Use of boreal forested wetlands by Pacific loons (*Gavia pacifica* Lawrence) and horned grebes (*Podiceps auritus* L.): Relations with limnological characteristics. *Hydrobiologia* 279-280 (AQUATIC BIRDS IN THE TROPIC WEB OF LAKES: Kerekes, J.J. (ed)), 171-183. *POPULATION; birds; waterfowl; loon; grebe; habitat selection; limnology; surface water; modeling*

Our objective was to determine if the occurrence and abundance of Pacific loons (*Gavia pacifica* Lawrence) and horned grebes (*Podiceps auritus* L.) on 123 wetlands of Yukon Flats National Wildlife Refuge in east central Alaska were related to the limnological characteristics of those wetlands. Aquatic bird-wetland use surveys were conducted in conjunction with limnological sampling from May through September 1985-87 and May through August 1989. Results from logistic regression analysis demonstrated a significant association between the probability of wetland use by Pacific loons and shoreline length, water color, calcium and total phosphorus. Wetland use by horned grebes was related to shoreline length, pH, and chlorophyll. Aquatic bird abundance was then used as a Poisson response variable and modeled as a function of wetland limnological characteristics. Our results indicate that Pacific loon abundance was adequately modeled by linear and quadratic functions of shoreline length, color, pH, calcium and total phosphorus. Horned grebe abundance could not be modeled with this approach. The statistical techniques known collectively as generalized linear models provided a framework for the development of models for aquatic bird use of wetlands. Our results, however, indicate that while this approach shows promise, a better understanding of how to model aquatic bird abundance is needed. We then identify problems in model development and suggest avenues for future research.

Heiman, M., 2000. Contaminants in Alaska: is America's Arctic at risk?

Interagency, <http://www.state.ak.us/dec/deh/POPs.htm> *CONTAMINANTS; POPs (persistent organic pollutants); metals; long range transport; bioaccumulation*

Changes are occurring in America's Arctic. Chemicals rarely used in the Arctic are appearing in Alaska's air, water, fish, plants, and wildlife. These contaminants are of concern locally and globally. Locally, fish and wildlife are an essential part of the Alaskan Native diet and culture. Globally, this unanticipated concentration of pollutants may be sending an important message about how contaminants travel and accumulate far from the original source. The presence of environmental pollutants in the Arctic is particularly troubling because the Arctic ecosystem is fragile and slow to recover from impacts.

The contaminants of greatest concern are persistent organic pollutants, or POPs. These include DDT, PCBs, and dioxins. POPs have a broad range of negative effects. They are transported to the Arctic by large-scale air and water currents and some migratory species. Heavy metals, including mercury, cadmium, selenium, arsenic, and lead are also of great concern in the Arctic, and some are occurring at levels that can't be explained by natural releases.

The levels of persistent organic pollutants found in the Alaskan Arctic are surprising because POPs were not manufactured in the Arctic. Although this paper focuses on the long-range transport of contaminants, some POPs were used at military installations during World War II and the Cold War, and these sites also concern local residents.

The use of some POPs has been banned for many years in the United States, Canada, and some European nations. However, these contaminants can travel long distances from areas in Russia, Asia, and other countries where they are still used.

POPs and heavy metals are showing up in Alaska's wildlife. In the Aleutian Islands for example, bald eagles, sea otters, and Steller sea lions all have elevated levels of the pesticide DDT and some other contaminants. Concentrations of the pesticide hexachlorohexane (HCH) in male polar bears from Alaska are among the highest in the Arctic. Sea otters from Adak on the Aleutian Chain had concentrations of DDT 36 times higher than sea otters in Southeast Alaska. Some killer whales in the North Pacific are now considered among the most contaminated marine mammals on earth.

People also are exposed to these pollutants. Canadian studies have shown that the concentration of PCBs in the blood of adult Inuit is approximately seven times higher than in other North American adult populations that have been tested. Preliminary studies also show that Alaskan Natives in western and southwestern communities have also been exposed to PCBs and DDT.

The world's Arctic is at risk from potentially harmful contaminants. In Alaska, they have been found in water, air, wildlife, and humans. There is good reason to suspect that harmful effects are likely in some instances, but conclusive evidence is lacking. An organized, systematic approach is needed to properly evaluate the real risks posed by these chemicals and to identify actions needed to reduce unacceptable risks. As many other Arctic countries have done, the United States should establish a fully funded Arctic contaminants program. By taking action now, Alaska's rich natural resources can be protected for future generations.

Heinrichs, H., Kennedy, B., Langley, D., and Burrows, R., 2001. Methodology and Estimates of Scour at Selected Bridge Sites in Alaska. USGS WRIR 00-4151. United States Geological Survey, Alaska Department of Transportation and Public Facilities, Anchorage.
<http://water.usgs.gov/pubs/wri/wri004151/> *INFRASTRUCTURE; HYDROLOGY; surface water; engineering; flooding; modeling; bridge*

The U.S. Geological Survey estimated scour depths at 325 bridges in Alaska as part of a cooperative agreement with the Alaska Department of Transportation and Public Facilities. The department selected these sites from approximately 806 State-owned bridges as potentially susceptible to scour during extreme floods. Pier scour and contraction scour were computed for the selected bridges by using methods recommended by the Federal Highway Administration. The U.S. Geological Survey used a four-step procedure to estimate scour: (1) Compute magnitudes of the 100- and 500-year floods. (2) Determine cross-section geometry and hydraulic properties for each bridge site. (3) Compute the water-surface profile for the 100- and 500-year floods. (4) Compute contraction and pier scour. This procedure is unique because the cross sections were developed from existing data on file to make a quantitative estimate of scour. This screening method has the advantage of providing scour depths and bed elevations for comparison with bridge-foundation elevations without the time and expense of a field survey. Four examples of bridge-scour analyses are summarized in the appendix.

Henry, S.H., 1969. Hearing Loss Among Alaska Native Schoolchildren of the Lower Yukon: Ellensberg, Central Washington State College, Ph.D., vi, 52 p *PEOPLE; children; health (condition); otitis media; hearing loss; INCOMPLETE (need abstract)*

Heyer, J., Berger, U., Kuzin, I., and Yakovlev, O., 2002. Methane emissions from different ecosystem structures of the subarctic tundra in Western Siberia during midsummer and during the thawing period. *Tellus Series B: Chemical and Physical Meteorology* 54B (3), 231-249. *REFERENCE; CLIMATE; NUTRIENT CYCLING; carbon; vegetation; ground ice / permafrost; air quality; flooding*

Methane emission was measured using a static chamber method at seven different ecosystem structures of the subarctic tundra on the Yamal Peninsula (West Siberian Lowlands, Russia) in August 1995 (midsummer) and June 1996 (spring thaw). The results obtained represent one of the most extensive data sets available for Siberian tundra and confirm the significance of this area as an important source of atmospheric methane. Mean midsummer emission rates (4.24-195.3 mg CH₄ / m² d [milligrams of methane per square meter per day]) were higher than mean rates reported for wetlands between 65-70 degree N in Alaska, Sweden and Russia. The highest emission rates were measured in a lake terrestrialization mire which was always flooded, the lowest rates at a dry site in a polygonal mire. Mean emission rates during spring thaw ranged from 0.16 to 56.2 mg CH₄ / m² d. These rates increased at 4 out of 5 sites from 2.4-15.1 mg CH₄ / m² d at the beginning of the measuring period to 24.2-156 mg CH₄ / m² d at the end. The water-table level was the crucial parameter influencing spatial variation of methane emission rates, while temperature was the most important factor controlling temporal variation, especially during spring thaw. However, short-term changes of air temperature had no effect, and diurnal variation of methane emissions was never detected. In addition to the direct influence of temperature on methanogenesis, the indirect effect on soil thawing was apparent. Increasing thawing depth was positively correlated with methane emission. Rapid alterations of the water table also resulted in large episodic methane emissions. Methane emission exceeded the calculated methane production in spring, suggesting that accumulated methane from the previous year was also released. The results show that considerable methane emission occurs even in the spring without an active vegetation cover and without plant-mediated methane transport. This is a consequence of high methane production rates even at low temperatures, and of methane release via diffusion as the main transport pathway from the soil into the atmosphere.

Hickman, G., 1979. Nesting ecology of bank swallows in interior Alaska, University of Alaska Fairbanks, M.S., 78 p *INCOMPLETE (need abstract); POPULATION; birds; swallow; reproduction; behavior (reproductive/nesting); habitat selection*

Hilchey, G., 1947. Gravity water supply for placer mines (with special reference to Alaska and the Yukon), University of Alaska, Bachelor of Mining Engineering *MINING; surface water; engineering; INCOMPLETE (need abstract)*

Hilmer, M., and Lemke, P., 2000. On the decrease of Arctic sea ice volume. *Geophysical Research Letters* 27 (22), 3751-3754. *REFERENCE; CLIMATE; sea ice*

The decrease of Arctic sea ice volume is investigated using a dynamic-thermodynamic sea ice model. The model was forced with NCEP/NCAR reanalysis winds and surface air temperatures in a hindcast simulation of the period 1958-1998. The simulation reveals pronounced decadal variability (10-12 years) along with a significant linear negative trend of total Arctic sea ice volume which amounts to -4%/decade. The decrease is apparent throughout the annual cycle with largest amplitudes from September to December.

Regionally the strongest thinning of ice thickness occurs in the East Siberian Sea with magnitudes up to -30cm/decade. The simulation also reveals some positive trends in the Baffin Bay /Labrador Sea and north of the Canadian Archipelago.

Hinzman, L., Lilly, E., Kane, D., and Johnson, R., 1997. Soil Moisture Dynamics in Areas of Discontinuous Permafrost. *Proceedings Seasonally Frozen Soils Symposium*, Fairbanks, p. 261-267 *INCOMPLETE (need abstract); SOIL; HYDROLOGY; ground ice / permafrost*

Hinzman, L., Nolan, M., Prokein, P., Fatland, R., Gentry, J., and Johnson, B.I., 2000. Determining the Utility of Synthetic Aperture Radar (SAR) in Estimating Surface Soil Moisture Conditions for Trafficability Analyses; Phase III Progress Report. INE/WERC 00.07. Water and Environmental Research Center, University of Alaska Fairbanks, Fairbanks.
http://www.uaf.edu/water/publications/trw_progress_2000.pdf *HYDROLOGY; SOIL; CLIMATE; snow; ground ice / permafrost; ground water; imaging (remote sensing); modeling; engineering; military; infrastructure; road*

Introduction

Improving vehicle trafficability planning is a major defense mission, and we believe that this research has made significant improvements towards this end. We are striving to develop new space-borne Synthetic Aperture Radar (SAR) techniques to measure temporal changes in soil moisture, soil freeze/thaw state, and snowmelt, utilizing both amplitude and phase signal information. Such knowledge is of great use to a variety of end-users. Military planners need to predict the bearing strength of the underlying soil and thus the number and weight of vehicles able to travel across it. Global climate modelers need to know the surface greenhouse gas and latent heat flux. The common variables in these applications are soil moisture, snowmelt, and soil moisture phase (frozen or thawed) over large, often remote areas, over short time intervals.

Our techniques involve multi-temporal amplitude comparisons, SAR interferometry, expert hydrological systems, artificial neural networks, and new geo-spatial/temporal data representation techniques. The basis of this research is that because the dielectric properties of soils change with varying moisture content (or snow melt or frozen/unfrozen ground), both the amplitude and phase of the signal received by the SAR satellites will change as well. Our approach to this type of research in the past has made extensive use of field data for ground truthing. In this report we present field results from the Pinon Canyon Maneuver Site (PCMS; managed by Ft. Carson in Colorado Springs) in southern Colorado and Caribou Poker Creeks Research Watershed (CPCRW) near Fairbanks, Alaska. PCMS is reserved for major tank maneuvers, and has an excellent reputation for range management. In particular, the range managers are very sensitive to the role that soil moisture plays in damage to the site, and restrict maneuvers to areas in which long-term traffic-related damage will be minimal. CPCRW is a research watershed in the boreal forest of Subarctic Alaska where we are concurrently conducting other hydrologic studies that provide complementary data needed for these analyses.

This project uses new and innovative SAR techniques to solve problems related to vehicle trafficability and global climate change, namely remotely-sensed soil moisture measurement. We have three main objectives for this project: 1) Build on the existing uses of SAR by developing new techniques for its implementation, 2) Continue our field data collection efforts in the Pinon Canyon Maneuver Site (PCMS; managed by Ft. Carson in Colorado Springs) and Caribou Poker Creeks Research Watershed (CPCRW), and 3) Initiate development of prototype applications of vehicle trafficability planning for national decision makers relying on timecritical geospatial information.

Conclusions

Results to date indicate satellite borne synthetic aperture radar is a promising tool for estimation of ground surface condition. Several analyses techniques are being examined. Our analysis approaches are changing from doing direct comparisons of field measured soil moisture with SAR reflectance values, to more refined comparisons. Interferometric analyses appear very promising, demonstrating marked responses to rainfall events. Coherograms also appear to be a valuable approach to detect changes. Through a Quadtree analysis, it should be fast and easy to quantitatively map specific areas of interest to soil moisture levels. Further, an analysis tool named SARfari is being developed to compartmentalize analysis techniques, enabling a trained user to quickly examine SAR imagery for field analyses of surface condition over broad areas.

A spatially distributed hydrological model has been applied to the Pinon Canyon Maneuvering Site to enable a more compatible comparison of soil moisture levels simulated on similar spatial scales by two independent techniques. Although not fully calibrated yet, the hydrologic model is performing quite well and the broader comparisons (over large spatial areas and numerous satellite viewing dates) will permit further refinement of SAR analysis techniques.

Hinzman, L., and Vörösmarty, C., eds., 2001. NSF-ARCSS Workshop on Arctic System Hydrology: Meeting White Papers. Arctic Research Consortium of the U.S., Fairbanks, Alaska. *REFERENCE; HYDROLOGY; CLIMATE; NUTRIENT CYCLING; flooding; freeze-thaw cycles; glacial discharge; modeling; ground ice / permafrost; thermokarst; river ice; sea level; snow*

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Vladimir E. Romanovsky, Thomas E. Osterkamp, Nikolai N. Romanovsky

Hobbie, S., Shevtsova, A., and Chapin III, F., 1999. Plant responses to species removal and experimental warming in Alaskan tussock tundra. *Oikos* 84 (3), 417-434. *CLIMATE; vegetation; grasses; sedges; labrador tea; shrub birch*

We manipulated air temperature and the presence of the seven dominant plant species in Alaskan tussock tundra and measured shoot growth, branching, aboveground biomass, and reproduction of the remaining plant species. Warming stimulated shoot growth of the dominant sedges and shrubs after one and two years of manipulation and total leaf biomass of the dominant shrubs after three years. Warming decreased aboveground biomass of *Eriophorum vaginatum* [cotton grass], *Cassiope tetragona* and most non-vascular species. Warming also reduced total reproductive output of two of three species measured. Removal of single species had no effect on shoot growth of the remaining species. However, total aboveground biomass and reproduction of *Ledum palustre* [labrador tea] increased with removal of other shrub species, suggesting that competition limits biomass accumulation in *L. palustre*. Sphagnum removal increased the aboveground biomass of *Betula nana* [shrubby birch]. The higher frequency of significant warming versus species removal effects on plant growth and biomass suggests that direct limitation by environmental conditions is more important than limitation by species interactions in tussock tundra. Furthermore, we found no significant interactions between warming and species removal, suggesting that increased temperature per se will not alter the intensity of species interactions. When combined with knowledge of dispersal abilities and controls over establishment, extrapolation of species responses to environmental manipulation may thus allow us to predict effects of climate change on community composition.

Hochachka, W., Martin, K., Doyle, F., and Krebs, C., 2000. Monitoring vertebrate populations using observational data. *Canadian Journal of Zoology/Revue Canadienne de Zoologie* 78 (4), 521-529. *POPULATION; mammals; birds; monitoring*

Methods for monitoring temporal changes in population size vary from intensive and potentially expensive to less intensive and more easily implemented techniques. In this paper we evaluate the utility of a monitoring technique that can be used to follow many vertebrate species simultaneously at low cost and requires little training of personnel. Observers record the number of individuals seen per hour in the field and these rates of encounter are used as an index of population size. We examine whether encounter rates reflect population size by comparing them with independent censuses of three species over a 7-year period in the boreal forest near Kluane Lake in the southern Yukon Territory. Encounter rates were generally an accurate reflection of variation in population size. In our study system, inter-observer variability did not influence our ability to detect fluctuations in population size: the underlying fluctuations were detected whether data from all or only a group of "high-quality" observers were used. In our study, the benefit of using all available data outweighed the cost of variation among observers because sample sizes were large (averaging over 1200 data points from 33 observers per year). Variation in the length of observation periods did not affect the chance of detecting animals in our study. Encounter rates provide a reasonable index of variation in population size, although caution should be used with species that are uncommon or difficult to detect.

Hodges, J., 1999. Proximate factors affecting snowshoe hare movements during a cyclic population low phase. *Ecoscience* 6 (4), 487-496. *POPULATION; mammals; snowshoe hare; nutrition; ;distribution; behavior (feeding); predation*

Animals change their movements in response to food supply and predation risk. Such behavioural shifts can affect reproduction and survival, especially if animals are forced to trade off between food and safety. I studied snowshoe hares (*Lepus americanus* Erxleben) during a low phase of the ten-year cycle in the southern Yukon. I used a factorial manipulation of food addition and predator reduction to determine how predators, food supply, and hare density affect hare movements. Control hares were more active than hares protected from predators or hares given supplemental food. Female hares showed no change in home range size or winter travel rates with these treatments, but females protected from predators had lower summer travel rates than did control females. Male hares protected from predators had lower travel rates in both seasons and smaller home ranges than did males exposed to mammalian predators. Male hares generally had higher movements than did females, but neither sex responded to a similar to 5-fold change in density. The results indicate that different movement indices have distinct functions that may differ with sex. Not all movement types are necessarily affected by predation risk, food availability, or density. The increase in movements with higher risk is unusual, because most small mammals reduce movements when predation risk is high. For snowshoe hares, safety may increase by moving away from predators and using larger areas.

Hodges, K., Krebs, C.J., and Sinclair, A., 1999. Snowshoe hare demography during a cyclic population low. *Journal of Animal Ecology* 68 (3), 581-594. *POPULATION; mammals; snowshoe hare; demographics; behavior (feeding); predation*

1. Snowshoe hare (*Lepus americanus* Erxleben) populations were studied in southwest Yukon during the low phase of the 10-year population cycle. Food availability and predator abundance were manipulated in a factorial design to determine the importance of each factor in hare dynamics during this phase. 2. Food was abundant during the low phase, and snowshoe hares were not food limited. 3. Survival of hares was higher than at any other phase of the cycle, and predators were scarce, but > 75% of hare deaths resulted from predation. 4. Food addition resulted in higher hare densities and better body condition than on control sites. There were no observable effects of food addition on population rate of increase, recruitment, survival or age structure. 5. Mammalian predator reduction resulted in higher hare densities, higher survival, better body condition and an older age structure. Relative to control populations, recruitment was lower and population rates of increase similar. 6. The joint manipulation of food addition + predator reduction had greater positive effects on hare density and body condition than either single factor manipulation. Survival was better than on control sites, and the age structure was older than on control sites. Population rates of increase were similar, but recruitment was higher on the control areas. 7. We conclude that snowshoe hare dynamics at the low of the cycle are dominated by the interaction of food and predation. Risk of predation also had indirect effects on snowshoe hare age structure and body condition.

Hodges, K., Stefan, C., and Gillis, E., 1999. Does body condition affect fecundity in a cyclic population of snowshoe hares? *Canadian Journal of Zoology/Revue Canadien de Zoologie* 77 (1), 1-6. *POPULATION; mammals; snowshoe hare; reproduction; nutrition; predation*

Snowshoe hares (*Lepus americanus*) undergo a 10-year cycle in abundance, with cyclic changes in reproduction occurring 3 years prior to numeric changes. Reproduction may be associated with body condition, which might change with nutrition or predation pressure. We describe hare body condition (as a mass - skeletal size relationship) through a cycle in the southern Yukon from 1989 to 1996, test the effects of food and predation risk on body condition, and examine whether changes in body condition are related to cyclic reproductive changes. Hare body condition was lowest during the decline phase but rapidly improved during the low phase. Although yearling hares were

in poorer condition than adults, changes in age structure cannot explain the cyclic fluctuation in condition. Food addition and predator reduction both resulted in better body condition. Body condition did not affect reproduction. The highest natality occurred when hares were in intermediate condition, while the lowest natality occurred when hares were in the best condition. Although changes in food and predation risk affect hare body condition, we found no relationship between body condition and cyclic reproductive changes. Rather, during times of nutritional deficit, female hares may maintain mass during gestation and lactation, but at a proximate cost to their offspring. Thus, inferences based on indices of condition incorporating body mass may be misleading.

Hoefs, M., Bunch, T.D., Glaze, R.L., and Ellsworth, H.S., 1982. Horn aberrations in Dall's sheep (*Ovis dalli*) from Yukon Territory, Canada. *Wildlife Disease* 18 (3), 297-304. *POPULATION; health (condition); mammals; sheep; growth/development; deformity*

Horn aberrations in Dall's sheep from the Kluane Lake area of Yukon Territory were of two basic types. In the more prevalent type, the horn was severed at an annual growth check and the terminal segment of the remaining portion formed a short conical protuberance. The second type had characteristics of the first, but in addition, underwent extreme twisting or torquing during subsequent growth. Sheep with aberrant horns represented 2% of the Kluane Lake population or 14% of harvestable rams (greater than or equal to 6 yr old). Deformed horns, occurring in ewes and rams, were generally observed in animals 6 yr or older. Aberrations followed necrosis of the terminal segment of the horn core: cavitation of the sheath between successive periods of growth or the sequestering of portions of necrotic core within the sheath resulted. All sheep examined (eight) had a normal complement of 54 chromosomes.

Hoefs, M., and Bunch, T.D., 1992. Cranial asymmetry in a Dall sheep ram (*Ovis dalli dalli*). *Wildlife Disease* 28 (2), 330-332. *POPULATION; mammals; sheep; growth/development; deformity*

The horns of a 13-yr-old Dall sheep ram (*Ovis dalli dalli*) from the Sheep Mountain herd in Kluane National Park (Yukon, Canada) had unique characteristics. The right horn was 1,127 mm long, while the left horn was only 861 mm long and compressed and distorted at its base. The reduced growth of the left horn was due to chronic epidermitis and osteomyelitis of the cornual process, which began when the ram was 5 yr of age.

Hoefs, M., and Nowlan, U., 1994. Distorted sex ratios in young ungulates: The role of nutrition. *Journal of Mammalogy* 75 (3), 631-636. *POPULATION; mammals; caribou; sheep; mountain goat; reindeer; reproduction; nutrition*

The long-held view that sex ratios of ungulates at birth are at or near parity has been the subject of considerable debate. Numerous examples of distorted sex ratios at birth have been reported, but the observations and their interpretation have not been consistent. Study of captive ungulates can provide valuable information on this contentious subject because relevant data are easy to obtain and are reliable. We assessed sex ratios of offspring from ungulates held in game farms in the Yukon Territory, Canada. Elk (*Cervus elaphus nelsoni*), reindeer (*Rangifer tarandus tarandus*), mountain goats (*Oreamnus americanus*), Dall's sheep (*Ovis dalli dalli*), Stone's sheep (*Ovis dalli stonei*), and caribou (*Rangifer tarandus caribou*) were studied. Sample sizes among these species varied from 11 to 320 young, and observation periods varied between 2 and 23 years. All six ungulates showed a distorted sex ratio of neonates favoring females, which we attribute to the high-quality supplementary feed provided to these animals.

1997. Comparison of horn growth in captive and free-ranging Dall's rams. *Journal of Wildlife Management* 61 (4), 1154-1160. *POPULATION; mammals; sheep; growth/development; nutrition*

We compared horn growth of rams from 2 study populations of Dall's sheep (*Ovis dalli dalli*) living under different nutritional regimes. The "wild" herd in Kluane National Park is characterized by a high density and nutritional limitations; the "captive" herd held in a large enclosure at the Yukon Game Farm near Whitehorse, receives high quality supplementary feed. The captive herd had its origin in the wild herd; genetic implications therefore can be ruled out as a contributing factor in explaining the differences observed. Captive rams developed larger and more massive horns. Their horns reached a length of 1,000 mm in their eighth year, those of wild rams rarely exceeded 950 mm even after 12 years. More pronounced were the differences in horn circumference, averaging about 18% over all age classes. When length and circumference measurements were combined to calculate volume, 7-year-old captive rams had horns with volumes averaging 2,750 cm³; their wild counterparts only horns with 1,500 cm³. We demonstrate the great phenotypic plasticity residing in these sheep, which was revealed through increase in resource availability.

Hoefs, M., 2001. Mule, *Odocoileus hemionus*, and White-tailed, *O. virginianus*, Deer in the Yukon. *Canadian field-naturalist* 115 (2), 296-300. *POPULATION; mammals; deer; distribution; habitat selection*

Both Mule Deer (*Odocoileus hemionus*) and White-tailed Deer (*Odocoileus virginianus*) have colonized the southern half of the Yukon in recent decades. Mule Deer have attained a continuous distribution in suitable habitats, White-tailed Deer have remained rare. Deer habitats are largely open, south-facing grassy slopes bordered by aspen, sites of recent forest fires, and cultivated hay fields. Many sightings have been reported by the general public. These have been supplemented by interviews of native elders and other long-time residents and a literature search. Mule Deer first appeared in the Yukon in the late 1930s to early 1940s and by the 1980s had reached the latitude of Dawson (64 degree N) and crossed into Alaska in the Ladue River drainage. A northern record for Mule Deer was established with a sighting near Chapman Lake along the Dempster Highway (64 degree 50' N, 138 degree 25" W). White-tailed Deer are more recent, first observed near the British Columbia border (60 degree 10' N) at Tagish Lake in 1975 and reaching Moose Creek along the Klondike Highway (63 degree 30' N) in 1998.

Hoefs, M., and Bunch, T., 2001. Lumpy jaw in wild sheep and its evolutionary implications.

Wildlife Disease 37 (1), 39-48. *POPULATION; mammals; sheep; growth/development*

The distribution and prevalence of mandibular osteomyelitis, lumpy jaw, and other dental anomalies in wild sheep were investigated and their biological and evolutionary implications were assessed. Our survey was based on 3,363 mandibles of wild sheep and 1,028 from domesticated varieties. Lumpy jaw is widespread in wild sheep of North America, but it is rare or absent in wild sheep from Eurasia. Among the subspecies of *Ovis* spp. in North American, the thinhorn sheep (*Ovis dalli*) were the most seriously impacted, with a prevalence in Dall's sheep (*O. dalli dalli*) of 23.3% and 29.3% in Stone's sheep (*O. dalli stonei*). Among the bighorns (*O. canadensis*), the Rocky Mountain subspecies (*O. canadensis canadensis*) had a higher rate (12.1%) than other subspecies. Lumpy jaw was not documented in the desert sheep of Baja California (*O. canadensis cremnobates*, *O. canadensis weemsii*). Based on data from affected thinhorn sheep, it appears there is an inverse relationship between age of a subspecies in a long term evolutionary context and susceptibility to lumpy jaw. In Eurasian wild sheep lumpy jaw is rare or absent with prevalences ranging from 0 to 7.1% among subspecies, and in domesticated breeds the prevalence averaged 5.0%. The impact of lumpy jaw on different age classes or longevity is equivocal, although females are more susceptible than males. Lumpy jaw appears to effect horn development in males.

Hollmen, T., Franson, J., Creekmore, L., Schmutz, J., and Fowler, A., 1998. *Leucocytozoon simondi* in Emperor Geese from the Yukon-Kuskokwim Delta in Alaska. *Condor* 100 (2), 402-404. *POPULATION; birds; waterfowl; goose; parasitic infection*

We surveyed Emperor Geese (*Chen canagica*) in western Alaska for avian hematozoa. Blood smears were collected from 134 adults and goslings in late July 1996, on their breeding grounds on the Yukon-Kuskokwim Delta. One of 134 (0.7%) Emperor Geese harbored *Leucocytozoon simondi*, representing a new host record for this parasite. No other hematozoa were detected. This is one of few reports of avian blood parasites from the arctic tundra.

Hop, H., and Gharrett, A., 1989. Genetic relationships of Arctic grayling in the Koyukuk and Tanana Rivers, Alaska. *Transactions of the American Fisheries Association* 118 (3), 290-295. *POPULATION; fish; grayling; distribution; genetics*

Electrophoretic data were used to examine the stock structure of Arctic grayling *Thymallus arcticus* collected from the Yukon River drainage, Alaska. Arctic grayling were sampled from Grayling Lake in the Koyukuk River drainage and from three tributaries (Caribou Creek, Goodpaster River, and Volkmar River) entering a 60-km stretch of the Tanana River. Of 30 protein-coding loci examined, three (*Mdh-2*, *Pgm-1*, and *Sod-2*, coding for malate dehydrogenase, phosphoglucosmutase, and superoxide dismutase, respectively) were polymorphic. Differences in allele frequency between the Koyukuk and Tanana drainages accounted for about 5% of the observed variability, whereas differences among the collections from the Tanana drainage accounted for < 1%.

Howe, T.S., 2000. An investigation of environmental variables affecting concentrations of polycyclic aromatic hydrocarbons in eastern Alaska, University of Alaska Fairbanks, M.S. *AIR QUALITY; POL (petroleum/oil/lubricants = hydrocarbons); PAHs (byproducts of combustion = hydrocarbons); modeling; vegetation; spruce; wildfire; infrastructure; road*

Analytical methods for determining polycyclic aromatic hydrocarbon (PAH) concentrations in spruce needles were developed and evaluated. Concentrations of four PAHs (phenanthrene, anthracene, fluoranthene and pyrene) were determined in spruce needles collected near Eastern Alaska roadways. These needle concentrations were used to develop multivariate models that described the influence of climate and geographical variables on concentrations. These variables included latitude, longitude, radial distance from urban site, elevation, temperature, precipitation, ecosystem type, tree species, non-volatile extractable content of needles, and forest fire impact. The models show that three possible sources of PAHs exist in eastern Alaska, urban sites (Fairbanks, Anchorage and Valdez), ocean air, and forest fires. Distribution of PAHs away from these sources is strongly correlated with elevation. The general trend shows that PAH concentrations increase as elevation and proximity to sources decrease.

Hu, X., and Pollard, W., 1997. The hydrologic analysis and modelling of river icing growth, North Fork Pass, Yukon Territory, Canada. *Permafrost and Periglacial Processes* 8 (3), 279-294. *HYDROLOGY; river ice; engineering; modeling; infrastructure; bridge; road; pipeline*

River icings are common hydrologic phenomena in Arctic and sub-Arctic watersheds where their seasonal redistribution of water resources and impact on engineering structures such as highways, bridges, culverts and pipelines have long been recognized. The mechanics of icing formation, however, are still not fully understood. This paper documents river icing processes in the North Fork Pass area of northern Yukon Territory and proposes a simulation model based on water balance. The model divides river icing formation into three stages: 'freeze-up', which involves the initial formation of an ice cover; 'obstruction', where the channel experiences constricted flow due to increasing ice thickness; and 'overflow', which corresponds to the period when overflow is the dominant feature of the process. Icing growth involves different hydraulic and mechanical processes during each of the three stages. In this paper, some of the

important processes and phenomena including river icing location, the damming effect of the icing ice, the role of ice cover fractures, and the dynamic processes of icing-layer development, are discussed. The three-stage model is tested using field data, and is used to simulate the dynamics of river icing growth under different levels of initial stream discharge.

Hubartt, D., 1975. Some observations of hares and their predators in interior Alaska, University of Alaska, Fairbanks, M.S., vii, 57 leaves : ill. p *POPULATION; mammals; snowshoe hare; predation; fox; lynx; habitat selection*

Hubbs, A., and Boonstra, R., 1997. Population limitation in Arctic ground squirrels: Effects of food and predation. *Journal of Animal Ecology* 66 (4), 527-541. *POPULATION; mammals; squirrel; snowshoe hare; predation; nutrition; reproduction*

We examined the relative importance of food and predators in limiting Arctic ground squirrel (*Spermophilus parryii plesius* Richardson) populations in the boreal forest of the southwestern Yukon during the peak and early decline of a snowshoe hare cycle (*Lepus americanus* Erxleben). Squirrels were live-trapped from 1990 to 1992 on two control grids and three experimental treatments (food addition, mammalian and avian predator exclosure, and food addition plus mammalian predator exclosure). Adult squirrels were radio-collared on all areas in 1992. Food addition increased densities 3-8 times, generally increased reproductive traits (increased proportion of females lactating, doubled recruited litter sizes, resulted in earlier emergence of juveniles), increased immigration rates (but only in 1992), resulted in heavier females though not males at emergence in spring, and resulted in more rapid growth rates of juvenile males, but not of juvenile females. It had no effect on active season or overwinter survival rates. Exclusion of predators had virtually no effect on any demographic variable measured, except for population densities in 1991 when they were approximately double those of the control populations. Food addition plus exclusion of mammalian predators resulted in demographic changes that were comparable to those of food addition alone. Thus, it appeared that food, not predators, limited ground squirrel populations at this stage of the hare cycle. However, independent of experimental treatment, active season survival of adult squirrels declined markedly from 1990 (high hare numbers) to 1992 (low hare numbers). Most of the radiocollared squirrels disappearing in 1992 were killed by predators and this was coincident with high densities of predators. In the predator exclosures, all predation mortalities resulted from avian predators which we could not exclude. We conclude that both food and predators interact to limit Arctic ground squirrel populations during the peak and early decline of the hare cycle.

1998. Effects of food and predators on the home-range sizes of Arctic ground squirrels (*Spermophilus parryii*). *Canadian Journal of Zoology/Revue Canadien de Zoologie* 76 (3), 592-596. *POPULATION; mammals; squirrel; distribution; nutrition; predation*

We used radiotelemetry to study the effects of food addition and predator reduction on the home-range sizes of adult Arctic ground squirrels (*Spermophilus parryii*) on large-scale experimental grids in the boreal forest of the southwestern Yukon Territory. Home ranges were 2-7 times smaller on food-supplemented grids than on nonsupplemented grids, regardless of whether large mammalian predators were present. Similarly, core areas (where 50% of activities occur) were 8-11 times smaller on food-supplemented grids. Food availability rather than predator presence primarily determined the sizes of home ranges and core areas of Arctic ground squirrels.

Hubbs, A., Karels, T., and Boonstra, R., 2000. Indices of population size for burrowing mammals. *Journal of Wildlife Management* 64 (1), 296-301. *POPULATION; mammals; squirrel; distribution; modeling; imaging (remote sensing)*

There are few quick, precise indices for predicting population size of semifossorial mammals. We assessed the utility of powder-tracing and infrared thermal imaging to predict population size in the Arctic ground squirrel (*Spermophilus parryii*) in the boreal forest of southwestern Yukon. Density estimated from livetrapping was strongly and linearly correlated with both indices ($r = 0.81$ for powder-tracking; $r = 0.91$ for infrared imaging). The slope of the relationship between density and the infrared index (0.10) deviated from a slope of 1. The slope of the relationship between density and the powder-tracking index (0.82) did not deviate from a slope of 1, but our power to detect departures from this slope using this index was low (0.10). We recommend infrared imaging and powder-tracking for monitoring population sizes of semifossorial mammals.

Hughes, N., 1991. The behavioral ecology of arctic grayling distribution in interior Alaskan streams, University of Alaska Fairbanks, Ph. D., 124 p *INCOMPLETE (need abstract)*; *POPULATION; fish; grayling; distribution; behavior (territorial)*

1992. Selection of positions by drift-feeding salmonids in dominance hierarchies: Model and test for Arctic grayling (*Thymallus arcticus*) in subarctic mountain streams, interior Alaska. Canadian Journal of Fisheries and Aquatic Sciences/Journal Canadien des Sciences Halieutiques et Aquatiques Ottawa 49 (10), 1999-2008. *POPULATION; fish; grayling; behavior (feeding); habitat selection; modeling*

In this work I describe a model to predict position choice by each individual in a dominance hierarchy of drift-feeding stream salmonids. This is an adaptation of Hughes and Dill's model (1990. Can. J. Fish. Aquat. Sci. 47: 2039-2048) of position choice by solitary fish. I have included the effect that prey consumption, lateral diffusion of drifting invertebrates, and entry of invertebrates into the drift have on the density of prey downstream of feeding fish and the restrictions that dominant fish place on freedom of choice by their subordinates. I assume that each fish chooses the most profitable position that its rank in the hierarchy will allow. There was an encouraging match between the distribution patterns predicted by the model and the distribution patterns actually adopted by Arctic grayling (*Thymallus arcticus*) in two pools of a mountain stream. This result suggests that Arctic grayling locate and rank positions based on their profitability.

1998. Use of Whole-Stream Patterns of Age Segregation to Infer the Interannual Movements of Stream Salmonids: A Demonstration with Arctic Grayling in an Interior Alaskan Stream. Transactions of the American Fisheries Association 127 (6), 1067-1071. *POPULATION; fish; grayling; distribution; demographics*

I show how patterns of whole-stream age segregation can be used to infer interannual movements of stream salmonids. First, estimates of recruitment and mortality rates for the population as a whole are calculated using data from fish sampled along the entire length of the river. These rates are used to simulate the age structure of an idealized population. Next, each age-class is divided among lower, middle, and upstream reaches, according to the proportions observed in the real population. Finally, the amount of interannual movement is estimated from the pattern of age segregation that would exist after 1 year if recruitment and mortality were allowed to act on the simulated population but no fish moved between reaches. Application of this technique to the "older-fish-upstream" distribution pattern of Arctic grayling *Thymallus arcticus* in an Alaskan river showed that substantial movements are required to maintain the observed pattern of age segregation. Annual emigration was estimated at 24%, 11%, and 0% for downstream, midriver, and upstream reaches respectively, estimated immigration was 2%, 30%, and 51%.

1999. Population processes responsible for larger-fish-upstream distribution patterns of Arctic grayling (*Thymallus arcticus*) in interior Alaskan runoff rivers. Canadian Journal of Fisheries and

Aquatic Sciences/Journal Canadien des Sciences Halieutiques et Aquatiques Ottawa 56 (12), 2292-2299. *POPULATION; fish; grayling; distribution; demographics*

During the summer months, Arctic grayling (*Thymallus arcticus*) in Alaskan streams adopt a larger-older-fish-upstream distribution pattern. In this paper, I analyse data from two large interior Alaskan rivers to determine how population processes maintain this size and age gradient. These analyses support the hypothesis that age-phased recruitment and growth-dependent movement are primarily responsible for this distribution pattern. Age-phased recruitment describes the way that the mean age of fish recruiting to a reach increases upstream, from ages 0-1 in the lower river to ages 3-7 in the headwaters. This process begins with the concentration of spawning fish, and the resultant fry, in the lower reaches of the river. Downstream movement during the first year of life further concentrates young fish in the lower river. Over time, the distribution of this cohort broadens steadily as individuals move further upstream, so that fish recruiting to headwater reaches are 3-7 years old. This process contributes to both size and age gradients. Growth-dependent movement magnifies the size gradient by sorting fast-growing fish into the upper river and slow-growing fish into the lower river. This sorting results from the fact that individuals making long-distance upstream movements tend to have grown particularly rapidly that year, while individuals making long-distance downstream movements tend to have grown especially slowly that year. I rejected the hypothesis that age and size gradients are the result of whole-stream gradients in growth or mortality acting on a sedentary population. However, there was some evidence that fish did grow more slowly in the lowest 40 km of one river, although this made only a minor contribution to the size gradient and growth rates were remarkably constant for the next 120 km. There was no suggestion that spatial variation in mortality rate contributes towards the size or age gradient, but natural and sampling variability could have obscured small but significant differences between reaches.

Humphries, M., Thomas, D., and Speakman, J., 2002. Climate-Mediated Energetic Constraints on the Distribution of Hibernating Mammals. *Nature* 418 (6895), 313-316. *POPULATION; mammals; bat; climate; hibernation; nutrition; habitat selection*

The geographical distribution of plant and animal species is determined to a great extent by climate. However, the relationship between species distribution and annual variations in climatic patterns for a given region remains obscure. The relationship between climate and species survival can be complex. For example, the successful hibernation of mammals requires both suitable winter conditions and favorable conditions prior to hibernation. To survive the winter, the animal must be able to accumulate adequate energy reserves before hibernating. It must also be exposed to a desirable temperature range during hibernation. Researchers used the hibernation pattern of the North American little brown bat (*Myotis lucifugus*) to investigate the relationship between climate and species' energy requirements. The range of *M. lucifugus* extends across Canada and through Alaska, reaching into subarctic regions. In the coldest region of its range, the bats must rely exclusively on their own energy stores through the winter. However, because of the bats' body dynamics and lifestyle requirements (the need for agility and sustained flight for hunting), the species' pre-hibernation fat reserves must be limited. The researchers estimated the hibernation energy and fat requirements of *M. lucifugus* using a model that assumes that euthermic (normal) metabolism, torpor (hibernation state) metabolism, and metabolic expenditure during periods of arousal are temperature dependent. Hibernation site temperature and winter length were determined from climatic data. The model predicted that hibernation energy requirements are at their lowest at 2 degrees Celsius (C) but increase sharply if the temperature of the hibernation site decreases. Energy requirements are also increased, although less sharply, if the hibernation site temperature is raised about 2 degrees C, because maintaining torpor at

higher temperatures involves an additional energy expenditure. Because the temperature range required for successful hibernation is limited, a rise in global temperatures over the coming decades will push the range of *M. lucifugus* progressively northward.

Hundertmark, K.J., 2002. Phylogeography of moose (*Alces alces*): genetic signatures of population history, University of Alaska Fairbanks, Ph. D., 159 p *POPULATION; mammals; moose; genetics; distribution*

Through analysis of mitochondrial DNA (mtDNA) sequences, I examined phylogeographic relationships among moose (*Alces alces*) from Europe, Asia, and North America and inferred historic population trends explaining present-day structure of genetic variance. Diversity of nucleotide composition in cytochrome 'b' was low worldwide, with no variation detected among North American moose. The North American lineage was more closely related to European than to Asian lineages, indicating a recent colonization of North America and refuting the theory of eastern and western races of moose. An analysis of the control region provided greater resolution, which revealed similar yet more detailed patterns, including detectable variation within North America subspecies. Patterns of genetic variation among regional populations identified central Asia as the source of extant lineages of moose. Moreover, a recent coalescence was indicated, with the most recent common ancestor dating to the last ice age. Two historic expansions of moose populations were detected: an initial expansion in Eurasia coincident with an interstade of the last ice age, and a second expansion in eastern Asia and North America following the end of the last ice age. Data indicate a low effective population size in Eurasia during the peak of the last ice age followed by population and range expansion, likely facilitated by climate change. Haplotypes within North America formed a star phylogeny, indicative of recent expansion. Nucleotide and haplotype diversity were greatest in central North America and least in peripheral populations (Alaska, Colorado, and eastern North America). My data indicate a pattern of colonization consistent with a large central population providing founders for peripheral populations, perhaps resulting from leptokurtic dispersal. [?!] colonization and recent population expansion. Establishment of regional populations through small numbers of founders combined with selection pressure for smaller body size likely led to morphological differentiation among regional populations and likely was adequate for rapid development of subspecies. Nucleotide and haplotype diversity were low in southeastern Alaska, but were high in neighboring areas of British Columbia; there little sharing of haplotypes occurred despite close proximity, indicating recent admixture of separate colonizing populations

Hunter, D.B., Rohner, C., and Currie, D.C., 1997. Mortality in fledgling great horned owls from black fly hematophaga and leucocytozoonosis. *Wildlife Disease* 33 (3), 486-91. *POPULATION; birds; owl; snowshoe hare; parasitic infection; mortality; nutrition*

Black fly feeding alone and in concert with *Leucocytozoon* spp. infection caused mortality in fledgling great horned owls (*Bubo virginianus*) in the Yukon, Canada 1990 to 1991. These mortalities occurred during a year of food shortage corresponding with a decline in the population of snowshoe hare (*Lepus americanus*), the main prey for great horned owls. We hypothesize an interaction between food availability and the consequences of host-parasite interactions.

Huntington, C., 1981. Issue Paper on Subsistence King Salmon Drift Gillnetting, Yukon Area Subdistrict 4-A. Technical Paper No. 17. Alaska Department of Fish and Game, *PEOPLE; traditional food; land use*

The Galena Fish and Game Advisory Committee submitted a request to the Board of Fisheries to implement a ten-day subsistence season for the taking of king salmon by drift net on the middle Yukon River. This paper examines that request and discusses

responses to a user survey regarding traditional use, user preferences, and attitudes toward the proposal from residents of Kaltag, Nulato, Koyukuk, Galena, and Ruby.

Hutchinson, T., and Kuja, A., 1988. Use of native and agricultural plant species to re-vegetate northern mine tailings. SSCR7119431989E; ISBN066216736X; MIC9004622. Department of Indian Affairs and Northern Development. Northern Affairs Program, Ottawa (Ontario). *MINING; remediation; vegetation; recovery*

Five native plant species were selected from 2 harsh chemical environments (Smoking Hills, NWT and Sudbury, ON) which have acidic soils and heavy atmospheric pollution, as well as elevated soil metal levels. These plants were tested for their ability to survive and grow on 8 markedly different mine tailings from the Yukon, NWT and northern Ontario. From initial glasshouse trials on unamended tailings and on limed, fertilized tailings, sites were selected which represented a wide range of chemical and physical conditions. These were then used as field sites for trials of the native species, and for trials of 8 commercially used grasses and one legume. *Hordeum jubatum*, a vigorous weedy grass which colonizes disturbed areas in the sub-Arctic on neutral to alkaline soils and under drought conditions was included in the experiments and the tested tailings were chemically analysed. Droughts occurred in each year of the field trials, accentuated by the lack of soil organic matter and by the high sand content of the tailings. Amendments were made to the tailings by addition of lime to acidic ones to raise the pH, as well as additions of various combinations of peat and fertilizers. A sawdust mulch was used for half of the plots.

IHS, 1997. Final report on evaluation results for OPEL Grant # 96-N-16. Evaluation of village-based women's preventive health services by community health aides/practitioners. Indian Health Service / Yukon-Kuskokwim Health Corporation, Bethel, Alaska. *PEOPLE; health (condition); cancer; sexually transmitted disease (STD); tobacco; health care*

PURPOSE: This study was to evaluate two related pilot project initiatives recently implemented to increase the prevalence of cervical and breast cancer screening and STD screening, and reduce tobacco use among Native women in isolated villages in Southwest rural Alaska through Community Health Aids/Practitioners (CHA/Ps) in village-based clinics. The Yukon Kuskokwim Health Corporation (YKHC) conducted the long term, comprehensive evaluation to determine if this the largest health corporation in rural Alaska, should expand its village-based preventive health care services through training of all CHA/Ps in the region with additional community health education.

METHODS: Approximately 1400 women over 18 years of age, predominantly Yupik Eskimo, in eight remote village communities served by YKHC were screened to address the important implication of unmet medical needs in rural communities. The evaluation of the pilot project included: 1) comparison of screening rates in the intervention and control villages by CHA/P personnel for; Pap Smears, breast exams, STDs, tobacco education; assessment of quality of Pap Smears and cervical cancer screening services provided by CHA/Ps; 2) consumer satisfaction survey of selective services provided by CHA/Ps as compared to other health care providers; and 3) evaluation of effectiveness of community health education intervention. The evaluation extended for 18 months after initial health aide training to address the impact and feasibility of sustaining the initiatives.

RESULTS: The findings of the study address the objectives of the Alaska Area to increase cancer prevention and screening and reduce morbidity and mortality from lung, breast and cervical cancer.

CONCLUSION: The data collected by the project initiatives and the positive outcomes of this evaluation demonstrated that it was feasible to increase accessibility to selected health services for women in the Y-K Delta by providing a carefully planned advanced training and ongoing program support. This project promoted quality preventive health care services and community education efforts in villages.

2002. Division of Planning , Evaluation, and Health Statistics Web Site. Indian Health Service: <http://www.alaska.ihs.gov/dpehs/index.asp> *PEOPLE; POPULATION; infants; children; adults; mortality; health (condition); health (comparative)*

Indorf, C., Sherry, B., and Mancl, L., 2001. Comparisons of Yupik infant growth measurements with NCHS/CDC reference data. *Alaska Medicine* 43 (1), 6-12, 23. *PEOPLE; infants; health (comparative); growth/development*

The National Center for Health Statistics/Centers for Disease Control and Prevention growth reference is routinely used to monitor Yupik infant growth although Yupiks are ethnically different from the population from which the reference was developed. To clarify interpretation of Yupik infant growth data for clinical practice and public health assessment, Yupik infant growth measurements were compared with this reference. From 1990 through 1992 a convenience survey of 555 Yupik infants was completed in pediatric clinics in the Yukon Kuskokwim Delta region of Alaska. Data was analyzed using Z-score distributions of height-for-age, weight-for-age, and weight-for-height and head circumference-for-age percentiles based on the growth reference. At birth, Yupik neonates had significantly greater height- for-age and weight-for-age than the National Center for Health Statistics/Centers for Disease Control and Prevention reference. Between 1 and 12 months, Yupik infants had significantly greater weight- for-age, weight-for-height, and head circumference-for-age than the growth reference.

Irons, J.I., 1988. Life history patterns and trophic ecology of Trichoptera [caddisflies] in two Alaskan (U.S.A.) subarctic streams. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 66 (6), 1258-1265. *POPULATION; invertebrates; insects; limnology*

Nine species of Trichoptera were found: Rhyacophila vofixa (Rhyacophilidae), Glossosoma verdonia, Glossosoma alascense (Glossosomatidae), Brachycentrus americanus (Brachycentridae), Hydatophylax variabilis, Ecclisomyia conspersa, Onocosmoecus unicolor, Chyranda centralis , and Apatania crymophila (Limnephilidae). There were four shredders, three scrapers, one omnivore, and one predator. Within the shredder and scraper guilds, species had partially overlapping univoltine life histories. The trichopteran fauna of interior Alaska seems to be composed of species typical of boreal forest, with arctic, western montane, and Siberian influences.

Irons, J.I., and Oswood, M.W., 1992. Seasonal temperature patterns in an arctic and two subarctic Alaskan (USA) headwater streams. *Hydrobiologia* 237 (3), 147-157. *CLIMATE; water quality; surface water; seasonality*

Monument Creek (MC) and Little Poker Creek (LPC) are subarctic streams in interior Alaska; LPC is in a permafrost-dominated valley. Imnavait Creek (IC) is an arctic tundra beaded stream in the northern foothills of the Brooks Range. Water temperatures were recorded with automated dataloggers hourly. Water temperature rose in the spring about twice as fast in MC as in LPC, and again about twice as fast in IC as in MC. A similar pattern was observed during the autumnal decline in water temperature. Maximum daily amplitude followed a similar pattern. Although it is about 450 km north of the other streams, the tundra stream (IC) accumulated more degree-days, had higher maximum and mean temperatures, greater daily temperature amplitude, and steeper slopes of vernal temperature rise and autumnal temperature decline than the subarctic streams (LPC and MC). The absence of a canopy of riparian plants, channel morphology, and continuous sunlight during the arctic mid-summer accounted for these higher

temperatures. Beaded tundra streams provide a highly seasonal (< 120 d ice-free) and spatially and temporally complex thermal environment.

Irons, J.G., 1993. Latitudinal gradients in leaf litter decomposition in streams : effects of leaf chemistry and temperature, University of Alaska Fairbanks, Ph. D. *WATER QUALITY; surface water; vegetation; nutrient cycling; climate*

Irons, J.I., Miller, L., and Oswood, M.W., 1993. Ecological adaptations of aquatic macroinvertebrates to overwintering in interior Alaska (U.S.A.) subarctic streams. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 71 (1), 98-108. *POPULATION; invertebrates; insects; seasonality; limnology; climate; hydrology; freeze-thaw cycles; river ice*

Freshwater invertebrates of northern regions are faced annually with freezing of shallow habitats. Several responses to habitat freezing are possible, including migration to favorable habitats and physiological adaptations such as freeze-avoidance or freeze-tolerance. We thawed sections of frozen stream gravel and identified the live and dead invertebrates present. Chironomidae and Empididae (Diptera [true flies]) constituted > 90% of individuals found in frozen habitats: Empididae showed substantial survival in frozen habitats. We also tested the ability of Alaska stream invertebrates to survive in habitats that freeze. In a series of laboratory experiments we showed that most taxa found in Alaskan streams do not have the ability to survive even moderately subzero temperatures (e.g., -1.0 degree C). When faced with an advancing freezing front, these taxa actively moved away. We suggest that most aquatic invertebrate taxa survive winter by either migrating away from a freezing front or remaining in habitats that do not freeze. Chironomidae and Empididae, however, can overwinter in frozen habitat, and Empididae show high survival upon thawing of frozen stream gravels. Predicted changes in temperature and precipitation patterns at these latitudes due to global climate warming may have effects on the availability of overwintering habitat for stream invertebrates that result in changes in the structure and function of high-latitude stream ecosystems.

Irons, J.I., and Oswood, M.W., 1997. Organic matter dynamics in 3 subarctic streams of interior Alaska, USA. *Journal of the North American Benthological Society* 16 (1), 23-28. *HYDROLOGY; ground ice / permafrost; sediment; climate; snow*

The predominant biome in interior Alaska is known as the taiga, or northern boreal forest. In these high latitude forests (about 60 degree N-67 degree N in Alaska), the angle of solar radiation with respect to the land surface is a major factor controlling ecological processes, including those relevant to organic matter dynamics in streams. Sun angle determines mean annual air temperature, which in interior Alaska is about -3.3 degree C. Temperature extremes in this continental climate can range from -50 to +35 degree C. One result of this harsh thermal regime is the presence of permafrost in the colder microclimates. Indeed, much of interior Alaska is in the zone of discontinuous permafrost, in which south-facing slopes are generally permafrost-free, and cold north-facing slopes and poorly drained valley bottoms are generally underlain by permafrost. Soil carbon densities reflect the balance between input (organic matter production) and decomposition. In the cold and often water-saturated soils common at high latitudes, decomposition is reduced and soil carbon may accumulate as peat over very long time periods. Thus there is often a positive relationship between the amount of soil organic matter and the amount of permafrost in a watershed. Permafrost affects the hydrological regimes of subarctic streams. Streams dominated by permafrost are more "flashy" than those that are relatively permafrost-free. Snowmelt runoff is later and greater in a permafrost-dominated basin than snowmelt runoff from a permafrost-free basin. Likewise, peak stormflow discharge from a permafrost-dominated basin is much higher than in a non-permafrost stream; but during rain-free periods and in winter, flow is much lower. This pattern is a result of the flow-paths of precipitation as it travels to the stream.

On permafrost-dominated north-facing slopes, precipitation enters the thick organic layer and flows above the permafrost to the stream. On permafrost-free south-facing slopes, precipitation enters the groundwater and is released much more slowly to the stream. Differences in discharge result in different patterns of carbon and sediment flux from basins with differing amounts of permafrost.

Isbell, M.A., 2000. Benzene and toluene mixing ratios in indoor air of homes with attached garages and measurement of respective biomarkers of exposure and ventilation effects, University of Alaska Fairbanks, Ph. D., 133 p *AIR QUALITY (indoor); POL (petroleum/oil/lubricants = hydrocarbons)*

Benzene and toluene mixing ratios were measured in the indoor air of homes with attached garages for several seasons using a thermal desorption GC-FID sampling and analysis protocol (EPA T0-17). Benzene in the living area of these homes ranged from 1-72 ppbv and toluene ranged 3-111 ppbv. The garage levels of benzene ranged from 8-304 ppbv and the toluene levels ranged from 14-591 ppbv. Numerous experiments and a model support the hypothesis of a single source of toluene and benzene. Source strength estimate calculations supported the hypothesis that gasoline in the attached garage is the primary source of these compounds in living area air. They also showed that the home with the air-to-air heat exchangers and forced ventilation had less transport of aromatics than an unventilated home. Perturbation experiments showed that a metal gas can filled with gasoline in the garage and an indoor window open were important factors for benzene and toluene levels in the living areas of the homes. For most experiments, weighted regression analyses of toluene and benzene mixing ratios were consistent with a sole source. Finally, no correlation was observed between the levels of benzene and toluene measured in living areas and their respective urinary biomarkers: t,t-MA and hippuric acid

Jack, M., Osler, T., and Burns, B., 1983. Water quality-Yukon River Basin. Water quality work group report ; no. 1. Indian and Northern Affairs Canada, Northern Affairs Program, Whitehorse. *INCOMPLETE (need abstract); WATER QUALITY; HYDROLOGY; ground water; surface water*

Jaffe, D., and Zukowski, M., 1993. Nitrate deposition to the Alaskan snowpack. *Atmospheric Environment* 27A (17-18; Arctic Air, Snow, and Ice Chemistry), 2935-2941. *AIR QUALITY; acidification; snow*

Snowpack samples were collected from interior and arctic Alaska during March 1988 and analysed for pH, conductivity, NO_3^- , SO_4^{2-} and other constituents. The mean snowpack NO_3^- , SO_4^{2-} concentrations in the interior Alaska snowpack were found to be 160 and 179 ng per g, respectively. The interior snowpack was observed to have concentrations and deposition fluxes of NO_3^- which are approximately 1.5 and 1-3 times, respectively, those observed in Greenland. In the arctic samples, collected in the Sagavanirktok River Valley, wind-deposited loess substantially increases both pH and SO_4^{2-} concentrations in the snowpack. Snowpack nitrate in these samples is unaffected by the windborne loess and had a mean NO_3^- concentration of 688 ng per g. The NO_3^- deposition flux in the Arctic is approximately two times that found in the interior snowpack. The most plausible explanation for the elevated NO_3^- deposition flux is that the snowpack deposition is strongly influenced by the presence of the "arctic front", a meteorological boundary which acts to contain the polluted, arctic air mass. Alternatively, local NO_x emissions on Alaska's arctic coast or substantial changes in the scavenging efficiencies may also influence the observed north-south gradient in NO_3^- concentrations in the snowpack.

Jasek, M., 1998. 1998 break-up and flood on the Yukon River at Dawson- did El Nino and climate change play a role? *Proceedings The 14th International Symposium on Ice*, Clarkson University, Potsdam NY *INCOMPLETE (need abstract); CLIMATE; river ice; flooding*

Jeffery, B.L., 1998. Social determinants of self-rated health: the interaction of gender with socioeconomic status and social relationships in the Yukon, University of British Columbia, Ph. D., 258, ill. p *PEOPLE; health (condition); health (comparative); economics; demographics*

Jin, Y., 1996. A market test of the contingent valuation method: the case of bison hunting permits in Alaska, University of Alaska, Fairbanks, M.S., 62 p *INCOMPLETE (need abstract); PEOPLE; economics; mammals; bison*

Jodwalis, C.M., 1986. Triterpenes of thin leaf alder (*Alnus incana*), University of Alaska, Fairbanks, M.S., 67 p *VEGETATION; alder; chemical defense; herbivory*

John, E., and Turkington, R., 1995. Herbaceous vegetation in the understorey of the boreal forest: Does nutrient supply or snowshoe hare herbivory regulate species composition and abundance? *Journal of Ecology* 83 (4), 581-590. *VEGETATION; nutrition; herbivory (mammal); snowshoe hare*

The impact of nutrient addition and mammalian exclosures on the above-ground biomass and species composition of the understorey vegetation of the boreal forest were investigated in three field experiments. Experiment 1 was run from 1990-92 during which time the major herbivore, the snowshoe hare, declined dramatically in numbers. It combined the addition of nutrients with the exclusion of herbivores in a 2 x 2 factorial design. Experiment 2 was run over an 8-week period in 1991, and tested the effects of exclosures on above-ground plant biomass at a range of snowshoe hare densities. Experiment 3 examined the effects of longer-term (6-year) exclosures, erected in 1987, on understorey species composition. At natural densities, the impact of herbivores on vegetation is low compared with the effect of fertilizers. Fertilizer resulted in some species increasing in abundance and others decreasing. Where herbivores were at artificially high densities their impact was greater. There is a natural dynamic to the system as some species changed in abundance in control plots during the experiment. The results suggest that both the composition and abundance of herbaceous vegetation in the boreal forest are determined more by the productivity of the site than the activities of mammalian herbivores, at least during the period of the experiments when hare numbers were declining naturally.

1997. A 5-year study of the effects of nutrient availability and herbivory on two boreal forest herbs. *Journal of Ecology* 85 (4), 419-430. *VEGETATION; bluebells; lungwort; anemone; nutrition; herbivory (mammal); snowshoe hare*

The responses of populations of *Mertensia paniculata* (bluebells or lungwort) and *Anemone parviflora* (small-flowered anemone) to herbivore exclosure and fertilization in a factorial experiment were monitored over a 5-year period beginning at peak herbivore (hare) densities during the snowshoe hare population cycle. For each species the population density, number and size of leaves and the number of flowers were measured. Both species responded more strongly to fertilizer addition than to the exclusion of herbivores. *Mertensia* produced more flowering stems, more leaves per stem, and stem density increased in the fertilized plots. Fertilizing increased total leaf length per plant for non-flowering stems but this was not observed for flowering stems. However, the net effect of having more flowering stems and having greater leaf area on non-flowering stems was to increase the total leaf area of the population. The responses of *Mertensia* make it likely to become a stronger competitor in a more productive plant community. *Anemone* showed contrasting responses at both individual and population levels. While individual stems produced slightly more leaves in fertilized plots, the density of stems declined. There were no strong effects on either leaf size or flowering. There was evidence of higher leaf turnover in fertilized plants. Meanwhile, control and exclosed

unfertilized plots showed an increase in population density. The weak responses to herbivory may be explained by the timing; this part of the experiment was run during a period of declining herbivore activity. However, observed interaction effects suggest that those herbivores remaining in the system may be attracted to fertilized plots. It is planned to continue the experiment for at least another 5 years through, and beyond, the next hare peak.

Johnson, L., Sparrow, E., Jenkins, T., Collins, C., Davenport, C., and McFadden, T., 1980. The fate and effects of crude oil spilled on subarctic permafrost terrain in interior Alaska. EPA-600/3-80-040; CRREL Acc. No.: 34004079. U.S. Environmental Protection Agency. Environmental Research Laboratory., *CONTAMINANTS; POL (petroleum/oil/lubricants = hydrocarbons); fate; ground ice / permafrost; snow*

This study was conducted to determine both the short- and long-term effects of spills of hot Prudhoe Bay crude oil on permafrost terrain in subarctic interior Alaska. Two experimental oil spills of 7670 liters (2000 gallons) each on 500 sq m plots were made at a forest site underlain by permafrost near Fairbanks, Alaska. The oil spills, one in winter and one in summer, were conducted to evaluate their effect during these two seasonal extremes. Oil movement, thermal regime, botanical effects, microbiological responses, permafrost impact, and composition of the oil in the soil were monitored for two years. The results indicate that oil movement during the winter spill occurred within the surface moss layer beneath the snow. In the summer spill, movement of the oil was primarily below the moss in the organic soil. The oil movement in the summer spill was more rapid, moving 30 m downslope in the first 24 hours and 41 m total through the summer. The oil in the winter spill moved only 18 m downslope in the first day and stopped. Remobilization occurred in the spring allowing the oil in the winter spill to move an additional 17 m. The total area affected by the summer spill was nearly one and one-half times as large as the winter spill.

Johnson, P., and David, C., 1988. Impacts on river discharge of changes in glacierized components of mountain basins. *Water pollution research journal of Canada* 22 (4), 518-529. *HYDROLOGY; water quality; glacial discharge; sediment; flooding*

A reliable and predictable water supply is essential to any development in mountainous regions. Large glacierized components of basins can produce surplus or deficit conditions as climate changes from season to season and as the ice extent fluctuates through time. Shorter time frame glaciological changes can produce stream diversion, catastrophic floods or very irregular flow regimes. The major impact on water quality is the high level of and variations in sediment load concentrations which occur with the regime fluctuations. Sediment concentration regimes occur both in phase and out of phase with flow regimes.

Johnson, R., Hinzman, L., and Kane, D., 1994. Contaminant Transport Processes at Fort Wainwright, Alaska; Results of Tracer Studies. Technical Report. Water Resources Center, University of Alaska, Fairbanks.

<http://www.uaf.edu/water/projects/ftww/publications/publication.html#abstracts> *INCOMPLETE (need abstract); CONTAMINANTS; transport; HYDROLOGY; modeling; ground water; surface water; ground ice / permafrost; military*

Johnson, R., Kane, D., Hinzman, L., Light, G., and Farris, A., 1996. Modeling of Contaminant Transport in Groundwater in Regions of Discontinuous Permafrost. *Proceedings Eighth International Conference on Cold Regions Engineering*, p. 82-93 *INCOMPLETE (need abstract); CONTAMINANTS; HYDROLOGY; transport; military; modeling; ground water; surface water; ground ice / permafrost; engineering; infrastructure*

Johnson, A.K., 1999. Breeding bird density and species diversity in relation to primary productivity in the Tanana River floodplain, University of Alaska Fairbanks, M.S., 89 p
POPULATION; birds; behavior (reproductive/nesting); behavior (territorial); habitat selection; modeling; vegetation; succession; flooding

Contents: Ch. 1. Primary productivity and bird community structure in a boreal forest floodplain -- Ch. 2. Habitat use by neotropical migrants in a boreal forest floodplain.

Landbirds were censused in the Tanana River floodplain during the summers of 1995 and 1996. Two 10.5 hectare bird census plots were placed in willow-alder, white spruce, and black spruce forest. We used spot mapping data from these plots to learn about bird habitat associations at two spatial scales. At the scale of habitat type, we investigated the relative influences of structural complexity of vegetation, stage of succession, and primary productivity on the breeding bird community. Bird species richness and territory density in the three habitat types were highly positively correlated with primary productivity. At the spatial scale of an individual territory, detailed vegetation measurements recorded within 42 subplots on each census plot were used to formulate logistic regression models. These models describe habitat characteristics associated with territory presence for 11 bird species that were most common. Vegetation structure and plant species composition were important determinants of territory presence.

Johnson, M., Moore, M., Mitchell, P., Owen, P., and Pilby, J., 2000. Serious and fatal firearm injuries among children and adolescents in Alaska: 1991-1997. *Alaska Medicine* 42 (1), 3-10, 27. *PEOPLE; children; adolescents; mortality; firearms*

STUDY OBJECTIVE: To describe demographics, causal factors, intent, and incident locations of serious and fatal firearm injuries among children and adolescents in Alaska, for the years 1991 through 1997. METHODS: Data from the Alaska Trauma Registry plus Vital Statistics death certificates were reviewed for a seven-year period (1991-1997). Data elements included are: intent (ICD 9-CM E-Codes and narratives); age group; region of incident; place of occurrence; alcohol or drug involvement; type of firearm used; and perpetrator. RESULTS: During the seven-year study period, 222 children and adolescents ages 0-19 years were admitted to a hospital for a non-fatal firearm injury, plus 165 others received fatal firearm injuries. Of these 387 serious and fatal injuries, 34.9% (135) were determined to be unintentional, 36.4% (141) were suicides or suicide attempts, 23.3% (90) were homicide/assaults, 0.5% (2) were legal intervention, and for 4.9% (19) intent was unknown. Rates of serious and fatal firearm injuries per 100,000 youth for the six-year study period ranged from 14 in the Fairbanks North Star Borough and the Kenai Peninsula Borough to 105 in the Yukon-Kuskokwim Region. The statewide average for this period was 27.1 per 100,000 children and adolescents. CONCLUSIONS: Firearm injuries are a leading cause of serious and fatal injuries to children and youth in Alaska. This study suggests that many children and adolescents in Alaska who were injured by firearms, or who caused injury to other children or youth by firearms, had easy access to them. Efforts should be made to convince adults not to let children or at risk teenagers have unsupervised access to firearms, and to promote safe storage of firearms.

Jorgensen, J.L., 2001. Phylogenetic relationships of the *Oxytropis campestris* and *Oxytropis arctica* complexes in Alaska inferred from non-coding nuclear DNA and RAPD data, University of Alaska Fairbanks, M.S., 59 p *VEGETATION; locoweed; genetics*

The taxonomy and evolutionary relationships of the *Oxytropis arctica* and *Oxytropis campestris* complexes in Alaska are poorly understood. Taxonomic disagreement has centered on which morphological characters are important in circumscribing these taxa. Several of these taxa are endemic to Alaska, including *Oxytropis arctica* var. *barnebyana*, which is currently of conservation concern. Internal transcribed spacer sequences and randomly amplified polymorphic DNA markers were employed to circumscribe these

taxa. Both lines of evidence revealed one major dichotomy dividing northern populations from western populations. There is weak support for traditional taxonomies.

Morphological characters used to separate these taxa do not assort to either side of the dichotomy. These traits may be controlled by one or a few genes and may not represent degrees of divergence. They may have been derived independently in each population in response to adaptation to local environmental conditions, changing quickly in response to natural selection, genetic drift, mutation, or migration.

Jorgenson, M., 2000. Hierarchical Organization of Ecosystems at Multiple Spatial Scales on the Yukon-Kuskokwim Delta, Alaska, U.S.A. *Arctic, Antarctic, and Alpine Research* 32 (3), 221-239. *CLIMATE; sea level; vegetation; risk assessment; flooding; sediment*

I conducted an ecological land survey near Hazen Bay, on the Yukon-Kuskokwim Delta of Alaska during 1994-1998 in order to assess potential effects of sea-level rise on coastal ecosystems in this region. Independent classification of three landscape components grouped ecological characteristics of the area into 10 geomorphic units (e.g., tidal flats, abandoned floodplain cover deposits), 9 surface forms (e.g., levees, basins), and 18 plant associations (e.g., *Carex rariflora*-*Salix fuscescens*). I then used hierarchical associations among these landscape components to derive an ecosystem classification at three levels of organization that included 10 ecosections (based on geomorphology), 11 ecoseries (based on surface forms and geomorphology), and 27 ecotypes (primarily based on vegetation). The nature and distribution of ecosystems at all levels showed a strong influence from geomorphic processes. The active floodplain, with frequent flooding and sedimentation, had brackish ecotypes that were dominated by graminoids and forbs. The inactive floodplain, where flooding and sedimentation were infrequent, had slightly brackish ecotypes with a wide diversity of species and growth forms. In contrast, the abandoned floodplain, which lacked flooding and sediment deposition, but was strongly affected by permafrost aggradation, had ecotypes that were dominated by evergreen shrubs, mosses, and lichens that were intolerant to salts, but tolerated acidic, nutrient-poor conditions. Ecotypes with similar vegetation generally had similar environmental properties, including surface elevation, soil morphology, sedimentation, organic matter accumulation, thaw depths, water depths, pH, and electrical conductivity. When similar ecotypes were aggregated into ecosections based on geomorphic similarities, differences in ecological properties increased.

2001. An ecological land survey for Fort Greely, Alaska. TR-01-4. US Army Corps of Engineers, Engineer Research and Development Center, Hanover, N.H. *INCOMPLETE (need abstract); MILITARY; ecology; mapping*

Jorgenson, T., and Ely, C., 2001. Topography and Flooding of Coastal Ecosystems on the Yukon-Kuskokwim Delta, Alaska: Implications for Sea-Level Rise. *Journal of Coastal Research* 17 (1), 124-136. *CLIMATE; hydrology; sediment; ground ice / permafrost; ecology; distribution; flooding*

We measured surface elevations, stage of annual peak flooding, and sedimentation along 10 toposequences across coastal ecosystems on the Yukon-Kuskokwim (Y-K) Delta in western Alaska during 1994-1998 to assess some of the physical processes affecting ecosystem distribution. An ecotype was assigned to each of 566 points, and differences in elevations among 24 ecotypes were analyzed within individual toposequences and across the 40 x 40-km study area. Elevations of vegetated ecotypes along the longest toposequence rose only similar to 1 m over a distance of 7.5 km, and mean elevations of most ecotypes across the study area were within 0.5 m of mean higher-high water (1.47 m). During 1994 to 1998, monitoring of annual peak stage using crest gauges revealed flooding from the highest fall storm surge reached 2.58 m (1.11 m above mean higher-high tide). In each year, only the highest surface was unaffected by flooding. Mean

annual sedimentation rates for the various ecotypes were 8.0 mm/y on tidal flats, 1.4 to 3.8 mm/y on the active floodplain, 0.1-0.2 mm/y on the inactive floodplain, and 0 mm/y on the abandoned floodplain. If sea levels in the Bering Sea rise similar to 0.5 m by 2100, as predicted by some on a global basis, large portions of the coastal margin of the delta could be regularly inundated by water during high tides, and even the highest ecotypes could be affected by storm surges. Predicting the extent of future inundation is difficult, however, because of the changes in the ground-surface elevation through sedimentation, organic matter accumulation, and permafrost development.

Joy, P.J., 2001. Hepatitis B in Arctic ground squirrels (*Spermophilus parryi*): epidemiology and population biology, University of Alaska Fairbanks, M.S., 90 p *POPULATION; mammals; rodents; squirrel; mortality; health (condition)*

Using a mark-recapture design, an epidemiological investigation of Hepatitis B was performed on four colonies of *Spermophilus parryi*. Animals were trapped, marked and bled. Serum samples were screened for Hepatitis B markers. Program MARK was used to estimate survival rates. Prevalence rates ranged over 55% and 1999 rates were 10% higher than 1998. Vertical transmission of the virus was not observed and juveniles were unaffected by the mother's hepatitis status. Immigrants had lower prevalence rates than residents and incidence rates accelerated throughout the study. Survival was highest during the over-winter period and adult rates were lower in 1999. Recovered animals had different survival rates than other animals and survival rates of recovered animals were lower in 1999. Evidence suggests that delayed development of disease and/or environmental conditions lowered survival rates of recovered adults in 1999. Techniques that integrated epidemiology and population biology proved fruitful and worthy of further development

Karamanski, T.J., 1980. The last divide: fur trade and the exploration of the far Northwest, 1821-1852, Loyola University of Chicago, Ph. D. *POPULATION; trapping; non-indigenous*

Karels, T., and Boonstra, R., 2000. Concurrent density dependence and independence in populations of arctic ground squirrels. *Nature* 408, 460 - 463. *POPULATION; mammals; squirrel; mortality; hibernation*

No population increases without limit. The processes that prevent this can operate in either a density-dependent way (acting with increasing severity to increase mortality rates or decrease reproductive rates as density increases), a density-independent way, or in both ways simultaneously. However, ecologists disagree for two main reasons about the relative roles and influences that density-dependent and density-independent processes have in determining population size. First, empirical studies showing both processes operating simultaneously are rare. Second, time-series analyses of long-term census data sometimes overestimate dependence. By using a density-perturbation experiment on arctic ground squirrels, we show concurrent density-dependent and density-independent declines in weaning rates, followed by density-dependent declines in overwinter survival during hibernation. These two processes result in strong, density-dependent convergence of experimentally increased populations to those of control populations that had been at low, stable levels.

Karels, T., Byrom, A., Boonstra, R., and Krebs, C., 2000. The interactive effects of food and predators on reproduction and overwinter survival of arctic ground squirrels. *Journal of Animal Ecology* 69 (2), 235-247. *POPULATION; mammals; squirrel; predation; nutrition; reproduction*

1. We examined the effects of food and predators on population limitation in the arctic ground squirrel (*Spermophilus parryi plesius* Richardson) in the boreal forest of the south-western Yukon. We focused on ground squirrel reproduction and overwinter survival. 2. Squirrel populations were monitored by live-trapping and radio-telemetry from 1993 to the spring of 1996 on four control and four experimental areas (one predator

enclosure treatment, two food addition treatments, and one predator enclosure plus food addition treatment). 3. Predator exclusion increased body condition, percentage lactating, percentage weaning litters, litter size, and doubled population density relative to controls, but had no effect on juvenile growth rate, overwinter survival, or juvenile emergence date. 4. Food addition advanced juvenile emergence date and increased adult body condition, percentage lactating, percentage weaning litters, litter size, population density relative to controls (4-7 fold), but had no effect on juvenile growth rate or overwinter survival. 5. Predator exclusion combined with food addition increased adult body condition, percentage lactating, percentage weaning litters, population density relative to controls (19-fold). 6. We conclude that arctic ground squirrels in the boreal forest are limited by an interaction between food and predation, acting primarily through changes in reproduction, and that their impact on density was multiplicative.

Karle, K., and Densmore, R., 1994. Stream and Floodplain Restoration in a Riparian Ecosystem Disturbed by Placer Mining. *Ecological Engineering* 3, 121-133. *HYDROLOGY; surface water; mining; reclamation; flooding; sediment; vegetation; alder*

Techniques for the hydrologic restoration of placer-mined streams and floodplains were developed in Denali National Park and Preserve Alaska, USA. The hydrological study focused on a design of stream and floodplain geometry using hydraulic capacity and shear stress equations. Slope and sinuosity values were based on regional relationships. Design requirements include a channel capacity for a 1.5 year (bankfull) discharge and floodplain capacity for a 1.5 to 100 year discharge. Concern for potential damage to the project from annual flooding before natural revegetation occurs led to development of alder (*Alnus crispa*) brush bars to dissipate floodwater energy and encourage sediment deposition. The brush bars, constructed of alder bundles tied together and anchored laterally adjacent to the channel, were installed on the floodplain in several configurations to test their effectiveness. A moderate flood near the end of the two-year construction phase of the project provided data on channel design, stability, floodplain erosion, and brush bar effectiveness. The brush bars provided substantial protection, but unconsolidated bank material and a lack of bed armour for a new channel segment led to some bank erosion, slope changes and an increase in sinuosity in several reaches of the study area.

Karle, K., Merli, J., and Carlson, R., 1998. Placer-mine site reclamation evaluation in Alaska. *Proceedings The 1998 ASCE Wetlands Engineering River Restoration Conference*, Denver, CO, ASME, Fairfield, NJ, (USA), p. 6 *MINING; gold; surface water; hydrology; reclamation; vegetation; engineering; flooding*

Currently applied stream channel reclamation techniques utilized by placer-gold miners in Interior Alaska are frequently not successful in meeting reclamation goals required by various land management agencies. Upper basin channels with a gradient of one percent or greater are particularly at risk of failure after reclamation. Surveys were conducted on thirteen previously reclaimed streams in order to analyze each site's hydraulic capacity and fluvial stability. Morphological parameters were compared to established values which are generally considered to represent stable channels, using the Rosgen stream type classification system. Additionally, surveyed channel width and depths were compared with dimensions derived from relationships in the literature for hydraulically stable, gravel-bed streams. The Corps of Engineers HEC-RAS program and field data were used to model flood events and estimate velocities and shear stresses in the channels and overbanks. Analyses indicated that most stream channels were constructed with, or quickly developed, excessively large width-depth ratios, steep energy gradients, and low sinuosities. These factors, combined with low rates of natural revegetation common to subarctic climates, resulted in failure (continued erosion and bank instability) for most of the thirteen sites.

Karron, R., Singleton, R., Bulkow, L., Parkinson, A., Kruse, D., DeSmet, I., Indorf, C., Petersen, K., Leombruno, D., Hurlburt, D., Santosham, M., and Harrison, L., 1999. Severe respiratory syncytial virus disease in Alaska native children; RSV Alaska Study Group. *Journal of Infectious Disease* 180 (1), 41-49. *PEOPLE; infants; children; respiratory infection; health (comparative)*
Hospitalization rates for respiratory syncytial virus (RSV) infection range from 1 to 20/1000 infants. To determine the rate and severity of RSV infections requiring hospitalization for infants in the Yukon-Kuskokwim (YK) Delta of Alaska, a 3-year prospective surveillance study was conducted. The annual rate of RSV hospitalization for YK Delta infants <1 year of age was 53-249 /1000. RSV infection was the most frequent cause of infant hospitalization. RSV disease severity did not differ among non-high-risk infants in the YK Delta and at Johns Hopkins Hospital (JHH). On average, 1/125 infants born in the YK Delta required mechanical ventilation for RSV infection. During the peak season, approximately \$1034/child <3 years of age was spent on RSV hospitalization in the YK Delta. In YK Delta infants RSV microneutralizing antibody titers <1200 were associated with severe disease (odds ratio=6.2, P=.03). In the YK Delta and at JHH, newborns may be at greater risk for severe RSV illness than previously thought.

Kasichke, E., and Stocks, B., eds., 1999. *Fire, Climate Change, and Carbon Cycling in North American Boreal Forests*. Ecological Study Series Volume 138. Springer-Verlag, New York. *REFERENCE; CLIMATE; NUTRIENT CYCLING; carbon; wildfire; vegetation*

A discussion of the direct and indirect mechanisms by which fire and climate interact to influence carbon cycling in North American boreal forests. The first section summarizes the information needed to understand and manage fires' effects on the ecology of boreal forests and its influence on global climate change issues. Following chapters discuss in detail the role of fire in the ecology of boreal forests, present data sets on fire and the distribution of carbon, and treat the use of satellite imagery in monitoring these regions as well as approaches to modeling the relevant processes.

Contents: Preface.- Introduction.- Section I: Information Requirements and Fire Management and Policy Issues.- The Role of Boreal Ecosystems in the Global Carbon Cycle.- Boreal Forest Fire Emissions and the Chemistry of the Atmosphere.- The Eurasian Perspective of Fire: Dimension, Management, Policies and Scientific Requirements.- Fire Management in the Boreal Forests of Canada.- Effects of Climate Change on Management, Policy and Mitigation Options in the Boreal Forest.- Section II: Processes Influencing Carbon Dynamics in the Boreal Forest.- The Distribution of Forest Ecosystems and the Role of Fire in the North American Boreal Region.- Extent, Distribution and Ecological Role of Fire in Russian Forests.- Long-term Perspectives on Fire-Climate-Vegetation Relationships in the North American Boreal Forest.- Controls on Patterns of Biomass Burning in Alaskan Boreal Forests.- Post-Fire Stimulation of Microbial Decomposition in Black Spruce (*Picea mariana* L.) Forest Soils: A Hypothesis.- The Influence of Fire on Long-Term Patterns of Forest Succession in Alaskan Boreal Forests.- Section III: Spatial Data Sets for the Analysis of Carbon Dynamics in Boreal Forests.- And much more....

2000. *Fire, Climate Change and Carbon Cycling in North American Boreal Forests*. Ecological Study Series. Springer-Verlag, New York. v. 138 *NUTRIENT CYCLING; carbon; climate; vegetation; wildfire*

A discussion of the direct and indirect mechanisms by which fire and climate interact to influence carbon cycling in North American boreal forests. The first section summarizes the information needed to understand and manage fires' effects on the ecology of boreal forests and its influence on global climate change issues. Following chapters discuss in detail the role of fire in the ecology of boreal forests, present data sets on fire and the

distribution of carbon, and treat the use of satellite imagery in monitoring these regions as well as approaches to modeling the relevant processes.

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Kasischke, E., French, N., Harrell, P., Christensen, N.J., Ustin, S., and Barry, D., 1993. Monitoring of wildfires in boreal forests using large area AVHRR NDVI composite image data. *Remote Sensing of Environment* 45 (1), 61-71. *VEGETATION; wildfire; imaging (remote sensing); mapping*

Normalized difference vegetation index (NDVI) composite image data, produced from AVHRR data collected in 1990, were evaluated for locating and mapping the areal extent of wildfires in the boreal forests of Alaska during that year. A technique was developed to map forest fire boundaries by subtracting a late-summer AVHRR NDVI image from an early summer scene. The locations and boundaries of wildfires within the interior region of Alaska were obtained from the Alaska Fire Service, and compared to the AVHRR-derived fire-boundary map. It was found that AVHRR detected 89.5% of all fires with sizes greater than 2000 ha with no false alarms and that, for most cases, the general shape of the fire boundary detected by AVHRR matched those mapped by field observers.

Keech, M.A., 1999. Life-history consequences of maternal condition in Alaskan moose, University of Alaska Fairbanks, M.S., 47 p *POPULATION; mammals; moose; health (condition); reproduction; behavior (reproductive/nesting); mortality; growth/development; nutrition; predation*

Summary: "Characteristics of life-history of Alaskan moose (*Alces alces gigas*) including the effects of maternal condition of adult females on survival and physical condition of young during their first year-of-life" were studied. "Also examined" was "the relation between maternal condition and reproductive parameters of individual adult moose." It was "found that females in better physical condition, as indexed by rump-fat thickness, had higher rates of pregnancy, gave birth to more twins, and produced young with higher birth masses than did females with less rump fat. Expected time-to-death for individual young increased as birth mass increased and decreased with increasing birth date and litter size." The "results indicated maternal condition influenced subsequent variables associated with birth, which ultimately influenced future survival of offspring. Timing of parturition also occurred earlier for individual females with greater rump-fat thickness. That outcome suggested that timing of parturition was the result of environmental factors acting on females prior to birth" - UAF library bibliography

Kellner, F., Webster, I., and Chanteloup, F., 1996. Describing and predicting alcohol use-related harm: an analysis of the Yukon Alcohol and Drug Survey. *Substance Use and Misuse* 31 (11-12), 1619-38. *PEOPLE; alcohol*

During 1990 the Yukon Bureau of Statistics conducted an alcohol and drug survey with a sample of 1,348 residents of the Territory, aged 15 and over. Over three-quarters of the sample reported experiencing at least one type of harm from others' drinking during the past year, and over a half experienced two or more types of harm. Among the main predictors of prevalence and extent of harm were respondents' age (younger), a greater number of drinks per occasion, close associates with alcohol problems, and residing in smaller communities. The results are discussed in terms of their relevance to identifying vulnerable groups and informing policy aimed at reducing alcohol use-related harm.

Kellogg, J.E., 1975. The impact of the railroad upon a frontier region: the case of Alaska and the Yukon, Indiana State University, Ph. D., 160 p *INCOMPLETE (need abstract)*; *INFRASTRUCTURE*; *railroad*; *economics*; *health (effects)*

Kelly, D., 1978. Population density, territoriality, and foraging ecology of red squirrels (*Tamiasciurus hudsonicus*) in black and white spruce forests of interior Alaska, University of Alaska, Fairbanks, M.S., 123 p *INCOMPLETE (need abstract)*; *POPULATION*; *mammals*; *squirrel*; *distribution*; *behavior (feeding)*; *behavior (reproductive/nesting)*; *ecology*; *black spruce*; *white spruce*

Kertell, K., 1991. Disappearance of the Steller's eider from the Yukon- Kuskokwim delta, Alaska. *Arctic* 44, 177-187. *INCOMPLETE (need abstract)*; *POPULATION*; *waterfowl*; *eider*; *distribution*; *contaminants*; *lead*; *hunting*; *habitat selection*

Kessel, B., and Gibson, D.D., 1978. Status and distribution of Alaska birds. *Studies in Avian Biology* 1, 100 pp. *INCOMPLETE (need abstract)*; *POPULATION*; *birds*; *distribution*; *health (condition)*

1994. A century of avifaunal [bird population] change in Alaska. *Studies in Avian Biology* 15 (A century of avifaunal change in western North America), 4-13. *INCOMPLETE (need abstract)*; *POPULATION*; *birds*; *distribution*

Kesterson, M.B., 1988. Lynx home range and spatial organization in relation to population density and prey abundance, University of Alaska Fairbanks, M.S., 66 p *POPULATION*; *mammals*; *lynx*; *behavior (territorial)*; *distribution*; *habitat selection*; *nutrition*; *predation*

Kettl, P., Collins, T., Sredy, M., and Bixler, E., 1997. Seasonal differences in suicide birth rate in Alaska Natives compared to other populations. *American Indian and Alaska Native Mental Health Research* 8 (1), 1-10. *PEOPLE*; *suicide*; *seasonality*

Seasonal differences in suicide birth rates among Alaska Natives and for populations at different latitudes (residents of the Yukon, Saskatchewan, Montana, Wyoming, and Pennsylvania) were investigated. Seasonal birth rates for the general population were similarly examined. Suicide birth rates showed small seasonal variations for Alaska Natives with summer births showing more suicides. However, at lower latitudes, suicide birth rates among other populations showed no seasonal differences. Hours of daily sunlight at the summer and winter solstice correlated with the proportion of suicide victims born during those seasons. Seasonal differences in birth rates of suicide victims correlated strongly with latitude and seasonal differences in daylight. General population birth rates did not show significant seasonal differences, and did not correlate with differences in latitude or sunlight length at the summer or winter solstice.

Keyser, R., Kimball, S., Nemani, R., and Running, W., 2000. Simulating the effects of climate change on the carbon balance of North American high-latitude forests. *Global Change Biology* 6

(Suppl. 1), 185-195. *NUTRIENT CYCLING; CLIMATE; vegetation; hydrology; carbon; modeling; aspen; spruce; river ice*

The large magnitude of predicted warming at high latitudes and the potential feedback of ecosystems to atmospheric CO concentrations make it important to quantify both warming and its effects on high-latitude carbon balance. We analysed long-term, daily surface meteorological records for 13 sites in Alaska and north-western Canada and an 82-y record of river ice breakup date for the Tanana River in interior Alaska. We found increases in winter and spring temperature extrema for all sites, with the greatest increases in spring minimum temperature, average 0.47 degree C per 10 y, and a 0.7-day per 10 y advance in ice breakup on the Tanana River. We used the climate records to drive an ecosystem process model, BIOME_BGC, to simulate the effects of climate change on the carbon and water balances of boreal forest ecosystems. The growing season has lengthened by an average of 2.6 days per 10 y with an advance in average leaf onset date of 1.10 days per 10 y. This advance in the start of the active growing season correlates positively with progressively earlier ice breakup on the Tanana River in interior Alaska. The advance in the start of the growing season resulted in a 20% increase in net primary production for both aspen (*Populus tremuloides*) and white spruce (*Picea glauca*) stands. Aspen had a greater mean increase in maintenance respiration than spruce, whereas spruce had a greater mean increase in evapotranspiration. Average decomposition rates also increased for both species. Both net primary production and decomposition are enhanced in our simulations, suggesting that productive forest types may not experience a significant shift in net carbon flux as a result of climate warming.

Kidd, K., Schindler, D., Muir, D., Lockhart, W., and Hesslein, R., 1995. High concentrations of toxaphene in fishes from a subarctic lake. *Science (Washington)* 269 (5221), 240-242. *CONTAMINANTS; POPs (persistent organic pollutants); fish; air quality; bioaccumulation; sediment; risk assessment*

Concentrations of toxaphene and other organochlorine compounds are high in fishes from subarctic Lake Laberge, Yukon Territory, Canada. Nitrogen isotope analyses of food chains and contaminant analyses of biota, water, and dated lake sediments show that the high concentrations of toxaphene in fishes from Laberge resulted entirely from the biomagnification of atmospheric inputs. A combination of low inputs of toxaphene from the atmosphere and transfer through an exceptionally long food chain has resulted in concentrations of toxaphene in fishes that are considered hazardous to human health.

Kidd, K., Schindler, D.W., Hesslein, R.H., and Muir, D.C., 1995. Correlation between stable nitrogen isotope ratios and concentrations of organochlorines in biota from a freshwater food web. *Science of the Total Environment* 160-161 ((*ECOLOGICAL EFFECTS OF ARCTIC AIRBORNE CONTAMINANTS*)), 381-90. *CONTAMINANTS; POPs (persistent organic pollutants); fish; burbot; pike; invertebrates; water quality; bioaccumulation; modeling*

The relationship between total concentrations of hexachlorocyclohexane (Σ [total] HCH), Σ DDT, and chlorinated bornanes (toxaphene, Σ CHB) and the trophic position of biota from a subarctic lake was investigated using stable isotope ratios of nitrogen (¹⁵N/¹⁴N). Zooplankton, benthic invertebrates, and forage and piscivorous fishes were analysed for ¹⁵N/¹⁴N and organochlorines using mass spectrometry and high resolution capillary gas chromatography (GC-ECD), respectively. The trophic relationships of the biota were clearly defined, with ¹⁵N/¹⁴N increasing an average of 3.3/1000 from prey species to predator. Mean concentrations of Σ HCH were lowest in chironomids (subfamily Chironominae, 0.2 ng/g wet wt.) and highest in burbot liver (*Lota lota*; 30.2 ng/g wet wt.). Mean concentrations of Σ DDT and Σ CHB ranges from 0.5 and 2.0 (ng/g wet wt.), respectively, in snails (Family Limnaeidae), to 3430 and 2820 (ng/g wet wt.) in burbot

liver. Regression analyses indicated that both the wet and lipid weight concentrations of S HCH, S DDT, and S CHB in the biota from this food web were significantly related to trophic position, as defined by δ [change in] ^{15}N . Results from this study indicated that δ ^{15}N can be used to predict concentrations of organochlorines in freshwater biota.

Kidd, K., Schindler, D., Hesslein, R., and Muir, D., 1998. Effects of trophic position and lipid on organochlorine concentrations in fishes from subarctic lakes in Yukon Territory. *Canadian Journal of Fisheries and Aquatic Sciences/Journal Canadien des Sciences Halieutiques et Aquatiques Ottawa* 55 (4), 869-881. *CONTAMINANTS; POPs (persistent organic pollutants); trout; burbot; Pike; bioaccumulation*

Concentrations of organochlorines in lake trout (*Salvelinus namaycush*), burbot (*Lota lota*), and northern pike (*Esox lucius*) from subarctic lakes in Yukon Territory varied significantly among populations, and these differences could not be ascribed to size or age of the fishes. For each species, lipid content and trophic positioning (measured by stable nitrogen isotope ratios, δ [change in] ^{15}N) were significantly different across populations, and the latter differences could not be attributed to variable δ ^{15}N at the base of the food webs. Across lakes, total concentrations of PCBs, DDT, chlorinated bornanes (CHB), chlordane (CHL), chlorobenzenes (CBZ), and hexachlorocyclohexane (HCH) in lake trout and northern pike muscle and burbot liver were significantly related to their δ ^{15}N . The slopes of these log organochlorine - δ ^{15}N relations were greatest for more lipophilic contaminants (PCB, DDT, CHB), indicating that they bioaccumulate to a greater degree than less lipophilic contaminants. Lipid significantly predicted organochlorine concentrations both within and among populations of lake trout, and the slopes did not vary significantly with contaminant lipophilicity. Among-lake differences in HCH in trout muscle were removed by adjusting concentrations by the covariate lipid. Lipid-adjusted concentrations of CHB, PCB, DDT, CHL, and CBZ in lake trout remained significantly different between lakes, and these differences were attributed to variable food chain lengths.

Kielland, K., Bryant, J., and Ruess, R., 1997. Moose herbivory and carbon turnover of early successional stands in interior Alaska. *Oikos* 80 (1), 25-30. *VEGETATION; willow; alder; herbivory (mammal); nutrient cycling; carbon; moose; snowshoe hare*

In the taiga of interior Alaska, early successional stands are dominated by deciduous species. These species represent the main forage base for many mammalian herbivores. In a long-term study employing large, permanent exclosures, we measured the impact of winter browsing by moose and snowshoe hares on carbon flux in riparian willow/alder communities. We found that browsing-induced changes in leaf litter chemistry increased the rate of litter decomposition both in the laboratory and under field conditions, and increased the pool of mineralizable carbon in litter. The aboveground input of higher-quality litter-carbon following browsing may explain the increased respiration potentials of soils sampled outside the exclosures. Moreover, winter browsing tends to reduce the production of fine roots and appears to decrease fine root longevity. Thus, the net effect of moose browsing on aboveground and belowground processes in these early successional stands is to accelerate carbon turnover. These results demonstrate that the effects of mammalian herbivory on element cycling in taiga is a two-stage process, involving intraspecific as well as interspecific responses at different time scales. Winter browsing by moose offer one example of how mammalian herbivory modify ecosystem-level processes that govern major functions in these ecosystems.

Kincheloe, K.L., and Stehn, R.A., 1991. Vegetation patterns and environmental gradients in coastal meadows on the Yukon-Kuskokwim delta, Alaska. *Canadian Journal of Botany/Revue Canadien de Botanique* 69, 1616-1627. *INCOMPLETE (need abstract); VEGETATION; ecology; distribution*

King, S., Harden, J., Manies, K., Munster, J., and White, L., 2002. Fate of Carbon in Alaskan Landscapes Project – Database for Soils from Eddy Covariance Tower Sites, Delta Junction, AK. open file report 20-62. US Geological Survey, <http://geopubs.wr.usgs.gov/open-file/of02-062/> for the introduction or <http://geopubs.wr.usgs.gov/open-file/of02-062/of02-62.pdf> for full document *NUTRIENT CYCLING; carbon; soil; vegetation; wildfire; hydrology; ground ice / permafrost*

Soils in Alaska, and in high latitude terrestrial ecosystems in general, contain significant amounts of organic carbon, most of which is believed to have accumulated since the start of the Holocene about 10 ky before present. High latitude soils are estimated to contain 30-40% of terrestrial soil carbon (Melillo et al., 1995; McGuire and Hobbie, 1997), or ~ 300-400 Gt C (Gt = 10¹⁵ g), which equals about half of the current atmospheric burden of carbon. Boreal forests in particular are estimated to have more soil carbon than any other terrestrial biome (Post et al., 1982; Chapin and Matthews, 1993). The relations among net primary production, soil carbon storage, recurrent fire disturbance, nutrients, the hydrologic cycle, permafrost and geomorphology are poorly understood in boreal forest. Fire disturbance has been suggested to play a key role in the interactions among the complex biogeochemical processes influencing carbon storage in boreal forest soils (Harden et al., 2000; Zhuang et al., 2002).

There has been an observed increase in fire disturbance in North American boreal black spruce (*Picea mariana*) forests in recent decades (Murphy et al., 1999; Kasichke et al., 2000), concurrent with increases in Alaskan boreal and arctic surface temperatures and warming of permafrost (Osterkamp and Romanofsky, 1999). Understanding the role of fire in long term carbon storage and how recent changes in fire frequency and severity may influence future high latitude soil carbon pools is necessary for those working to understand or mitigate the effects of global climate change.

Klein, D.R., 1989. Northern subsistence hunting economies. In: Hudson, R.J., Drew, K.R., and Baskin, L.M., eds., *Wildlife production systems*. Cambridge University Press, Cambridge, England, pp. 96-111. *INCOMPLETE (need abstract); PEOPLE; subsistence*

1989. Caribou in the changing North. *Applied Animal Behavior Science* 29, 279-291. *INCOMPLETE (need abstract); POPULATION; CLIMATE; caribou*

Klingensmith, K.M., 1988. Nitrogen dynamics in primary successional soils on the Tanana River of interior Alaska, University of Alaska Fairbanks, Ph. D., 125 p *NUTRIENT CYCLING; SOIL; nitrogen; forestry*

Knapp, B., 1978? Southwest Alaska Eskimo dietary survey of 1978. Yukon Kuskokwim Health Corporation, Bethel. *PEOPLE; subsistence; nutrition; traditional food*

Kojima, S., 1996. Ecosystem types of boreal forest in the North Klondike River Valley, Yukon Territory, Canada, and their productivity potentials. *Environmental Monitoring and Assessment* 39 (1-3), 265-281. *VEGETATION; distribution; spruce; lichen; mosses; horsetail; willow; forestry; management*

Vegetation, environmental characteristics, and forest productivity were studied in the boreal forest in the North Klondike River Valley, Yukon Territory, Canada. The concept and approach of biogeoclimatic ecosystem classification were followed. For the treed vegetation, five ecosystem types were distinguished based on vegetation structure and physical and chemical properties of soils. They were: 1) spruce-lichen type, 2) spruce-moss type, 3) spruce-Equisetum [horsetail] type, 4) spruce-willow type, and 5) bog forest type. These types were differentiated mainly by moisture regime and base status of soils.

The sequence of the ecosystem types reflected their topographical position from slope summit to valley bottom. The spruce-lichen type developed in the driest and nutritionally impoverished habitats, the spruce-Equisetum type occurred in moist and nutritionally enriched sites, and the spruce-moss type was found in between them. The bog forest type occurred where peat had accumulated sufficiently to generate ombrotrophic conditions in habitats of high water table underlain with permafrost. The spruce-willow type developed along small creeks where substrates were very coarse. Tree growth characteristics were measured, except for the bog forest type that did not have trees over 5 m tall. Total volume of standing trees ranged from 29 to 582 m³/ha, with an overall mean of 216.9 m³/ha. The spruce-Equisetum type exhibited the highest figure, 413.5 m³/ha, while the spruce-lichen type the lowest one, 87.7 m³/ha. Mean annual increment ranged from 0.15 to 2.66 m³/ha, with an overall mean of 1.10 m³/ha. A similar tendency was noted for all other forestry characteristics, i.e., the spruce-Equisetum type showed the highest productivity while the spruce-lichen type the lowest. This tendency was considered to be attributed to the availability of moisture and basic cations in soils.

Koons, D., 2001. Threats to the Last Frontier. A report of invasive species to Alaska (DRAFT). Cooperative Extension Service, Fairbanks. *INCOMPLETE (need abstract); VEGETATION; distribution; invasive species*

Krasny, M.E., 1985. Establishment of four Salicaceae species on river bars along the Tanana River, Alaska, University of Washington, Ph. D., 152 p *VEGETATION; willow; disturbance; recovery*

Krebs, C.J., Boutin, S., Boonstra, R., Sinclair, A., Smith, J., Dale, M., Martin, K., and Turkington, R., 1995. Impact of food and predation on the snowshoe hare cycle. *Science (Washington)* 269 (5527), 1112-1115. *POPULATION; snowshoe hare; predation; nutrition*

Snowshoe hare populations in the boreal forests of North America go through 10-year cycles. Supplemental food and mammalian predator abundance were manipulated in a factorial design on 1-square-kilometer areas for 8 years in the Yukon. Two blocks of forest were fertilized to test for nutrient effects. Predator exclosure doubled and food addition tripled hare density during the cyclic peak and decline. Predator exclosure combined with food addition increased density 11-fold. Added nutrients increased plant growth but not hare density. Food and predation together had a more than additive effect, which suggests that a three-trophic-level interaction generates hare cycles.

Krebs, C., Boonstra, R., Boutin, S., and Sinclair, A., 2001. What Drives the 10-Year Cycle of Snowshoe Hares? *Bioscience* 51 (1), 25-35. *POPULATION; mammals; snowshoe hare; lynx; predation; nutrition; trapping*

The 10-year cycle of abundance in the snowshoe hare, *Lepus americanus*, is one of the most striking features of the ecology of the boreal forests. Ten-year snowshoe-hare cycles in Canada were first analyzed quantitatively by wildlife biologists in the 1960s, using the meticulous fur-trading records of the Hudson Bay Company, which was founded in 1671. The rise and fall in the Canada lynx, a specialist predator of snowshoe hares, was shown to mirror the rise and fall of its prey population. Cycles appear to challenge the implicit assumption that there is a balance in nature. Large-scale experiments in the Yukon have shown that the snowshoe-hare cycle is a product of an interaction between predation and food supply, but predation is the dominant process. The impact of food is most critical in winter. Hares do not usually die of starvation or malnutrition, but die from predation. Food quality and quantity affect body condition and predispose the hares to predation, increased parasite load, and higher stress levels. These indirect effects of predation and food probably suppress reproduction. Hares in peak and declining populations trade off safety and food, and behavior defines the

dynamics of the decline. The result is a time lag in indirect and direct predation effects, which is the basis for the cyclicity. The low phase of the cycle is the combined result of continuing predation mortality and slowly recovering reproductive potential. The 10-year snowshoe hare cycle appears to occur in synchrony across broad regions of Canada and Alaska. The most famous model ties the hare cycle to the sunspot cycle. Sunspots affect Earth's weather and they might entrain snowshoe-hare cycles through weather, but no underlying mechanism has been explained. A more likely explanation is based on dispersal movements. The hares disperse on a small local scale, so predator movements are probably the key element causing synchrony over a large area. The biological impact of the snowshoe hare cycle causes ripple effects for many predator and prey species in the boreal forest. The lynx is a threatened species, and an understanding of the dynamics of its interaction with snowshoe hares is critical for conservation. The boreal forest, one of the world's great ecosystems, and the 10-year snowshoe-hare cycle clearly can survive many natural environmental disturbances, but they may not survive increasing human impact.

Krebs, C.J., Boonstra, R., Nams, V., O'Donoghue, M., Hodges, K., and Boutin, S., 2001. Estimating snowshoe hare population density from pellet plots: a further evaluation. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 79 (1), 1-4. *POPULATION; snowshoe hare; monitoring*

We counted fecal pellets of snowshoe hares (*Lepus americanus*) once a year in 10 areas in the southwestern Yukon from 1987 to 1996. Pellets in eighty 0.155-m² quadrats were counted and cleared each June on all areas, and we correlated these counts with estimates of absolute hare density obtained by intensive mark-recapture methods in the same areas. There is a strong relationship between pellet counts and population density ($r = 0.76$), and we present a predictive log-log regression to quantify this relationship, which improves on our previously published 1987 regression, particularly at low hare densities. The precision of density estimates can be improved most easily by increasing the number of sets of quadrats in an area (one set = 80 plots), rather than increasing the number of plots counted within one set. The most important question remaining concerns the generality of this relationship for snowshoe hares living in other habitats in the eastern and southern portions of their geographic range.

Krebs, C.J., Boutin, S., and Boonstra, R., eds., 2002. *Ecosystem Dynamics of the Boreal Forest: the Kluane Project*. Oxford University Press, *POPULATION; ecology; mammals; snowshoe hare; lynx; birds; predation; reproduction*

The following is a book review found at http://www.nature.com/cgi-taf/DynaPage.taf?file=/nature/journal/v416/n6882/full/416679a_fs.html in the journal Nature.

Just as every picture tells a story, so too does every scientific project. This book is the story of the Kluane Boreal Forest Ecosystem Project, told brilliantly by the researchers who toiled for ten years from 1986 to uncover the drama and complexity of this Canadian ecosystem. Whoever wants to learn about the boreal forest of North America, one of the largest ecosystems of the world, and the stage on which a classic ecological drama — the ten-year population cycle of the snowshoe hare — is played out repeatedly, should definitely read this book. Equally important, it should be read for what it tells us about how to bring ecology into the twenty-first century: namely, to integrate population ecology into ecosystem ecology. The large-scale ecosystem study presented in this book represents a major step in that direction.

The book is illustrated with excellent drawings by Carol Stefan and accompanied by a CD-ROM put together by Alice Kenney. Although the book reports on highly integrated

teamwork, where many scientists have played a significant part both in the planning and the execution of the project, it also tells the story of the Arctic endeavours of one man — Charles Krebs. Inspired as a young boy by stories of Arctic pioneers such as Roald Amundsen and Fridtjof Nansen, he began work for his PhD on the lemming cycle in the late 1950s at Baker Lake, near Hudson Bay in Arctic Canada. As professor of zoology at the University of British Columbia, he organized the Kluane project in the western part of northern Canada. No wonder that the other members of the project express their "heartfelt thanks to Charles J. Krebs. Charley was the vital force behind this research collaboration. In no small measure, the successes of the study were related to his vision, his leadership, and his ability to keep us all focused on the task for over a decade of field research and writing."

The Kluane project was carried out in the southwestern Yukon. Nine faculty members from three Canadian universities and 26 graduate students joined with 75 summer assistants and 18 technicians to expend 157 person-years of effort. This team gained considerable benefit from many studies that had been carried out since the 1950s at the Arctic Institute of North America's Kluane Research Station.

The Kluane project set out to tackle one of the key — and longstanding — questions in the field of ecology: what regulates the dynamics of species within an ecosystem such as the boreal forest around Kluane? Are species regulated from below (through primary productivity) or from above (through predators), or a combination thereof?

The project found that much of the boreal forest vertebrate community is regulated by top-down control: several predatory species act as a guild within which each species operates in a compensatory manner. Populations of guild members are influenced to a greater or lesser extent by the population numbers of the major prey species — the snowshoe hare. Thus, some of these predator species are potentially redundant. But some species (such as the red squirrel) dance to a different drummer, being little influenced by the dramatic and regular fluctuations in snowshoe-hare populations, which are known to affect many other species, such as the lynx. Key factors in the ecosystem, such as nutrients, strongly influence plant growth, but their effects do not cascade upwards to affect predator populations.

As an important by-product, the project has given us a detailed description of the food web of the boreal forest of North America and, equally important, a unique database that will serve as a marvellous platform for ecologists in the years to come.

The Kluane project was not able to address the issue of spatial synchrony in the ten-year cycle — why hare populations across most of the 5 million square kilometres fluctuate together. However, this book provides a good basis for further theoretical work on such spatial issues. The authors recommend that similar large-scale projects are set up in other parts of the Canadian boreal forest. Indeed, that would provide the basis not only for extrapolating the results obtained to regions outside the Kluane Lake district, but also for addressing some of the spatial issues mentioned above.

Although the book does not address the issue of the ecological impact of global change, the work will serve as a benchmark from which to assess such change. It puts us in a much better position to address questions relating to which species — and species interactions — might be affected, and the possible resulting change in landscape. Indeed, to address the issue of the possible effects of climate change, monitoring of this

boreal-forest community (which has now been studied for more than 25 years) should be continued. By so doing, we would be able to integrate observational and experimental findings within a combined modelling effort — just what is needed to address the ecology of climate change.

The Kluane project was not without its practical challenges. The fact that such a large-scale project has been completed, however, should encourage other ecologists to embark on similar large-scale endeavours. Indeed, I am convinced that it is through such large-scale projects that we will be able to advance our broader ecological understanding.

This type of project is also exactly what is needed to enable ecologists to help politicians manage the biological diversity of the Earth when faced with a growing population, and the resulting increase in demand for resources. All such demands must ultimately be met from our natural resources. Research-funding agencies, and hence politicians, must realize that it is not enough to have had one Kluane project. We need many, so that we can compare the dynamics of ecosystems under different settings. Before the Kluane Project we had no role model — now we have one.

Kruse, G., 1998. Salmon run failures in 1997-1998: A link to anomalous ocean conditions? Alaska Fishery Research Bulletin 5 (1), 55-63. *POPULATION; fish; salmon; chinook; chum; climate; health (condition); morphology*

In July 1998 Alaska's Governor Tony Knowles submitted a request for federal disaster relief owing to severe economic and social hardships in some western Alaska communities affected by unusually poor salmon runs, especially Bristol Bay sockeye salmon *Oncorhynchus nerka* and Yukon River chinook *O. tshawytscha* and summer chum *O. keta* salmon. Other anomalies were also noted in these runs: late run timing, smaller-than-average fish, altered migration pathways, and anecdotal reports of higher occurrences of parasites and increased signs of predation. Were these poor returns attributable to unusual marine environmental conditions in 1997/98? Decadal changes in salmon productivity have been related to indices of the strength of the Aleutian Low in winter, which may affect feeding success during early marine life. Analysis of return-per-spawner data is needed to determine whether this climate-salmon relationship continues to hold. Additionally, significant changes in ocean conditions occurred in the North Pacific and Bering Sea in 1997/98 that may have had profound effects on the marine ecosystem. Not only was there a very strong equatorial El Niño, but light winds, low nutrients, and high solar radiation led to the first-recorded bloom of coccolithophores in the Bering Sea in summer 1997 and a bloom occurred again in spring 1998. At-sea research is urgently needed on the biotic implications of these conditions, from effects on primary and secondary producers to effects on invertebrates, fish, birds, and marine mammals through the pelagic and benthic food webs.

Kruse, J., and Sperling, F., 2002. Phylogeny of Nearctic Species of the Xylosteana Group of Archips Huebner (Lepidoptera: Tortricidae) Based on Combined Analysis of Morphological and Mitochondrial DNA Data Sets. Annals of the Entomological Society of America 95 (3), 288-301. *POPULATION; invertebrates; insects; genetics; herbivory (insect)*

The Holarctic Archips xylosteana Group consists of at least 18 morphologically similar species in the Nearctic, three of which were synonymized with *A. argyrospila* by Razowski and subsequently returned to species status, two that were described since 1986 but are clearly related to *A. argyrospila*, and an additional Western clade of *A. argyrospila* haplotypes that Razowski had not seen. We examined the morphology of all described Nearctic Xylosteana Group members plus one undescribed species, as well as DNA variation in a 816 bp segment of the mitochondrial COI gene for 17 of these species.

We also examined three of five species of *Archips* from the Packardiana Group (=Archippus Freeman), and three outgroup genera (*Argyrotaenia* Stephens, *Clepsis* Guenee, and *Choristoneura* Lederer). Parsimony analyses of the combined molecular and morphological data sets gave better resolution and a better supported tree than did analyses of any single data set. All analyses revealed five species groups, rendering paraphyletic the *Xylosteana* Group as previously defined. An updated systematic list of Nearctic *Archips* is provided. We discuss the possibility that our data could support the resurrection of the genus *Archippus* from synonymy and the recognition of the *Cerasivorana* Group and the *Purpurana* Group as new genera. We have elected to leave the genus intact pending future investigations that include the additional Palearctic members of the group.

Kruszynski, G., and Johnson, P., 1992. Glacierized basin hydrological variability and climate change trends. *Proceedings Northern Research Basins Conference*, Whitehorse, Yukon *INCOMPLETE (need abstract); CLIMATE; HYDROLOGY; glaciology*

Kuzyk, G., Dehn, M., and Farnell, R., 1999. Body-size comparisons of alpine- and forest-wintering woodland caribou herds in the Yukon. *Canadian Journal of Zoology/Revue Canadienne de Zoologie* 77 (7), 1017-1024. *POPULATION; mammals; caribou; morphology; nutrition; predation; migration; snow*

Information from radiotelemetry studies has shown that woodland caribou (*Rangifer tarandus caribou*) living in the snow-shadow region of the southwest part of the Yukon spend part of the winter in the subalpine and alpine zones. Other woodland caribou living in areas with high snowfall in central and eastern Yukon have traditional winter ranges in forested lowlands. We theorize that selective forces exerted by the wintering environments will have induced differences in caribou body characteristics, and we test the hypothesis that woodland caribou that winter in the alpine zone are phenotypically different from those wintering in forested environments. We compared five physical measurements from 382 female woodland caribou in 11 Yukon herds. Our results indicate a significant (14 cm) difference in shoulder height between forest- and alpine-wintering groups, but provide no support for the hypothesis that the difference is due to snow depth. There were no significant differences in other body measurements or in body proportions. It is also unlikely that the difference in shoulder height is due to winter nutrition, since body condition scores did not differ between forest- and alpine-wintering groups. We discuss seasonal nutrition, predation, and migration as alternative explanations for our results.

Kwaitkowski, R., 1987. Water quality monitoring in Canada North of 60 degree. *Water pollution research journal of Canada* 22 (4), 55. *WATER QUALITY; monitoring*

This workshop was intended to generate information that would result in the efficient design of water quality monitoring activities in the North, leading experts in northern aquatic ecology were invited to present state-of-the-art techniques in their respective fields relevant to the Workshop. A secondary objective of the Workshop was the establishment of information flow/coordination between the various water quality monitoring and research agencies working in the North. The territorial governments (Yukon Territorial Government, Government of the Northwest Territories), other federal related agencies (Canada Wildlife Service, Environmental Protection Service, Health and Welfare Canada, Fisheries and Oceans), regulatory bodies (Yukon Water Board, Northwest Territories Water Board), universities and native groups were invited to participate.

Kwong, Y., Roots, C., Roach, P.D., and Keetley, W., 1997. Post-mine metal transport and attenuation in the Keno Hill mining district, central Yukon, Canada. *Environmental Geology* 30 (1-2), 98-107. *MINING; water quality; metals; sediment; acidification*

The Keno Hill mining district in central Yukon was the second largest silver producer in Canada with mines operating from 1913 to 1989 on more than 65 vein silver deposits. The seven and a half decades of mining activities have generated large volumes of mine waste disposed on the land surface, resulting in elevated metal contents in numerous small drainages. To assess the extent of metal mobilization, old mine workings and the associated mine waste were examined and the water courses draining to a major river valley sampled. The results of field observations and an array of water and sediment analyses led to three major conclusions. 1. Acid mine drainage is not widespread because of galvanic protection of pyrite from oxidative dissolution and neutralization by carbonates in the country rock. 2. Mechanisms operative to limit aqueous metal transport in small streams in the district include cryogenic precipitation, coprecipitation and sorption. 3. The near-surface concentration of metals limits the options of waste disposal in future mining developments due to potential metal-leaching problems.

Kyle, C., Davis, C., and Strobeck, C., 2000. Microsatellite analysis of North American pine marten (*Martes americana*) populations from the Yukon and Northwest Territories. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 78 (7), 1150-1157. *POPULATION; mammals; marten; genetics*

Elucidating the population genetic structure of a species gives us insight into the levels of gene flow between geographic regions. Such data may have important implications for those trying to manage a heavily harvested wildlife species by determining the genetic connectivity of adjacent populations. In this study, the population structure of 12 North American pine marten (*Martes americana*) populations from the Yukon through to the central Northwest Territories was investigated using 11 microsatellite loci. Genetic variation within populations across the entire geographic range was relatively homogeneous as measured by: mean number of alleles (5.89 plus or minus 0.45) and the average unbiased expected heterozygosity (H_e) (65.6 plus or minus 1.7%). The overall unbiased probability of identity showed more variance between populations (1/10.25 plus or minus 7.84 billion) than did the mean number of alleles and the H_e estimates. Although some population structure was found among the populations, most regions were not strongly differentiated from one another. The low level of structure among the populations can, in part, be attributed to isolation by distance rather than to population fragmentation, as would be expected in more southerly regions in which suitable habitat is more disjunct. Furthermore, the low levels of population genetic structure were likely due to high levels of gene flow between regions and to large effective marten populations in the northern part of their distribution.

La Rosa, F., Tozzi, P., Saltamacchia, G., and Vitali, R., 1989. [Descriptive epidemiology of malignant tumors of the colon and rectum] [Article in Italian]. *Ann Ig* 1 (5), 899-922. *PEOPLE; health (comparative); health (condition); cancer*

This paper examines patterns and trends of colon and rectal cancer in different countries and in Italy. Incidence and mortality rates of colorectal cancer vary widely in the world. High rates are characteristic of highly developed countries in North America, northern and western Europe. The lowest rates are found in Asia, Africa and most Latin American countries. The most recent incidence rates for colon cancer from cancer registries around the world published in "Cancer Incidence in Five Continents, 1982" range from 0.6 cases per 100,000 in Dakar, Senegal to 32.3 in Connecticut, USA for males and from 0.7, always in Dakar, to 27.4 among the Japanese population of Bay Area, USA. The Italian cancer registry for Varese, shows a rate of 19.9 for males and 16.9 for females. The incidence rates for cancer of the rectum range from 1.5 per 100,000 in Dakar to 22.6 in the North West Territory and Yukon, Canada. For females the highest rates, 13.9, are in Israel (born in Europe or America) and the lowest always in Dakar, 1.0. The Varese rates are 15.7 and 9.1 for males and females respectively. Regression analysis shows that between

incidence rates of colon and rectal cancer, divided by sex, there is a strict correlation. The sex ratios for colon and rectal cancer differ, rectal cancer being distinctly more common among males in most countries, whereas colon cancer affecting both sexes at rather similar rates. Results confirm that there is a higher frequency, for colon cancer in particular, in urban areas than in rural areas. Differences due to race, on the contrary, have found no confirmation. The international incidence trends over the period 1960-1980 show a general increase for colon cancer in both sexes. In Asia the most evident increase have been in Singapore and Miyagi. In Europe, Slovenia (Yugoslavia) and Norway present 40-50% increases. Similar tendencies have been observed for rectal cancer trends. Values more than increase 100%, for both sexes, have been found in Hawaii and Singapore. In Europe, Norway and Slovenia always present the highest increases. Marked geographic variations occur even as regards colon and rectal mortality in the different countries. The highest values for colon cancer have been found in Luxemburg (18.4) for males, and in New Zealand (13.3) for females and the lowest in Honduras for both sexes (0.1 and 0.0 respectively). In Italy the values are 8.0 for males and 6.0 for females.(ABSTRACT TRUNCATED AT 400 WORDS)

Lacey, E., Wieczorek, J., and Tucker, P., 1997. Male mating behaviour and patterns of sperm precedence in Arctic ground squirrels. *Animal Behaviour* 53 (4), 767-779. *POPULATION; mammals; squirrel; reproduction; behavior (reproductive/nesting); behavior (territorial); genetics*
Ground squirrels (genus *Spermophilus*) display considerable interspecific variation in male reproductive behaviour. Although male Arctic ground squirrels, *S. parryii plesius*, are territorial during the mating period, males in several other species of *Spermophilus* are not. To begin exploring the reasons for this behavioural difference, patterns of mating behaviour and sperm precedence were characterized for a free-living population of *S. parryii plesius*. Twenty females that were monitored continuously throughout behavioural oestrus consorted and presumably copulated with a mean of 1.9 plus or minus 0.8 males during a single period of sexual receptivity. A combination of electrophoretic and DNA fingerprinting analyses revealed that more than 90% of pups in litters (N = 11) reared by females that consorted with two or more males were sired by a female's first mate. The percentage of young sired by each of a female's consorts did not vary with either consortship duration or the interval between consortships by different males. Instead, the only consistent correlate of paternity was consortship order. Both pre-consortship calling and post-consortship defence of females were significantly associated with first consortships, suggesting that males were able to distinguish unmated females from females that had already copulated. Because the probability of siring young should influence which females are preferred as mates and how males compete for access to those females, comparative studies of sperm precedence patterns may yield insights into the evolution of interspecific variation in male mating behaviour.

Lafferty, R., Parker, J., and Bernard, D., 1992. Stock assessment and biological characteristics of burbot in lakes of interior Alaska during 1991. *Fishery Data Series* 92-20. Alaska Department of Fish and Game, <http://www.sf.adfg.state.ak.us/statewide/divreports/html/details.cfm?id=216>
POPULATION; fish; burbot

Abundance and/or indices of abundance were estimated for populations of burbot *Lota lota* in 16 lakes in interior Alaska. Sampling occurred from May through October 1991. Mean catch per unit of effort of fully recruited burbot (450 mm total length and larger) per 48-hour set ranged from 0.03 (SE = 0.02) in Nancy Lake to 3.62 (SE = 0.42) in Tolsona Lake. Abundance of fully recruited burbot estimated with mark-recapture experiments was greatest in Paxson Lake (7,435; SE = 1,685) and lowest in T Lake (134 fish; SE = 39). Catchability coefficients from spring surveys (0.636) were greater than summer surveys (0.428).

Langdon, S., and Worl, R., 1981? Distribution and exchange of subsistence resources in Alaska. Technical paper no. 55. Alaska Dept. of Fish and Game, Division of Subsistence, Juneau. <http://www.arlis.org/> *INCOMPLETE (need abstract); PEOPLE; subsistence; traditional food; distribution; economics*

Lanier, A., Kelly, J., Smith, B., Amadon, C., Harpster, A., Peters, H., Tanttila, H., Key, C., and Davidson, A., 1996. Cancer in Alaska Natives; a twenty-five year report: 1969-1993; incidence and mortality. Alaska Area Native Health Service; Indian Health Service; Public Health Service; Department of Health and Human Services; New Mexico Tumor Registry at The University of New Mexico Medical Center, Anchorage.

<http://www.anhb.org/sub/epi/documents/Cancer25yrPaper.PDF> *PEOPLE; cancer; health (comparative); mortality*

INTRODUCTION

Cancer incidence rates for all Alaska Natives (Eskimo, Indian, Aleut) were first reported in 1976. Since then numerous publications have documented the unusual cancer patterns in this population. The most recent report summarized data for twenty years, 1969-88. Key findings were that, in comparison to the U.S. White population, Alaska Natives were at greater risk for cancers of the nasopharynx, stomach, liver, gallbladder, cervix and kidney than the United States White population, although at less risk for cancers of the prostate, breast, uterus, bladder, brain, leukemia and lymphoma. Marked differences remain between Alaska Natives and U.S. Whites for cancers of specific sites (organs), however, the incidence rates in Alaska Natives for all cancers combined are now similar to those of U.S. Whites.

Over the twenty-year period, the most dramatic increase was seen in cancer of the lung. Rates increased two-fold in men, and five-fold in women. This pattern reflects the consequences of the widespread use of tobacco which occurred in Alaska Natives some time after World War II.

This report updates the previous report and adds information on patients diagnosed in the years 1989-1993. These are the latest statistics for which we have complete data statewide, and provide the best estimates of cancer incidence in the Alaska Native population. Data for the entire 25 year period are presented as a composite for the 25 years (1969-93), and for each of five five-year periods. Numbers of new (incident) cases and rates are given for all cancers and for specific sites. These are presented by age, sex, ethnicity, geographic region, and service unit. Sites listed are those most commonly included in standard cancer publications, plus a few additional sites of particular importance in the Alaska Native population (e.g. nasopharynx, gallbladder). Data have been collected, tabulated, and analyzed in accordance with procedures established by the National Cancer Institute Surveillance, Epidemiology, and End Results (SEER) program (<http://seer.cancer.gov/>). Data presented are based on "invasive" cancers only; cancers classified as "in situ" or "intraepithelial neoplasia" are not included in this report.

Rates for the most recent five year period (1989-93) are the best estimate of current rates. For comparison with cancer data for the U.S., Alaska Native rates are "age-adjusted" to the US 1970 standard population. For comparison of rates within Alaska and between subgroups, unadjusted ("crude") rates were used. This is based on the assumption that the distribution of the population by age and sex is similar for all Native subgroups. Rate calculations based on small numbers of patients must be interpreted with caution. We

elected not to calculate rates when the rate would be based on less than five cases. In those instances, the tables include the numbers of cases but not the rates.

The Alaska Native Tumor Registry (<http://seer.cancer.gov registries/alaska.html>) plays an active role in the clinical management of cancer patients, assisting providers in assuring appropriate and timely follow-up of all patients. Few other cancer registries are as clinically involved. The Alaska Native Tumor Registry is also a population-based registry, not solely a hospital-based registry. Active, statewide case identification has resulted in a complete registry of all Alaska Natives diagnosed with cancer while resident of Alaska since 1969. The State of Alaska initiated mandatory reporting of cancer in January, 1996. It is hoped that regional hospitals will continue to provide information to the Alaska Native Tumor Registry to assure optimal patient care. The Alaska Native Tumor Registry is also willing to assist small regional hospitals to fulfill cancer reporting requirements as specified by state regulation.

Lanier, A., Holck, P., Kelly, J., Smith, B., and McEvoy, T., 1999. Alaska Native Cancer Survival Report. Alaska Native Health Board; Alaska Native Medical Center, Anchorage. <http://www.anhb.org/sub/epi/documents/survivalreport.pdf> *PEOPLE; cancer; health (condition); health (comparative)*

Introduction

This is the first report of survival rates from cancer for Alaska Natives. Information on cancer in American Indians/Alaska Natives (AI/AN) is scarce. The most available cancer information on AI/AN nationwide is mortality data based on death certificates (1). These data indicate that cancer rates differ between various groups of AI/AN throughout the United States. Incidence data (new patients diagnosed each year) are available on an ongoing basis only for American Indians of New Mexico/Arizona and Alaska Natives - Eskimo, Aleut, Indian (2,3). Data from the Alaska Native Tumor Registry (<http://seer.cancer.gov registries/alaska.html>) document that cancer patterns in Alaska Natives differ from those of Whites and Blacks and other minority populations in the United States (2,3). Cancer rates among Alaska Natives also differ from those of American Indians of New Mexico/Arizona. Within Alaska there are also differences by ethnic group, Eskimo, Aleut, Indian (2). Although cancer was considered a rare disease in Alaska Natives as recently as the midtwentieth century, incidence rates now equal those of U.S. Whites, and mortality rates exceed those of U.S. Whites (2). Cancer is now the leading cause of death among Alaska Native women, and ranks third among men.

There are even fewer published reports of survival rates from cancer for AI/AN than incidence and mortality reports for these populations. Reports include survival rates for Indians in Montana, Western Washington and New Mexico/Arizona for all cancers combined (4-6). For specific cancer sites, survival data are available largely for American Indians of New Mexico/Arizona (7-10). Cancer survival rates for most minority populations in the United States are lower than for U.S. Whites (11). The lowest rates reported are among American Indians in New Mexico/Arizona (11).

Lanier, A., Kelly, J., Holck, P., Smith, B., and McEvoy, T., 2000. Alaska Native Cancer Update 1985-97; By Sex, Age, Service Unit and Year. Alaska Native Health Board; Epidemiology Center, Anchorage. <http://www.anhb.org/sub/epi/documents/ANCU%201985-97.pdf> *PEOPLE; health (condition); health (comparative); cancer; mortality*

INTRODUCTION

This report is from the Alaska Native Tumor Registry (<http://seer.cancer.gov registries/alaska.html>), Alaska Native Medical Center and the Alaska Native Epidemiology Center, Alaska Native Health Board. Data for 1997 are provided and supplement previous reports including "Cancer in Alaska Natives 1969-

1993, a 25 Year Report”, and “Alaska Native Cancer Update – 1984-96”. As in previous reports, cancer data are provided for Alaska Natives who are eligible for Indian Health Service (IHS) benefits and who were residents of Alaska at the time of diagnosis. Only cancers diagnosed as “invasive” are tabulated. Certain cancers of the skin (squamous and basal cell carcinomas) are excluded, consistent with standard tumor registry reporting. Classification of tumors follows the International Classification of Oncology (ICD-O) classification system (see Appendix). Extensive effort is expended to assure completeness and accuracy of the information reported. Incidence rates (average annual) have been calculated for the years 1993-97 for all cancers and each primary site. Rates are age-adjusted to the US 1970 Standard Population to allow comparison with other published rates. Rates are given for males, females, and both sexes combined. These rates are compared with those for the US White population for the same time period. An asterisk (*) indicates those rates for Alaska Natives that differ significantly from those of US Whites. Numbers of cancers are provided for all Alaska Natives and for each of the eight major IHS Service Units: Anchorage, Barrow, Bristol Bay, Interior, Kotzebue, Mt. Edgecumbe/Annette Island, Norton Sound and Yukon Kuskokwim. Numbers are given for all cancers and by primary cancer site by age, sex, and year of diagnosis.

HIGHLIGHTS ALASKA NATIVE TUMOR REGISTRY 1997 UPDATE

In the 1990s, over 200 Alaska Natives have developed cancer each year. In 1997, 267 Alaska Native patients (136 men and 131 women) were newly diagnosed with invasive cancer. This is the largest number diagnosed in any single year since the first year, 1969, that the registry recorded statewide data.

Based on data for the most recent five years (1993-97), the most commonly diagnosed invasive cancers among Alaska Native men and women combined were: Lung, Colon/rectum, Breast, Prostate, and Stomach

Based on this same five year period (1993-97), the average annual age-adjusted incidence rate for all cancers combined is now 5% higher among Alaska Natives than the US White population.

Cervical cancer rates in AN women no longer exceed US white rates. In 1997, no new patients were diagnosed with invasive cervical cancer. This is the first year no new cervical cancers have been diagnosed in the history of the registry! Although the rate for all cancers combined is similar for AN and US Whites, rates for specific cancer sites differ.

The rate for lung cancer in AN exceeds the US rate among both men and women. Rates among AN are also higher than US for cancers of the nasopharynx, most organs in the digestive tract, and the kidney.

Breast cancer among AN women has increased and is now as high as that of US White women.

Prostate cancer occurs less often in AN men than in US Whites.

Rates among AN are also lower than US Whites for melanoma of the skin, lymphoma, and cancers of the bladder and brain.

This report provides details on occurrence of cancer by gender and age for all cancers combined and by specific cancer sites, for all Alaska Natives and for eight major service delivery areas.

**These data are also available on the Alaska Native Health Board web site:
www.anhb.org/sub/epi**

Lanier, A., Kelly, J., Holck, P., Smith, B., McEvoy, T., and Sandidge, J., 2001. Cancer incidence in Alaska Natives thirty-year report 1969-1998. *Alaska Medicine* 43 (4), 87-115. *PEOPLE; health (condition); cancer; health (comparative)*

The Alaska Native Tumor Registry (<http://seer.cancer.gov/registries/alaska.html>) includes data from 1969 to the present. This report provides incidence rates over the thirty year period, 1969 through 1998, and compares trends over time for Alaska Natives (AN) with those of US Whites and Blacks. To examine current rates, average annual age-adjusted incidence rates for AN for 1984-98 are compared with US Whites. Data from the registry document numerous differences in rates of occurrence of specific cancers compared to US Whites and Blacks. Studies of these differences may provide clues to the causes and risk factors for the cancers. Most importantly, these data show that although cancer was considered a rare disease in the Alaska Native population as recently as the mid-twentieth century, the incidence rate for all cancers combined among Alaska Natives is now as high as that of US Whites, and even higher in women. On the other hand, despite relative differences in rates, the most frequently diagnosed cancers among Alaska Natives are the same as US Whites. Cancers of the lung, colon/rectum, breast, and prostate are most frequently diagnosed among Alaska Natives and in the U.S. These four cancers comprise over 50% of all diagnosed invasive cancers. Cancer of the lung is almost entirely preventable by eradication of tobacco use. Screening and early detection have been proven to reduce mortality for cancers of the colon/rectum and breast. Primary and secondary prevention of these cancers could markedly improve morbidity and mortality.

LaPerriere, J., and Rea, C., 1989. Effects of calcium magnesium acetate deicer on small ponds in interior Alaska. *Lake and Reservoir Management* 5 (2), 49-57. *WATER QUALITY; contaminants; calcium magnesium acetate; limnology; invertebrates; bacteria; insects; microbes; infrastructure; road*

Whole-lake experiments were conducted on 3 ponds in interior Alaska to test the effects of calcium magnesium acetate (CMA), an experimental road deicer, on aquatic organisms. The CMA added to the test ponds equalled approximately one chemical application applied to 0.4 km of a typical section of road (one lane) draining entirely to a small pond. Calcium elevation did not persist into the next summer; it may have been flushed out by snowmelt. Acetate from the CMA mixture was apparently rapidly taken up by aquatic organisms and cycled for several months, depleting dissolved oxygen in the water. Dissolved oxygen became extremely low in a small pond of about 2,600 m³ treated with 55 mg/L calcium acetate (calculated from calcium elevation). Bacteria and algae both appeared to be stimulated by CMA additions, as indicated by higher standing crops in treated ponds. Cladocerans [water fleas] were more dense in treated ponds than in control ponds.

LaPerriere, J., Van Nieuwenhuysse, E., and Anderson, P., 1989. Benthic algal biomass and productivity in high Subarctic streams, Alaska. *Hydrobiologia* 172 (High Latitude Limnology (23rd Congress of the Societas Internationalis Limnologiae, Hamilton (New Zealand); Vincent, WF, Ellis-Evans, JC (eds))), 63-75. *LIMNOLOGY; invertebrates; microbes; chlorophyll; algae; nutrition; phosphorus; water quality*

Year-round measurements of the standing crop of epilithic algae (as chlorophyll a concentration) in two streams - one second and one fourth order (map scale 1:63,360) -

in interior Alaska (64 degree - 65 degree N) were only about one tenth that reported from streams of temperate North America. Cell densities in these streams, however, were similar to those in comparable temperate streams. Year-round domination of the benthic flora by very tiny diatoms (*Achnanthes* spp.) may explain the apparent disparity between low chlorophyll a content and nearly average cell densities. Chlorophyll a standing crop in a more alkaline groundwater-fed stream, however, was higher and within the range of similarly sized temperate streams. Maximum chlorophyll a standing crop varied positively with alkalinity in 5 clear-water streams where standing crop was measured on natural or artificial substrates. Seasonal mean concentrations of sestonic chlorophyll a (used as estimates of benthic algal chlorophyll a standing crop) varied directly and significantly with alkalinity among ten clear-water streams; and, with total phosphorus among 8 of 10 clear-water and 5 brown-water streams studied. During the summer, when there is little darkness, gross primary productivity (as estimated by the diurnal dissolved-oxygen method) was similar to that of northern temperate streams. Gross primary productivity was also seen to vary directly with alkalinity in 5 clear-water streams of this region (DBO).

LaPerriere, J., 1994. Benthic ecology of a spring-fed river of interior Alaska. *Freshwater forum* 32 (2), 349-357. *LIMNOLOGY; invertebrates; insects; microbes; hydrology; ground water; surface water*

A massive aquifer between the Gerstle, Tanana and Delta rivers in interior Alaska receives water from them and from smaller streams that flow from the Granite Mountains in the Alaska Range. Groundwater from the aquifer intersects the surface in a mid-sized spring-fed stream, Clearwater Creek. Benthic algal standing crop was at least an order of magnitude higher than that in a nearby surface-water stream, the upper Chena River. Standing crop peaked in spring and autumn and averaged about half this value. Macroinvertebrate diversity in Clearwater Creek was low. In early spring and autumn, drifting macroinvertebrates were primarily Ephemeroptera [mayflies], Plecoptera [stoneflies] and Trichoptera [Caddisflies], but in summer, Diptera [true flies] dominated the drift.

LaPerriere, J., and Reynolds, J., 1997. Gold placer mining and stream ecosystems of interior Alaska. In: Milner, A., and Oswood, M., eds., *FRESHWATERS OF ALASKA ECOLOGICAL SYNTHESSES*. Ecological Studies. SPRINGER, NEW YORK, NY (USA), pp. 265-280. *MINING; gold; water quality; sediment; management; economics*

Placer mining has historically been an economically important part of the mining industry in Alaska. The discovery of gold brought many settlers to the state, and access to the gold fields provided impetus for expansion of the transportation systems. Because water is used in most processes that separate placer gold from lighter materials, there is the possibility of sediment pollution of nearby water bodies. When we conducted our research on the effects of placer-gold mining on streams, we studied several streams receiving heavy sediment loads. Emphasis was placed on Birch Creek, where the heavy sedimentation at the main research site was primarily due to the cumulative effects of numerous mines above, and partially due to their inadequate or even nonexistent settling ponds. Today, Birch Creek apparently receives far less sediment from mining, and the water quality is visibly improved. This improvement is undoubtedly partially due to decreased industrial activity because of the lower price of gold. The annual value per refined ounce peaked at \$455 in 1987, falling to \$359 in 1993. However, another factor in water quality improvement was undoubtedly the completion of the effluent guidelines issued by announcement in 53 FR 18788, May 24, 1988, which essentially requires total recycle of the process water, with only excess stormwater allowed to be discharged. Discharged water must be treated if necessary to reduce settleable solids to 0.02mL/L, which the U.S. EPA considers to be the detection limit of the method.

Lauriol, B., Prevost, C., Deschamps, E., Cinq-Mars, J., and Labrecque, S., 2001. Faunal and Archaeological Remains as Evidence of Climate Change in Freezing Caverns, Yukon Territory, Canada. *Arctic* 54 (2), 135-141. *CLIMATE; hydrology; ground ice / permafrost; history*
Animal and plant remains, some associated with prehistoric artefacts, were collected in freezing caverns (glaciers) of northern Yukon Territory. Radiocarbon dates show that the oldest remains are Middle Wisconsinan (ca. 38 000 BP). The absence of material of Late Wisconsinan age likely indicates that the caves were infilled by ice during this cold period. Climate warming and ice melting during the Holocene allowed animals and prehistoric hunters to regularly visit these caves. Ice plugs were evidently smaller during the early Holocene than they are now.

Lawrence, J., Swerhone, G., and Kwong, Y., 1998. Natural attenuation of aqueous metal contamination by an algal mat. *Canadian Journal of Microbiology/Revue Canadienne de Microbiologie* 44 (9), 825-832. *MINING; WATER QUALITY; contaminants; metals; aluminum; iron; manganese; cadmium; nickel; copper; zinc; remediation; algae; bacteria; acidification*
Naturally occurring mechanisms of attenuation for metals in the environment are important for understanding and remediating acid rock drainage. A filamentous green algae was found forming an extensive mat below an outflow of acidic, metal-laden groundwater, at Macintosh Creek, MacMillan Pass, Yukon Territory, Canada. Emerging waters had a pH of 3.3 and the following dissolved metal concentrations in milligrams per litre: Al = 156, Fe = 298, Mn = 1.1, Cd = 0.13, Ni = 2.52, Cu = 0.69, and Zn = 5.0. In contrast, waters that had coursed over the algal mat had the following concentrations in milligrams per litre: Al = 26.4, Fe = 29.3, Mn = 0.18, Cd = 0.03, Ni = 0.4, Cu = 0.2, Zn = 0.88. In addition, the concentration of dissolved As declined from 32.9 to 9.3 $\mu\text{g/L}$. Thus, the concentrations of potentially deleterious elements were typically reduced by between 5- and 10-fold. Scanning electron microscopy (SEM) indicated that individual filaments of the algae were encrusted with mineral precipitate. Microprobe analyses indicated that the coatings were predominantly composed of Fe with other metals, in the presence of S and P, the latter possibly associated with the algal biomass. While culturing methods indicated the presence of 10^4 - 10^6 *Thiobacillus ferrooxidans* per mL in the water, epifluorescence microscopy observations using DAPI and SYTO 9 nucleic acid stains did not reveal bacteria in association with the algal filaments. Hydrated samples were also observed using confocal scanning laser microscopy (CSLM) with FITC-conjugated lectin staining, autofluorescence, and reflection imaging. These observations indicated that the algal filaments had an extensive exopolysaccharide surrounding the filaments and that mineralization occurred within the matrix. This suggested that factors such as the E_h and pH proximal to the algae may be playing an important role in mineral production.

Laxton, N., Burn, C., and Smith, C., 1996. Productivity of loessal grasslands in the Kluane Lake region, Yukon Territory, and the Beringian "Production Paradox". *Arctic* 49 (2), 129-140. *VEGETATION; grasses; soil; nutrient cycling; nitrogen; herbivory (mammal)*
The Beringian "Production Paradox" is posed by abundant evidence that large ungulates populated unglaciated portions of northwestern North America and adjacent northeast Asia during the late Pleistocene, while botanical data from the same period suggest a poorly productive tundra environment. It is not clear how the large animals sustained themselves, but portions of Beringia, locally in receipt of loess [wind blown silt], may have harbored sufficient forage-producing plants to nourish these animals. Loessal soils in the region today are warm and dry in summer, and are often used as rangelands. The loessal hypothesis was examined on grasslands in the Kluane Lake area, southwest Yukon Territory, at sites which have recently received loess blown from the Slims River delta. The biomass and species diversity of grasslands around the lake increase with the quantity of silt in the soil. Likewise, soil fertility indices, including total nitrogen, available nitrogen (NH_4), and total carbon, increase with silt content, particularly at sites

where the soil surface has been stable for some time, and a "humified" loess (Ahk) horizon has developed. These results support the hypothesis that sites in receipt of loess may have played a significant role in the vegetative productivity of the Beringian ecosystem.

Leach, D., 2001. Alaska Native Births and Infant Deaths: 1980 - 1997. Alaska Native Tribal Health Consortium, Alaska Area Native Health Service, Division of Planning, Evaluation, and Health Statistics: http://www.alaska.ihs.gov/dpehs/Mortality_Reports/ANBIreport97.pdf
PEOPLE; reproduction; mortality; infants; health (comparative)

INTRODUCTION

One of the principle sources of information about the changing patterns of the health status of Alaska Natives is natality and mortality statistics. This report represents a summary of trends (1980 through 1997) in the health status of Alaska Natives as indicated by their birth and infant death rates. Source data on births and infant deaths was obtained from special natality and mortality reports prepared by the Indian Health Service. The most recent data year available is 1997.

TERMINOLOGY

The terms death rate and mortality rate and birth rate and natality rate are used interchangeably. Below are several terms and definitions which are quoted in this publication.

Birth Rate/Natality Rate. The number of live births per 1000 total population (Table 3), or by 1000 women in the age group (Table 4). The birth rates for 15-17 year olds are nearly identical between the U.S. and Alaska Native populations. The 1997 U.S. rate is 63.7 births per 1000 women compared to the Alaska Native three-year average (1995-97) rate of 63.1. (Ventura SJ, Mosher WD, Curtin SC, Abma JC, Henshaw S. Trends in pregnancy rates for the United States, 1976-97: An update. National vital statistics reports; vol 49 no. 4. Hyattsville, Maryland: National Center for Health.

Fertility Rate. The number of live births per 1000 women of reproductive age, 15-44 years of age. The three-year average fertility rate of 118.4 for Alaska Natives is nearly double that of the 1997 U.S. rate of 65.0.

Infant Death/Infant Mortality Rate. The number of deaths under one year of age divided by the number of live births, expressed as deaths per 1000 live births.

Neonatal Mortality Rate. The number of deaths in the first four weeks of life divided by the number of live births, expressed as deaths per 1000 live births.

Post Neonatal Mortality Rate. The number of deaths to infants between the ages of four weeks and one year of life divided by the number of live births, expressed as deaths per 1000 live births.

METHODOLOGY

In small populations, the number of births (or infant deaths) are frequently too small to be useful over time. Therefore, averages are often calculated over a specific time frame. Three-year moving averages have been tabulated. For example, the three-year rate for 1997 refers to the average of the years 1995, 1996, and 1997. The "moving average" methodology reduces the effect of year-to-year variations in categories where small numbers of births (or infant deaths) occur.

2001. Alaska Native Mortality: 1980-1998. Alaska Area Native Health Service - Alaska Native Tribal Health Consortium; Division of Planning, Evaluation, and Health Statistics: http://www.alaska.ihs.gov/dpehs/Mortality_Reports/Mortality98Report.pdf *health (comparative);*

PEOPLE; mortality; infants; children; adults; heart disease; cancer; accidents; alcohol; suicide; stroke; homicide; cirrhosis; respiratory infection

INTRODUCTION

Alaska Native Mortality represents a summary of trends in the health status of Alaska Natives as indicated by their death rates. Population statistics for Alaska Natives from the U.S. Census Bureau along with population projections make it possible to estimate reliable patterns of death rate changes. These data are used to examine Alaska Native cause-specific death rates for all Alaska Natives and by Alaska Area service units.

Alaska is divided among nine service units: Anchorage, Annette Island, Barrow, Bristol Bay, Interior Alaska, Kotzebue, Mt. Edgecumbe, Norton Sound, and Yukon-Kuskokwim Delta Service Units. A service unit is the local administrative unit of the Indian Health Service (IHS).

Data for each service unit (including Alaska) is presented in Appendix, Tables 3 and 4. Table 3 shows the number of Alaska Native deaths and the three-year crude death rate by leading cause of death; Table 4 presents the number of Alaska Native deaths by age group for the service units and Alaska's age-specific, three-year mortality rates.

METHODOLOGY

Data on Alaska Native deaths were provided by the State of Alaska, Department of Health and Social Services, Bureau of Vital Statistics and are based on officially recorded death certificates. Because some service units report few (three or less) observations in each cell and to ensure confidentiality of descendants, single years are not published for individual service units. Instead, three-year moving averages have been tabulated. Also, in small populations, causes of deaths due to specific diseases and deaths are often too small to be useful over time or in relation to other causes. So, averages are often calculated over a specific time frame. The "moving average" methodology reduces the effect of year-to-year variations in categories where small numbers of deaths occur.

POPULATION STATISTICS

Population figures used in calculating the death rates are based on the U. S. Census figures for Alaska Natives/American Indians in Alaska. Official Population counts were used for 1980 and 1990. Populations between Census years 1980 and 1990 are estimated by a smoothing technique in order to show a gradual transition between Census years. Populations beyond the latest Census year (1990) are projected through linear regression techniques, using the most current 10 years of birth and death data provided by the National Center for Health Statistics. The natural change is by the estimated number of births minus the estimated number of deaths and is applied to the latest Census numeration.

NUMBER OF DEATHS

Appendix, Table 1 shows the actual number of deaths by year for Alaska Natives from 1980 through 1998 by cause of death. The order of each cause of death is ranked by their relative importance based on the number of deaths in 1998. Single year death rates are the best measure for multiple regression analysis such as those done on Chart A, pages 3 through 5. On the other hand, three-year average death rates are the best measure for a particular time period when the population and incidence of death are relatively small.

CRUDE DEATH RATES

The crude death rate is the number of deaths in a year divided by the estimated population and multiplied by a constant of proportionality. The number of deaths occurring in a certain time period is expressed as number of deaths per 100,000 population. Currently, 100,000 is used for the standard unit of population. The deaths are summed, divided by the population and multiplied by 100,000 to determine the crude

death rate. For example, in 1998, there were 605 Alaska Native deaths from all causes and an estimated population of 103,688 (revised November 1998). The 1998 crude death rate calculation for Alaska Natives from all causes is 583.5: $(605/103,688) \times 100,000 = 583.5$. The crude death rate represents the average chance of dying during a specified period for persons in the entire population.

THREE-YEAR MOVING AVERAGES

Appendix, Table 2, page 15, presents the three-year average crude death rates per 100,000 population by major cause of death from 1980 through 1998. These rates were computed by averaging the total number of deaths for the three-year time period for the numerator and using the mid-year population for the denominator. (3-yr. Average Number of Deaths / Mid-Year Population) * 100,000 For example, the average number of 1996-1998 deaths and the 1997 Alaska Native population are used to compute the three year average, 1996-1998, crude death rate of 599.9.

Lee, M., and Birkbeck, J., 1977. Anthropometric measurements and physical examinations of Indian populations from British Columbia and the Yukon Territories, Canada. *Human Biology* 49 (4), 581-591. *PEOPLE; health (condition); morphology; INCOMPLETE (need abstract)*

Lee, K., 1985. Resource partitioning and behavioral interactions among young-of-the-year salmonids, Chena River, Alaska, University of Alaska, Fairbanks, M.S., 75 p *POPULATION; fish; salmon; chinook; grayling; whitefish; behavior (feeding); behavior (territorial?)*

Leffell, M., Fallin, M., Erlich, H., Fernandez-Vijna, M., Hildebrand, W., Mack, S., and Zachary, A., 2002. HLA antigens, alleles and haplotypes among the Yup'ik Alaska natives: report of the ASHI Minority Workshops, Part II. *Human Immunology* 63 (7), 614-625. *PEOPLE; biochemistry; genetics; distribution*

As part of the American Society for Histocompatibility and Immunogenetics coordinated studies among minority populations, human leukocyte antigen (HLA) alleles were defined for 460 volunteer Yup'ik Eskimos from the Yukon Kuskokwim delta region of southwestern Alaska. The study group included 252 adults with no other first-degree relatives and 48 informative nuclear families. Full Yupik ancestry through both maternal and paternal grandparents was claimed by 81.1% of participants. HLA-A, -B, -Cw, -DRB1, and -DQB1 alleles were determined by SBT, SSOP, reverse SSOP, and/or RSCA according to the protocols of five participating laboratories. Polymorphism was limited with 3-6 alleles comprising > 80% of the alleles observed at each locus. Homozygosity was high, particularly at the HLA-A and -DQB1 loci, with 36.6% and 44% of individuals having a single allele defined at these respective loci. HLA-A, -B, and -DRB1 alleles were in Hardy-Weinberg equilibrium, whereas HLA-Cw and -DQB1 alleles gave significant deviation ($p = 0.002$; 0.005). Significant linkage disequilibrium ($p \leq 0.00001$) was observed in all pairwise evaluations. A new Cw*0806 allele was observed in high linkage disequilibrium with B*4801 ($\Delta = 0.099$; $\Delta(\text{rel}) = 1.0$). Three extended haplotypes were found to have frequencies > 5%, the most prevalent being A*2402; B*4801; DRB1*0401; DQB1*0301 (0.0933). Comparison of available class I data indicate that the Yup'ik share several common alleles with other Native American populations, including: A*2402, *0206, *6801; B*1501, *2705, *3501, *4002, *4801, *5101; and Cw*0202, *0304, *0401. Comparisons of class II data also confirm a close relationship of the Yup'ik to two other Eskimo populations, Siberian and East Greenland Eskimos. DRB1*0401 and *1101, which occur in high frequency among these Eskimo populations, but not in other Native Americans, were also prevalent among the Yup'ik, with respective frequencies of 0.232 and 0.107.

Lehmkuhl, K.L., 2000. Population dynamics and ecology of yellow-cheeked voles (*Microtus xanthognathus*) in early post-fire seres of interior Alaska, University of Alaska Fairbanks, M.S.,

106 p *POPULATION; mammals; vole; distribution; nutrition; habitat selection; behavior (defensive); mortality; flooding; vegetation; black spruce; white spruce*

Yellow-cheeked voles occupy early successional habitats in boreal regions, but specific factors influencing the species' distribution and population dynamics are not well known. Yellow-cheeked voles were studied in three early post-fire habitats in interior Alaska to relate population parameters to habitat characteristics. Voles were live-trapped during June, July, and August of 1997 and 1998, and habitat components were measured with trapping grids. Capture data were analyzed using the robust design to estimate vole abundance, density, survival, and recruitment. Yellow-cheeked voles were most abundant in the floodplain white spruce, where survival was stable and recruitment was high. The white spruce habitat had the greatest cover of preferred forage species, while grasses, large diameter logs and snags provided escape cover. Observed differences in habitat quality may be related to unique successional processes in black and white spruces communities.

Lenart, E.A., Bowyer, R.T., Ver Hoef, J., and Ruess, R.W., 2002. Climate change and caribou: Effects of summer weather on forage. *Canadian Journal of Zoology/Revue Canadienne de Zoologie* 80 (4), 664-678. *POPULATION; mammals; caribou; nutrition; climate*

In 1989, the Chisana caribou (*Rangifer tarandus*) herd in the northern Wrangell Mountains, Alaska, U.S.A., declined substantially in population size and productivity. Grasses, sedges, forbs, and willows (*Salix* spp.) are critical components of the diet of caribou in spring and summer, and the abundance and quality of forage are influenced by climate. To evaluate effects of climatic variation on caribou forage we conducted a field experiment in subarctic tundra where light, air temperature, and precipitation were manipulated. We used a plastic tarpaulin to increase air temperature and decrease precipitation. We also decreased light intensity with a shade cloth and increased precipitation by adding water to determine climatic effects on nutrient content and biomass of forage for caribou during the summers of 1994 and 1995. The most notable treatment effect on aboveground biomass was that shading resulted in higher nitrogen concentrations in all plant growth forms. In addition, shading consistently reduced biomass in forbs during mid and late season. Water treatment increased total plant biomass in the greenhouse plots during midseason in 1994 and in late spring in 1995. Water treatment also increased late-season biomass in control plots during 1994 but had no effect on biomass in shaded plots in either 1994 or 1995. A decline in nitrogen concentration in plants occurred throughout summer, a pattern that was not evident in *in vitro* dry matter digestibility. Climate variation and subsequent effects on forage plants have the potential to influence the population dynamics of caribou through effects on their food supply.

LeResche, R.E., Bishop, R.H., and Coady, J.W., 1974. Distribution and habitats of moose in Alaska. *Le Naturaliste Canadien* 101, 143-178. *INCOMPLETE (need abstract); POPULATION; mammals; moose; habitat selection; distribution*

Lester, S.J., and Kenyon, J.E., 1996. Use of allopurinol to treat visceral leishmaniasis in a dog. *Journal of the American Veterinary Medicine Association* 209 (3), 615-7. *POPULATION; health care; domestic animals; dog; parasitic infection*

Visceral leishmaniasis was diagnosed in a working sled dog on the basis of history, clinical signs, and identification of amastigotes in a skin biopsy specimen. Allopurinol was administered as sole treatment for the disease. The drug was given for 9 months, and, during this time, clinical signs of disease resolved. Laboratory abnormalities had resolved by 12 months after diagnosis and 3 months after treatment. The dog has been without medications for 19 months and remains free of clinical signs, has sired 2 litters, and functions well as lead sled dog for a team.

Letson, G.W., Gellin, B.G., Bulkow, L.R., Parks, D.J., and Ward, J.I., 1992. Severity and frequency of sequelae of bacterial meningitis in Alaska Native infants. Correlation with a scoring system for severity of sequelae. *American Journal of Disabled Children* 146 (5), 560-6.

PEOPLE; infants; children; health (comparative); bacteria; respiratory infection; influenza; pneumonia

OBJECTIVES--To (1) determine the frequency and severity of sequelae of *Haemophilus influenzae* type b and *Streptococcus pneumoniae* meningitis in Alaska Native children, (2) compare morbidity and mortality of H influenzae b and S pneumoniae meningitis, and (3) evaluate the applicability of the Herson-Todd prognostic score (HTPS) to both H influenzae b and S pneumoniae meningitis in this population. **DESIGN--**A retrospective study of all cases of H influenzae b and S pneumoniae meningitis in Alaska Native children younger than age 5 years. Data on meningitis sequelae, obtained from medical charts and records of the Infant Learning Program, were collected, and incidence of sequelae tabulated. Data obtained on admission to the hospital were used to calculate HTPS. **SETTING--**Indian Health Service facility for the Yukon- Kuskokwin Delta region of southwest Alaska. **STUDY SUBJECTS--**51 of 63 Alaska Native children with H influenzae b meningitis and 13 of the same 63 Alaska Native children with S pneumoniae meningitis occurring between 1980 and 1988. One child was infected with both organisms, producing a total of 64 cases for study. **SELECTION PROCEDURES--**Cases were identified by surveillance for these diseases between January 1, 1980, and December 31, 1988, maintained by the Arctic Investigations Program, Centers for Disease Control. **MEASUREMENTS AND RESULTS--** Sequelae of bacterial meningitis caused by H influenzae b were equal to or exceeded rates of sequelae described in other children in the United States. After H influenzae b meningitis, motor abnormalities (29%) and hydrocephalus (7%) occurred two to four times more often in Alaska Native children than in children in other parts of the United States. Differences in severity of H influenzae b sequelae could not be accounted for by microbiologic markers of the H influenzae b strain, including ampicillin sensitivity, biotype, outer membrane protein type, or electropherotype. Numbers of cases of S pneumoniae meningitis were too small for statistically valid comparison, but sequelae of S pneumoniae meningitis occurred in roughly equal proportion as sequelae of H influenzae b meningitis. The HTPS was applied to Alaska Native children with H influenzae b meningitis and was found to be very accurate in predicting children with major sequelae. Analysis of the prognostic factors used in deriving the HTPS revealed a unique set of predictors for sequelae in Alaska Native children: seizures at admission, glucose levels in cerebrospinal fluid of less than 1.1 mmol/L; and male gender, with a significant predictive interaction between male gender and age less than 6 months at admission. **CONCLUSIONS--**Alaska Native children suffer greater neurologic morbidity as a result of H influenzae b meningitis than do their non-Native counterparts. The HTPS was a good predictor of major sequelae in Alaska Native children with H influenzae b or S pneumoniae meningitis and could be useful in determining which patients need referral to a tertiary care center.

Leverington, D., and Duguay, C., 1996. Evaluation of three supervised classifiers in mapping 'depth to late-summer frozen ground,' Central Yukon Territory. *Canadian Journal of Remote Sensing* 22 (2), 163-174. *CLIMATE; ground ice / permafrost; monitoring; mapping; imaging (remote sensing); snow; river ice; lake ice*

With increased concern about the nature of global climate change, a program has been established to develop techniques for monitoring changes in cryosphere [frozen zone] parameters using remotely sensed data as a primary data source. This research program, known as CRYSYS (CRYospheric SYStem), is focussing on monitoring surface snow and ice conditions in order to monitor climate-driven processes that influence the cryosphere. One component of the cryosphere that is of particular interest is permafrost.

The primary objective of this research was to evaluate three supervised classification schemes (maximum likelihood, evidential reasoning, and a neural network) in the prediction and mapping of depth to late-summer frozen ground (DTFG) in the widespread discontinuous permafrost zone of the boreal forest of central Yukon. Source imagery used in the classifications was composed of TM- and DEM-derived data known to be correlated with DTFG. Results of a two-class DTFG experiment indicate that all tested classifiers are suitable for generating two-class correlative DTFG data products in the Mayo region. The neural network classifier was found to be most successful, producing a two-class DTFG image with a 93% agreement rate between predicted and field-measured DTFG classes. Land cover and equivalent latitude were consistently found to be especially useful sources for use in the classifications. When three DTFG classes were used, agreement rates greatly decreased for all classifiers, supporting field observations that suggest that only two DTFG classes exist in the study area.

1997. A neural network method to determine the presence or absence of permafrost near Mayo, Yukon Territory, Canada. *Permafrost and Periglacial Processes* 8 (2), 205-215. *CLIMATE; hydrology; ground ice / permafrost; vegetation; modeling*

A neural network was used to predict the presence or absence of the permafrost table within 1.5 m below the ground surface, over two study areas near Mayo, Yukon Territory. Input sources used in neural network classifications included land cover (derived from Landsat Thematic Mapper (TM) imagery), equivalent latitude, aspect, and TM band 6 (thermal infrared imagery). For the first study area, maximum median agreement between predicted and field-measured permafrost-table conditions, produced using land cover and equivalent latitude data as input to the neural network, was over 90%. The agreement percentage produced by classification of the second study area, using land cover and equivalent latitude, and using correlative permafrost-surface relations from the first study area, was 60%. Training data, the portability of which is critical in region-wide predictions of active-layer conditions, cannot be transferred between the two study areas examined here.

Levine, M., Milliron, A., and Duffy, L.K., 1994. Diurnal and seasonal rhythms of melatonin, cortisol and testosterone in interior Alaska. *Arctic Medical Research* 53 (1), 25-34. *PEOPLE; non-indigenous; seasonality; endocrinology; depression*

The diurnal variations in the secretory patterns of melatonin, cortisol and testosterone were studied in a Fairbanks, Alaska population who were unadapted to the extreme light variations of the North. Statistically significant variations in hormonal levels were found in both diurnal and seasonal rhythms. Prominent findings included unusually high levels of cortisol at 0200 and 0800 in the fall and elevated daytime levels (1030) of melatonin in the winter. These results indicate a delayed phase secretory pattern when compared to the normal pattern at lower latitudes. These findings imply possible underlying physiological causes for the high incidence of behavior disorders such as depression and alcoholism in Alaska and circumpolar environments in general.

Levine, M., 1995. Seasonal symptoms in the sub-Arctic. *Military Medicine* 160 (3), 110-114. *PEOPLE; non-indigenous; seasonality; depression*

To obtain information regarding the frequency and severity of seasonal symptoms in the sub-Arctic, 361 Seasonal Pattern Assessment Questionnaires (SPAQ) were collected from four separate populations, all either assigned to Fort Wainwright, in Interior Alaska, or receiving treatment there. The study included both civilian and military personnel, of both genders, over 16 years of age. The mean score on the SPAQ was in the low end of the range of sub-syndromal seasonal affective disorder. Females scored significantly higher than males, the mean score approaching that found in seasonal affective disorder. Active duty females scored higher than civilians, and were found to have symptoms severe enough to qualify as true seasonal affective disorder in 10.9% of cases. The

highest scores and highest rates of true seasonal affective disorder were found in a group of 25 Medical Activity (MEDDAC) female non-commissioned officers who were not in patient status.

Lewis, V.E., 1981. Pinosylvin monomethyl ether : an herbivore feeding deterrent from *Alnus crispa* [Alder], University of Alaska, Fairbanks, M.S., 43 p *VEGETATION; alder; herbivory; chemical defense*

Lichvar, R., Racine, C., Murray, B., Tande, G., Lipkin, R., and Duffy, M., 1997. A floristic inventory of vascular and cryptogam plant species at Fort Richardson, Alaska. Tech. Report EL-97-4. U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS. http://www.uaa.alaska.edu/enri/aknhp_web/bib/bib.html *INCOMPLETE (need abstract); MILITARY; VEGETATION; distribution*

Light, G., 1996. An assessment of benzene concentration variations in ground-water samples extracted from monitoring wells: Fairbanks, University of Alaska, M.S. Thesis, 136 p *INCOMPLETE (need abstract); CONTAMINANTS; POL (petroleum/oil/lubricants = hydrocarbons); transport; monitoring; military; hydrology; ground water*

Lindberg, M., Sedinger, J., and Flint, P., 1997. Effects of spring environment on nesting phenology and clutch size of Black Brant. *Condor* 99 (2), 381-388. *POPULATION; birds; waterfowl; brant; reproduction; behavior (reproductive/nesting); snow*

We studied the effects of timing of spring snowmelt on nesting phenology, nest site selection, and clutch size of Black Brant (*Branta bernicla nigricans*) breeding at the Tutakoke River colony, Yukon-Kuskokwim Delta, Alaska. In late springs, brand nested later; however, time between peak arrival at Tutakoke and nest initiation (6 to 12 days) was similar in early and late springs. Nest initiation was more synchronized in late springs than early springs. Height of nests relative to spring meltwater levels was lower in late springs than early springs, indicating that the interval between snowmelt and nest initiation was shorter. Reduced availability of nest sites and increased nesting synchrony in late years may result in greater competition for available nest sites and reduced site fidelity. Clutch size was greater in late springs than in early springs. This increase in clutch size may result from greater accumulation of endogenous reserves [of energy] on spring staging areas in late springs, or from demographic changes in the breeding population.

Linkous, J.L., 1995. Indigenous knowledge and beaver management systems : a comparative perspective from Selawik and Fort Yukon, Alaska, University of Alaska Fairbanks, M.A., 138 p *INCOMPLETE (need abstract); POPULATION; mammals; beaver; management; native perspective*

Lipkin, R., and Parker, C., 1995. Rare vascular plants of the BLM Dalton Highway utility corridor. Report to U.S. Bureau of Land Management. Natural Heritage Program, University of Alaska, Anchorage. Alaska. http://www.uaa.alaska.edu/enri/aknhp_web/bib/bib.html *INCOMPLETE (need abstract); VEGETATION; distribution; disturbance*

Lloyd, A., and Fastie, C., 2002. Spatial and Temporal Variability in the Growth and Climate Response of Treeline Trees in Alaska. *Climatic Change* 52 (4), 481-509. *CLIMATE; VEGETATION; spruce; growth/development*

In this study, we investigated the response of trees growing at the cold margins of the boreal forest to climate variation in the 20th century. Working at eight sites at and near alpine and arctic treeline in three regions in Alaska, we compared tree growth (from measured tree ring-widths) to historical climate data to document how growth has

responded to climate variation in the 20th century. We found that there was substantial regional variability in response to climate variation. Contrary to our expectations, we found that after 1950 warmer temperatures were associated with decreased tree growth in all but the wettest region, the Alaska Range. Although tree growth increased from 1900–1950 at almost all sites, significant declines in tree growth were common after 1950 in all but the Alaska Range sites. We also found that there was substantial variability in response to climate variation according to distance to treeline. Inverse growth responses to temperature were more common at sites below the forest margin than at sites at the forest margin. Together, these results suggest that inverse responses to temperature are widespread, affecting even the coldest parts of the boreal forest. Even in such close proximity to treeline, warm temperatures after 1950 have been associated with reduced tree growth. Growth declines were most common in the warmer and drier sites, and thus support the hypothesis that drought-stress may accompany increased warming in the boreal forest.

Lockhart, W., Wagemann, R., Tracey, B., Sutherland, D., and Thomas, D., 1992. Presence and implications of chemical contaminants in the freshwaters of the Canadian Arctic. *Science of the Total Environment* 122 (1-2), 165-245. *WATER QUALITY; CONTAMINANTS; metals; mercury; radiation; POPs (persistent organic pollutants); POL (petroleum/oil/lubricants = hydrocarbons); biochemistry; enzymology*

Hydrocarbons, stable organochlorines, metals and radionuclides are widespread in the freshwaters of the Canadian Arctic. Petroleum-associated hydrocarbon sources include natural seepage, wastes and effluents from exploration, production and refining at Norman Wells and spills. Hydrocarbons also originate from combustion of carbon-based fuels, generally at lower latitudes and then reach the Arctic with air movements. Organochlorine compounds also move throughout the hemisphere by aerial pathways and have become distributed widely in Arctic fish. The organochlorine at highest concentration in Arctic freshwater is alpha-HCH, while those generally at highest concentrations in the fish are toxaphene, PCBs and chlordane. Metals are ubiquitous in Arctic freshwaters, with inputs of several metals by precipitation superimposed on natural geologic backgrounds. Mercury is found in muscle of fish from Arctic freshwaters at concentrations up to about 0.5 ppm. Radionuclides are also widespread at levels below those acceptable in food, with some local elevations near former mines. The implications of these contaminants for the northern ecosystems and the people dependent upon them are still not clear. Preliminary studies of inducible enzymes in fish suggest that the thresholds for biological damage have not been reached.

Lockhart, W., Wilkinson, P., Billeck, B., Hunt, R., Wagemann, R., and Brunskill, G., 1995. Current and historical inputs of mercury to high-latitude lakes in Canada and to Hudson Bay. *Water, Air, & Soil Pollution* 80 (1-4; Third International Conference on Mercury as a Global Pollutant), 603-610. *CONTAMINANTS; metals; radiation; mercury; sediment; air quality; bioaccumulation*

Sediment cores collected from several lakes in northern Canada have been analyzed for mercury and several other chemical contaminants. Sites ranged from the Experimental Lakes Area of northwestern Ontario, north to Cornwallis Island, and west to the southern Yukon. Cores were sliced at sites of collection and individual slices were freeze dried and analyzed for Pb-210 and Cs-137 to estimate average time intervals of deposition. The earliest date estimated by Pb-210 was about 1850, and mercury concentrations in some lakes were clearly increasing before then, assuming no vertical movements of mercury within the sediments. Extrapolation of dates downward to deeper slices, assuming a constant sedimentation rate, indicated that in some lakes mercury inputs increased slowly even in the 1500's, more rapidly after 1750, and more rapidly yet over the current century. These increases are interpreted as increased fluxes of mercury to the lakes as a

result of long-range transport of atmospheric mercury, since there are no local industrial sources of mercury. Slices taken near the bottom of a core are taken to estimate the geological component while elevations in excess of that in surface slices are taken to represent contamination from fallout. This partitioning suggests that sediments in the eastern Northwest Territories are dominated by pollution, while those from the western Northwest Territories are influenced more by their geological settings. Two cores from Hudson Bay suggest that mercury is increasing there too, but has not yet exceeded geological sources. Mercury shows little or no tendency to decline in the most recent slices; indicating that inputs of mercury remain at or near their historical maxima. Given relatively high and continuing inputs of mercury to northern lakes it seems likely that some portion of that mercury may find its way into the food chain, hence the long-term prospect is for increasing levels of mercury in northern fish.

Loperfido, J.C., 1968. Dissolved organics in interior Alaska ground waters: College [Fairbanks], University of Alaska, M.S., 86 p *WATER QUALITY; NUTRIENT CYCLING; ground water; surface water; ground ice / permafrost; carbon*

Low molecular weight organic compounds have been extracted from surface run off water, ground water, and subpermafrost ground water... Apparent molecular formulas suggest that the organics extracted from each water were derived from terpenoid compounds. Similarities among the organics extracted from all three waters lend support to the hypothesis that dissolved organics in subpermafrost ground water have their origin in the decaying plant and animals life overlying permafrost-free zones.

Loyens, W., 1966. The changing culture of the Nulato Koyukon Indians, University of Wisconsin, Ph.D., 288 p *PEOPLE; anthropology; traditional food; behavior (habits and lifestyles)*

LTER, 2002. Bonanza Creek Long Term Ecological Research. University of Alaska Fairbanks; National Science Foundation: <http://www.lter.uaf.edu> *AIR QUALITY; VEGETATION; SOIL; POPULATION; NUTRIENT CYCLING; LIMNOLOGY; HYDROLOGY; CLIMATE; ecology; wildfire; ground ice / permafrost; snow; nutrition; monitoring; modeling; management; forestry; herbivory; habitat selection; flooding*

The Bonanza Creek Experimental Forest (BCEF) is a 5053 ha research area located approximately 20 km southwest of Fairbanks, AK along the Parks Highway. The Forest is within the Tanana Valley State Forest, a unit managed by the Division of Forestry, State of Alaska.

The area represents a transect of typical vegetation and landforms in interior Alaska, and includes a section of the Tanana River floodplain at an elevation of approximately 120 m and adjacent uplands. These uplands form the southern limit of the Tanana-Yukon uplands, rising to a ridge crest of 470 m.

The vegetation, a mosaic of forest and non-forest types, corresponds to four broad topographic zones: upland hills and ridges, lowland toeslopes and valley bottoms, old Tanana River terraces, and the active floodplain.

The Caribou-Poker Creeks Research Watershed (CPCRW) is a 104 km² basin near Chatanika, AK. This site is reserved for ecological, hydrological, and climatic research. It is owned jointly by the State of Alaska and the University of Alaska Fairbanks. The entrance to the Research Watershed is located on the Steese Highway about 31 miles from Fairbanks.

Luong, H., and Brown, E., 1984. Removal of arsenic from contaminated water with partially deacetylated shellfish waste. NTIS: PB85-214716/GAR. USGS/G-827-03. Institute of Water

Resources, University of Alaska, Fairbanks. *WATER QUALITY; surface water; ground water; MINING; gold; remediation; contaminants; metals; arsenic*

Arsenic is often enriched in placer and lode gold deposits. In Alaska, USA, and Yukon Territory, Canada, there is concern that recently increased activity in gold mining may result in arsenic contamination of pristine streams and groundwaters. Chitosan, a very good cationic flocculant, might be used to remove this arsenic. Shellfish wastes are composed of protein, calcium carbonate and large amounts of chitin. *Mucor rouxii* spore transformation of shellfish waste could be considered as a nontoxic agent for removing dissolved arsenic (and other heavy metal contaminants) and particulates from placer mine wastes in Alaska. The project attempted to evaluate the arsenic removal capability of partially deacetylated chitin derived from shellfish waste. Chitosan will remove substantial amounts of dissolved arsenate from water, whereas chitin is much less effective.

MacCluskie, M., and Sedinger, J., 2000. Nutrient reserves and clutch-size regulation of Northern Shovelers in Alaska. *Auk* 117 (4), 971-979. *POPULATION; birds; waterfowl; shoveler; nutrition; metabolism; reproduction*

We determined patterns of nutrient-reserve use by female Northern Shovelers (*Anas clypeata*) nesting at Minto Flats, Alaska, and compared them with those of female shovelers nesting in the Prairie Pothole Region of Manitoba, Canada. Individual variation in somatic lipid was best explained by nest initiation date; females that initiated nests early had larger lipid reserves than females that delayed nest initiation. These results contrast with those from Manitoba, which showed that females used lipid reserves and stored protein during egg production. Incubating females from Alaska did not use protein or mineral reserves, but lipid reserves decreased significantly throughout incubation. Females in Alaska and Manitoba used lipid reserves similarly during incubation. We conclude that endogenous nutrient availability does not proximately limit clutch size during laying for this population of shovelers, possibly due to the high productivity of wetlands in interior Alaska and/or the long photoperiod that allow females to forage extensively. Successful completion of incubation or brood rearing may be an ultimate factor that controls clutch size for this population of shovelers.

Maciulek, J., 1989. Tundra ponds of the Yukon Delta, Alaska, and their macroinvertebrate communities. *Hydrobiologia* 172 (HIGH LATITUDE LIMNOLOGY (23rd Congress of the Societas Internationalis Limnologiae, Hamilton (New Zealand) Vincent, WF; Ellis-Evans, JC (eds))), 193-206. *POPULATION; invertebrates; insects; gastropods; worms; distribution*
The Yukon Delta, a low alluvial tundra in western Alaska, has more than 10⁵ thaw-basin ponds within its 70 000 km² area. In 1984 and 1985, 68 ponds in three interior areas of the Delta were surveyed to determine limnological features, macroinvertebrate fauna, and trophic character. Ponds ranged up to 90 ha in area, 2 m in depth, and 17 m in elevation, and occurred in various temporal stages of growth and senescence. Among the 18 major invertebrate taxa collected, in order of decreasing frequency of occurrence, Trichoptera, Hemiptera, Diptera, Pelecypoda, Isopoda, Coleoptera, Gastropoda, and Oligochaeta were found in over 50% of the ponds. Trichoptera, the only taxon occurring in all ponds, was represented by 22 species of 6 families. The average Delta pond had 6.6 of the nine more common taxa. This measure of faunal richness was similar among study areas but was higher in low-tundra (sea level) ponds and in older ponds on raised tundra. In comparison, lentic invertebrate communities in five other areas of Alaskan and Canadian tundra had fewer taxa and also lower average richness based on occurrence of the same nine taxa (DBO).

MacLeod, M., Woodfine, D., Mackay, D., McKone, T., Bennett, D., and Maddalena, R., 2002. BETR North America: A regionally segmented multimedia contaminant fate model for North America. *Environmental Science and Pollution Research* 8 (3), 156-163. *AIR QUALITY;*

CONTAMINANTS; POPs (persistent organic pollutants); long range transport; fate; modeling; vegetation

We present the Berkeley-Trent North American contaminant fate model (BETR North America), a regionally segmented multimedia contaminant fate model based on the fugacity concept. The model is built on a framework that links contaminant fate models of individual regions, and is generally applicable to large, spatially heterogeneous areas. The North American environment is modeled as 24 ecological regions, within each region contaminant fate is described using a 7 compartment multimedia fugacity model including a vertically segmented atmosphere, freshwater, freshwater sediment, soil, coastal water and vegetation compartments. Inter-regional transport of contaminants in the atmosphere, freshwater and coastal water is described using a database of hydrological and meteorological data compiled with Geographical Information Systems (GIS) techniques. Steady-state and dynamic solutions to the 168 mass balance equations that make up the linked model for North America are discussed, and an illustrative case study of toxaphene transport from the southern United States to the Great Lakes Basin is presented. Regionally segmented models such as BETR North America can provide a critical link between evaluative models of long-range transport potential and contaminant concentrations observed in remote regions. The continent-scale mass balance calculated by the model provides a sound basis for evaluating long-range transport potential of organic pollutants, and formulation of continent-scale management and regulatory strategies for chemicals.

Maddux, D.C., 2002. Constructed wetlands for wastewater treatment in the subarctic: Fairbanks, University of Alaska Fairbanks, Ph. D., 146 p *CONTAMINANTS; metals; copper; lead; zinc; cadmium; WATER QUALITY; remediation; microbes; vegetation*

This research had two basic objectives: to assess the capability of macrophytes [non-microscopic plant] indigenous to the subarctic in removal of heavy metals from wastewater and to determine the feasibility of using constructed wetlands for sewage wastewater treatment in a subarctic environment with a focus on rural application. The research consisted of two parts: a greenhouse study in which indigenous macrophytes were subjected to heavy metal pollutants similar to those found in roadway runoff and a constructed wetland built to treat sewage wastewater. Five species of plants were tested in both projects: *Arctophila fulva* [grass], *Carex rhynchophysa* [sedge], *Menyanthes trifoliata* [buckbean], *Scirpus validus* [bulrush] and *Typha latifolia* [cattail]. In the greenhouse study, the plants were exposed to four heavy metals: cadmium (Cd), copper (Cu), lead (Pb) and zinc (Zn) over a 68-day period. The plants were grown under a photoperiod of 20 hours light: 4 hours dark. There were significant differences in metal uptake among species and more metals were stored in below-ground plant parts than in above-ground plant parts. In separate experiments, plants took up zinc in greater quantities than the other metals except *Arctophila fulva* which took up copper in the greatest quantity. Effects of phytotoxicity [toxicity to plants] from the metal concentrations were apparent only in *Menyanthes trifoliata*. The constructed wetland study consisted of a five-cell system. Biological oxygen demand (BOD), total suspended solids (TSS), fecal coliforms (FC), total phosphorus (TP), total Kjeldahl nitrogen (TKN) and ammonium nitrogen (NH₄⁺) were measured bi-weekly during each growing season over a three-year period. Reduction efficiencies, averaged over the ice-free season, ranged from 24-67% for BOD; 38-62% for TSS; 93-99% for FC; 21-60% for TP; 43-76% for TKN; and 50-92% for NH₄⁺. The reduction of pollutants indicated the ability of [?!] subarctic. Vegetation colonized the constructed wetland rapidly, with a complex community structure emerging over the study period. Pollutant reduction appeared to be limited by the size of the constructed wetland and not by the extreme climatic conditions

Magoun, A.J., and Dean, F.C., 2000. Floodplain Forests Along the Tanana River: Interior Alaska Terrestrial Ecosystem Dynamics and Management Considerations. Agricultural & Forestry Experiment Station, University of Alaska Fairbanks; Alaska Boreal Forest Council, http://www.akborealforest.org/abfc_miscpub_3.pdf *VEGETATION; population; succession; stress; forestry; management*

SUMMARY

Despite some confusion over the objectives and methods of ecosystem management (Yaffee 1999), there is increasing interest on the part of resource managers, scientists, and the public in moving toward ecosystem management of forest resources (Calhoun 1998). The Society of American Foresters (SAF) defined ecosystem management as an ecological approach to forest resources management that “attempts to maintain the complex processes, pathways and interdependencies of forest ecosystems and keep them functioning well over long periods of time, in order to provide resilience to short-term stress and adaptation to long-term change. Thus, the condition of the forest landscape is the dominant focus, and the sustained yield of products and services is provided within this context ” (Society of American Foresters’ Task Force on Sustaining Long-term Forest Health and Productivity 1993). Ecosystem management should be based on 1) consideration of all ecosystem components, 2) sound scientific information, and 3) inclusive processes that involve members of the general public. Full incorporation of all components of ecosystem management should include biological and physical components, economic components, and social and political components.

The term “ecosystem management” does not explicitly appear in current documents setting policy and guidelines for management of forests in the Tanana Valley. However, maintaining a sustained yield of all natural resources (as mandated by the State Constitution), requires an approach to natural resource management that includes the principles of ecosystem management. In order for forest managers and the general public to know whether we are accomplishing ecosystem management in the Tanana Valley, the Alaska Boreal Forest Council (ABFC) believes a regionally specific set of guidelines for addressing ecosystem management is necessary. Forest management guidelines are frequently incorporated in regulations embodying “Best Management Practices” (BMPs) or in sets of criteria which serve as performance yardsticks in forest certification programs. Much of the policy on, and regulation of, forestry and timber harvesting in interior Alaska is governed by the Alaska Forest Resources and Practices Act (AFRPA) and its associated BMPs, the Tanana Valley State Forest (TVSF) Forest Management Plan, and the Tanana Basin Area Plan (TBAP). The TVSF Forest Management Plan is currently under revision. The AFRPA is also under revision for interior Alaska (Region III). However, the policy guidelines and regulations that currently pertain to forest management in the Tanana Basin do not specifically address how timber sales are designed. The ABFC is interested in forest management certification (Society of American Foresters’ Task Force on Forest Management Certification Programs 1999) as one of many tools that might provide specific guidelines that result in timber harvests patterned after natural disturbance events in interior Alaska. At this time, there is no forest certification program for interior Alaska.

Even if forest certification programs are not implemented in interior Alaska, the ABFC is committed to helping develop ecosystem-based approaches to forest management in the Tanana Valley. The first step toward ecosystem management is learning how interior Alaska boreal forests function as ecological units. Commercially valuable forests in interior Alaska occur on south-facing slopes and along the major rivers and their tributaries. This report deals primarily with the biological and physical components of forests that grow along the Tanana River, referred to as “riparian forests” or “floodplain forests.” We did not address the economic and sociological aspects of ecosystem

management in this report, though we recognize these aspects are integral components of a successful ecosystem management approach.

Why did we focus this report on floodplain forests along the Tanana River? White spruce is the primary commercial timber species in interior Alaska. The white spruce that occurs in relatively narrow bands along the Tanana River and its tributaries are attractive to loggers and forest managers because the floodplains of the Tanana Valley are some of the most productive sites for white spruce in the region. Moreover, because the road system in the valley parallels the Tanana River from Tok to Nenana, there is better access to timber on the floodplain than to much of the commercially-forested state land in more remote upland areas. The floodplain forests are also a top concern of many recreationists, tour operators, and others primarily focused on aesthetics and the value of the river for recreation. Biologically, the white spruce along the rivers may be important to the distribution of some species of plants and animals, and movements of some species may be influenced by the long, narrow landscape patterns and limited habitat types in these forests. Certain species of plants and animals may actually reach their greatest densities in, or be restricted to, floodplain forests. Finally, from the political standpoint, logging white spruce along the rivers in the Tanana Valley has been one of the most controversial topics on the agenda Division of Forestry (DOF) in the Alaska Department of Natural Resources (ADNR) and its Citizens' Advisory Committee (CAC). There have been over 20 years of research on floodplain forests along the Tanana River conducted by scientists with the Long Term Ecological Research (LTER) program at the University of Alaska (<http://www.lter.uaf.edu>) and others. However, most of this research has been conducted in the Fairbanks area and deals primarily with successional patterns, soil development, and nutrient cycling. Comparatively little is known about the upper and lower reaches of the river or about other ecosystem components. In this report, we summarize much of the scientific information regarding floodplain forests in the Tanana Valley, including plant and animal communities as well as forest processes and functions. We consider all community types on the floodplain because white spruce stands do not function separately from the successional stages that precede or succeed them, or from the adjacent habitat types that also occur on the floodplain. It will become readily apparent that little information is included on plants other than trees and shrubs. Until there is a good map of the floodplain that can be overlaid on appropriate databases, there is no feasible way to develop even species lists specifically for floodplain sites. There is a striking absence of detailed ecological information on most plants.

We attempted to synthesize the most recent work on the floodplain as well as incorporate key items from older literature. We also included information from upland sites when it was applicable, especially if comparable research was lacking for floodplain forests, and we included some information from other regions, especially boreal forest areas, when relevant information was not available from the Tanana Basin or if it highlighted research needs for interior Alaska. Because most of this report is a literature review, we did not write it in the style of a peer-reviewed journal article. For example, we retained the authors' original measurement units (but also added approximate metric conversions). We primarily used common names, but we included scientific names where they were used by the author without a common name or where they provided better clarity. Scientific names and common names for plants, birds, and mammals that are mentioned in the text are available in tables at the end of the report (Tables 1, 2, and 3, respectively). Readers interested in the complete scientific names of plants referred to in the cited literature are urged to consult the original publications. The University of Alaska Museum's Herbarium has a Provisional List of Alaskan Flora that includes authors' names.

There were many applicable papers that were not cited in the report, but constraints of time and space would not allow us to include everything. Although we tried to remain unbiased in the selection and discussion of material, we recognize that being completely unbiased is impossible. We recommend that readers seek out the original papers and form their own opinion of the research results and conclusions.

Drafts of this report have been peer-reviewed by individuals listed in the acknowledgements. Table 4 is a list of people cited for personal communications. Our report is meant as a “starting point” for discussions on management of terrestrial forest ecosystems along the Tanana River. Our hope is that readers will gain a broad picture of the conditions and processes shaping the Tanana Valley’s floodplain forests, and that the report will be used as a guidepost to those seeking more complete information on specific topics. Most of our discussions are limited to floodplain forests along the main Tanana River, even though many of ecosystem processes and plant and animal communities are similar along the major tributaries of the Tanana. We restricted our discussions to the Tanana because most of the research on floodplain forests in the Tanana Valley has been conducted in stands along the Tanana River, and to a lesser extent along lower reaches of the Chena River. Most of the detailed studies on forest succession and nutrient cycling have been conducted near Fairbanks. Additional research is needed in other reaches of the Tanana and along its major tributaries to determine if research results are applicable over broad areas. It is likely that research conducted along the Tanana River near Fairbanks will be more applicable to lower reaches of the Tanana and major tributaries like the Nenana and Kantishna Rivers than to upper reaches of the river and tributaries like the Tok, Robertson, and Gerstle Rivers because the geomorphology and hydrology of the rivers change upstream of Fairbanks (Collins 1990).

This report does not deal with the aquatic portions of floodplain forests in the Tanana Valley or the interface between terrestrial and aquatic ecosystems, though we recognize their importance (e.g., Gregory et al. 1991; Naiman and Décamps 1997). Other ongoing projects with the ABFC and DOF are focusing on the aquatic ecosystems of the Tanana floodplain. It is our hope that when all these projects are completed, a synthesis of the information will provide a more complete picture of the floodplain ecosystems of the Tanana Valley.

Finally, we believe a comparison of floodplain and upland white spruce sites in the Tanana Valley would be valuable in the management of forests in the Tanana Valley. There are some basic differences between these forest types as well as many similarities. Hopefully, future funding will be available for just such a comparison.

Mahrt, J.L., Zwickel, F.C., and Tessier, T.G., 1991. Blood parasites of blue grouse (*Dendragapus Obscurus*) in western North America. *Wildlife Disease* 27 (3), 482-5.

POPULATION; birds; grouse; parasitic infection; health (condition); health (comparative)

Three hundred thirty-three blue grouse (*Dendragapus obscurus*) were examined for blood parasites from 11 sites: southern Yukon Territory, southeast coastal Alaska, northern and central interior British Columbia, south coastal British Columbia, northcentral Washington, southcentral Oregon, northwestern California, eastcentral Nevada, northwestern Colorado, and westcentral Montana. Three species of protozoan parasites (*Leucocytozoon lovati*, *Haemoproteus masoni*, *Trypanosoma avium*) and a splendidofilariid nematode (*Microfilaria* sp. B) were found in nearly all locations.

Prevalence levels were consistently high for *L. lovati* (92%). The other hematozoa were found less frequently (*H. masoni* 29%; *T. avium* 46%; and *microfilaria* 29%). The range of these parasites in blue grouse was extended to a more northern (Yukon Territory) and more southern distribution (Nevada) than previously reported. Ranges were also extended to blue grouse populations in Alaska, Washington, Oregon and California.

Maier, J., Murphy, S., White, R., and Smith, M., 1998. Responses of caribou to overflights by low-altitude jet aircraft. *Journal of Wildlife Management* 62 (2), 752-766. *MILITARY; noise; population; mammals; caribou; stress; reproduction; disturbance*

Military training exercises have increased in Alaska in recent years, and the possible effects of low-altitude overflights on wildlife such as barren-ground caribou (*Rangifer tarandus*) have caused concern among northern residents and resource agencies. We evaluated the effects of overflights by low-altitude, subsonic jet aircraft by U.S. Air Force (USAF) A-10, F-15, and F-16 jets on daily activity and movements of free-ranging female caribou. This study was conducted on caribou of the Delta Caribou Herd in interior Alaska during each of 3 seasons in 1991: late winter, postcalving, and insect harassment. Noise levels experienced by caribou were measured with Animal Noise Monitors (ANMs) attached to radiocollars. Caribou subjected to overflights in late winter interrupted resting bouts and consequently engaged in a greater number of resting bouts than caribou not subjected to overflights ($P = 0.05$). Caribou subjected to overflights during postcalving were more active ($P = 0.03$) and moved farther ($P = 0.01$) than did caribou not subjected to overflights. Caribou subjected to overflights during the insect season responded by becoming more active ($P = 0.01$). Responses of caribou to aircraft were mild in late winter, intermediate in the insect season, and strongest during postcalving. We conclude that females with young exhibit the most sensitive response to aircraft disturbance. Accordingly, military training exercises should be curtailed in areas where caribou are concentrated during calving and postcalving.

Mallek, E.J., II, 1999. Plant architecture and forage selection by moose, University of Alaska Fairbanks, M.S., 63 p *POPULATION; mammals; moose; habitat selection; nutrition; vegetation; herbivory (mammal)*

Summary: "The effects of plant architecture on browse selection and the extent of use of *Salix alaxensis* and *Salix plantifolia* by moose foraging in winter in Interior Alaska were studied during 1997 and 1998. Three sampling techniques were employed to estimate forage availability and utilization. Sampling forage availability prior to use (in autumn) provided the best estimates of forage use in spring. In *Salix plantifolia*, selection of current annual growth (CAG) twigs was significantly related to basal diameter of CAG, diameter of nearest neighbor, distance to nearest neighbor, and number of leaders per cluster. In contrast, CAG selection in *Salix alaxensis* was related only to basal diameter. The proportion of CAG biomass removed from stems of either species was not related to any measured plant architecture variables. Because plant architecture affects browse use by moose, it is an important factor in determining food availability, and thereby in assessing moose habitat"

Mann, D., Fastie, C., Rowland, E., and Bigelow, N., 1995. Spruce succession, disturbance, and geomorphology on the Tanana river floodplain, Alaska. *Ecoscience* 2 (2), 184-199.

VEGETATION; black spruce; white spruce; succession; soil; geology; wildfire; flooding; ground ice / permafrost; forestry

A long-standing paradigm in the ecology of the Alaskan taiga states that black spruce (*Picea mariana* [Mill.] BSP) replaces white spruce (*Picea glauca* [Moench] Voss) after several centuries of primary succession on floodplains. According to this Drury Hypothesis, autogenic thickening of organic horizons and shrinking of the active layer interact with the species' different physiological tolerances to cause black spruce dominance. We test the Drury Hypothesis on >200-year-old portions of the Tanana River floodplain near Fairbanks, Alaska, and reject it. In the meander belt portion of the study area, white spruce mixed with black spruce persists on geomorphic surfaces approximately 3,000 years old. Predictions of the Drury Hypothesis regarding active-layer and organic-horizon thicknesses are not substantiated. Neither of these variables correlates with the abundances of the different spruce species. Forest communities in

the study area are distributed along geologically based environmental gradients and are shaped by secondary succession following fires and probably floods. Black spruce dominates in the poorly drained, permafrost-rich, and fire-prone backswamp and white spruce in the oppositely characterized meander belt. Although geological chronosequences can be identified along avulsion-prone rivers like the study reach of the Tanana River, superposition of a meander belt-backswamp plan and frequent fire and flood disturbances may negate any vegetation chronosequences older than several centuries.

Manville, R.H., and Young, S.P., 1965. Distribution of Alaskan mammals. Circular 211. Bureau of Sport Fisheries and Wildlife, <http://biology.usgs.gov/s+t/SNT/noframe/ak177r.htm>
INCOMPLETE (need abstract); POPULATION; mammals; distribution

Marcotte, J., 1982. The King Salmon Drift Net Fishery of the Middle Yukon: An Overview and Study of the 1982 Season. Technical Paper No. 18. Alaska Department of Fish and Game, *PEOPLE; traditional food; fish; salmon; chinook*

This report examines participation in the recently reestablished king salmon drift net fishing season near the Yukon River communities of Kaltag and Nulato during 1981. The history of the subsistence drift net fishery is reviewed and events leading up to the reopening of the fishery in 1981 are described. Half the fishing households harvested fewer than 25 king salmon and the total subsistence harvest for the two communities was 950 king salmon.

Marcotte, J., and Haynes, T., 1984. Contemporary Resource Use Patterns in the Upper Koyukuk Region, Alaska. Technical Paper No. 93. Alaska Department of Fish and Game, *PEOPLE; subsistence; traditional food; mapping*

Findings of a study conducted cooperatively with the National Park Service and the U.S. Fish and Wildlife Service are presented in this report. Hunting, fishing, trapping, and plant gathering activities during a two-year period in 1981-1983 are described for the communities of Allakaket, Alatna, Bettles, Evansville, and Hughes. Maps depicting areas used for resource harvesting are presented as are 1982 harvest levels and general socioeconomic data for each community. Some comparisons are made between employment and resource harvest information collected in this study and in the late 1960s and early 1970s.

Marcotte, J., 1986. Contemporary Resource Use Patterns in Huslia, Alaska. Technical Paper No. 133. Alaska Department of Fish and Game, *PEOPLE; subsistence; traditional food; mapping*
This study documents wild resource harvest and use patterns for 1983 in the Koyukuk River community of Huslia. The presentation is based primarily from a 1984 survey of 56 of the 57 community households. Harvest data and land use maps are presented. Attention is given to socioeconomic and cultural factors which influence resource harvest activities. Research was conducted in cooperation with the Koyukuk National Wildlife Refuge.

1990. Subsistence Harvest of Fish and Wildlife by Residents of Galena, Alaska, 1985-86. Technical Paper No. 155. Alaska Department of Fish and Game, *PEOPLE; subsistence; traditional food*

This report describes contemporary subsistence harvest and use of wild resources by Galena residents. Findings are based on a 1986 survey of 35 percent (74 of 211) of community households. The relationship between Galena and the surrounding communities is discussed in terms of land use, resource sharing, and demography. Galena displays characteristics typical of its role as a subregional center yet harvest participation and subsistence production rates are high. Harvest and land use maps are presented.

Marcotte, J., Wheeler, P., and Alexander, C., 1992. Fish and Game Use by Residents of Five Upper Tanana Communities, 1987-88. Technical Paper No. 168. Alaska Department of Fish and Game, *PEOPLE; subsistence; traditional food; infrastructure*

This report summarizes the results of a household survey conducted in five Upper Tanana communities: Dot Lake, Tanacross, Tok, Tetlin, and Northway. The study was undertaken to update resource harvest and use data for this area and to provide a baseline of resource use, demographic, and other economic data to understand the possible impacts of the construction and operation of the proposed over-the-horizon backscatter radar facility. A total of 195 households were interviewed about their levels of resource harvest and use in 1987-88. The report summarizes the study findings in a series of tables and figures, and compares the results for 1987-88 with those from earlier subsistence studies.

Marshall, S., 1994. Peatland Sphaeroceridae (Diptera [true flies]) of Canada. *Memoirs of the Entomological Society of Canada* 169, 173-179. *POPULATION; invertebrates; peat; climate*
Seventy-three species of the acalyptrate family Sphaeroceridae [true flies] are recorded from Canadian peatlands, largely on the basis of pan trap samples from peatlands in southern Ontario, the Yukon, and Alberta. *Spelobia nana* (Rondani), *Spelobia ibrida* (Rohacek), and *Trachypella atomus* (Rondani) are newly recorded from North America. Fifteen species are identified as characteristic of peatlands, and their distributions and relationships are discussed. Southern peatland populations of several of these species are interpreted as relict populations in peatlands serving as post-Pleistocene refugia. Some species are known so far only from peatlands along the postglacial fringe.

Martin, G., 1983. Use of Natural Resources by the Residents of Dot Lake, Alaska. Technical Paper No. 19. Alaska Department of Fish and Game, *PEOPLE; subsistence; traditional food; land use; seasonality; native perspective*

This paper describes subsistence use of natural resources by residents of Dot Lake. Information on seasonality, methods of harvest, methods of preparation and storage, cultural significance of resources, and patterns of sharing and exchange are presented. Information on demography, wage employment opportunities, and attitudes toward local development are also provided.

1983. Use of Natural Resources by the Residents of Dot Lake, Alaska: Executive Summary. Technical Paper No. 78. Alaska Department of Fish and Game, <http://www.ak.gov/adfg/subsist/geninfo/publctns/subabs.htm#interiorregion> *PEOPLE; traditional food; land use; management*

This document is a companion summary to Technical Paper No. 19 entitled Use of Natural Resources by the Residents of Dot Lake, Alaska (Martin 1983). The summary highlights research findings as they relate to the proposed land disposal (Sam Creek Subdivision) near Dot Lake.

Marusik, Y., and Koponen, S., 2002. Diversity Of Spiders In Boreal And Arctic Zones. *Journal of Arachnology* 30 (2), 205-210. *POPULATION; insects; invertebrates; spiders; distribution;*
During the last two decades a great number of studies dealing with arctic and boreal spiders have been published, both in the Palaearctic and the Nearctic. Such an increase in information makes it possible to analyze basic patterns of spider diversity in the North as well as to show areas where further studies are still necessary. The number of species found in faunas of larger areas north of 60 degree N varies from 620 (Finland) to 250 (Polar Urals) and 300 (Yukon), when island faunas are excluded. Two areas, divided by the Bering Strait, Northeastern Siberia and north-western North America have marked proportion of endemic taxa (ca. 8 %) belonging to several spider families. Considerable number of endemic spiders are known also in Middle Siberia. The number of spiders in local faunas of the boreal zone varies around 300 species. Study of species composition in more than 20 local northern faunas reveals that proportion of Lycosidae species in

each local fauna varies in smallest range (7-12 % of all species found) in comparison to other families. Thus Lycosidae can be used as an indicator group of general species diversity of spiders in local faunas.

Matsuki, M., Ayres, M., and MacLean, S.J., 1994. Temperature effects on growth and molt of *Nematus calais* (Hymenoptera: Tenthredinidae [a willow sawfly]). *Environmental Entomology* 23 (3), 719-725. *POPULATION; invertebrates; insects; sawfly; herbivory; climate*

We studied the effects of temperature on growth, consumption, assimilation, conversion efficiencies, and molt of *Nematus calais* Kirby (Hymenoptera: Tenthredinidae), a willow sawfly, in interior Alaska. Growth rate of fourth instars increased across the full range of naturally encountered temperatures (biomass doubling time of 6.1 d at 6 degree C versus 0.85 d at 30 degree C). Growth rate of fifth instars also increased from 6 to 24 degree C, but had generally lower Q_{10} s than fourth instars, and actually decreased from 24 to 30 degree C. Patterns in growth rate across temperatures were almost entirely a function of patterns in consumption rate; relative consumption rate increased sixfold from 6 to 24 degree C, whereas conversion efficiencies were constant across temperatures (approximate digestibility = 0.41 to 0.45, efficiency of converting digested matter = 0.24 to 0.31). The duration of the fourth molt decreased from 1.32 d at 6 degree C to 0.17 d at 24 degree C and then increased to 0.40 d at 30 degree C. Compared with more southerly distributed insects, growth rates of *N. calais* tended to be less temperature sensitive and to peak at lower temperatures. Similarities between *N. calais* and *Dineura virididorsata* (Retzius), a sawfly from northern Europe, suggest that the Tenthredinidae may be fundamentally different in their molting physiology from the Lepidoptera and Coleoptera; the ability of tenthredinids to molt rapidly at low temperatures may contribute to their ecological success in high-latitude environments.

Matsuki, M., and MacLean, S.J., 1994. Effects of different leaf traits on growth rates of insect herbivores on willows. *Oecologia* 100 (1-2), 141-152. *POPULATION; invertebrates; nutrition; growth/development; herbivory (insect); vegetation; biochemistry; nutrition; nitrogen*

We examined relative effects of traits of leaf quality of ten willow species (*Salix*: Salicaceae) on growth rates of five species of insect herbivores found in interior Alaska (a willow sawfly, *Nematus calais*; the tiger swallowtail butterfly, *Papilio canadensis*; and three species of chrysomelid beetles, *Gonioctena occidentalis*, *Calligrapha verrucosa*, and *Chrysomela falsa*). Leaf traits examined were water content, toughness, total nitrogen content, pubescence, and presence or absence of phenolic glycosides. Of ten *Salix* species, four species contain phenolic glycosides in their leaves. We examined relative effects of water content, toughness, and nitrogen content of the *Salix* leaves on larval growth rates at three different levels, i.e., on a single host species, between different host species, and between herbivore species. The within-host analyses showed that effects of water content, toughness and/or nitrogen content on herbivore growth rates were generally significant in early-season herbivores but not in late-season herbivores. For each herbivore species, differences in growth rates between hosts were not explained by differences in water content, toughness, or nitrogen content. The between-herbivore analysis showed that the interspecific difference in larval growth rates were related to difference in water and nitrogen content of the hosts. Pubescence of *Salix* leaves had little effects on herbivore growth rates. Presence of phenolic glycosides had a positive effects on growth rates of a specialist, *N. calais*, but no effect on the other specialist, *Ch. falsa*. Presence of phenolic glycosides had, in general, negative effects on growth rates of non-specialists, *G. occidentalis*, *C. verrucosa*, and *P. canadensis*.

Mattes, B.R., 1986. A qualitative and quantitative phytochemical analysis of *P. balsamifera* [poplar/cottonwood] in relationship to mammalian herbivory, University of Alaska, Fairbanks, M.S., 94 p *VEGETATION; poplar; chemical defense; herbivory (mammal); nutrition*

"... The deterrent properties of *P. balsamifera* secondary metabolites considered together with their concentrations in plant tissue explain why balsam poplar, in general, is not heavily utilized by hares as food... The carbon/nutrient balance hypothesis... predicts that trees grown under conditions of limited sunlight or enhanced soil nutrient composition will produce decreased levels of secondary metabolites. The results of this study do not support the hypothesis for *P. balsamifera*."

Matthews, M.D., 1973. Flocculation as exemplified in the turbidity maximum of Acharon Channel, Yukon River Delta, Alaska, Northwestern University, Ph. D., 88 p *HYDROLOGY; SEDIMENT; soil; surface water; INCOMPLETE (need abstract)*

Max, K., Mouchaty, S., and Schwaegerle, K., 1999. Allozyme and morphological variation in two subspecies of *Dryas octopetala* (Rosaceae) [mountain avens] in Alaska. *American Journal of Botany* 86 (11), 1637-? *VEGETATION; mountain avens; genetics; distribution*

The Alaskan endemic shrub *Dryas octopetala* ssp. *alaskensis* and its circumpolar conspecific ssp. *octopetala* are adapted to closely adjacent habitats in alpine areas of Alaska. These alpine areas form geographically disjunct "islands" among which there are limited opportunities for gene flow. Allozyme electrophoresis and a common garden experiment were used to examine genetic variation between subspecies and among disjunct populations of each subspecies. Overall, allozyme variation in *D. octopetala* is low with little differentiation among populations or between subspecies. Morphological differences, however, are greater between subspecies than among populations within subspecies. Divergence for a few morphological and life-history characters has apparently occurred in response to strong selection, but without divergence at allozyme loci. The ancestors of both subspecies of *D. octopetala* in Alaska were isolated during the Pleistocene in the glacial refugia of Alaska and Yukon, which may explain low overall variation. **DRYAS: o. *alaskensis* is thought to be a Pleistocene derivative of ssp. *octopetala*, which may account for the low allozyme divergence between subspecies. Recent restriction to alpine areas may explain the low differentiation among disjunct populations.**

McClellan, C., 1975. My Old People Say: An Ethnographic Survey of Southern Yukon Territory, Part I and Part II. National Museum of Civilization, *INCOMPLETE (need abstract); CLIMATE; traditional knowledge*

McCoy, V., and Burn, C., 2001. Climate Change in Central Yukon. Carleton University, <http://www.yukon.taiga.net/infosources/details.cfm?ID=449> *INCOMPLETE (need abstract); CLIMATE; precipitation; HYDROLOGY; ground ice / permafrost; dams; subsistence; PEOPLE; health (condition); VEGETATION; recovery; distribution; disturbance*

McCrum, M.A., 1985. A chemical mass balance of the Ester Creek and Happy Creek watersheds on Ester Dome, Alaska, University of Alaska, Fairbanks, M.S., 119 p *INCOMPLETE (need abstract); WATER QUALITY; MINING; surface water; ground water; gold*

Mcintire, E., and Hik, D., 2002. Grazing history versus current grazing: leaf demography and compensatory growth of three alpine plants in response to a native herbivore (*Ochotona collaris*). *Journal of Ecology* 90 (2), 348-359. *VEGETATION; sedges; locoweed; fleabane; herbivory (mammal); pika*

1 We measured leaf births, leaf deaths and leaf length of three alpine perennial species, *Kobresia myosuroides* [Pacific bog sedge], *Erigeron humilis* [Arctic alpine fleabane] and *Oxytropis nigrescens* [black locoweed], from sites with different grazing histories (strong or weak) in response to two levels of current season grazing (present or absent) by collared pikas (*Ochotona collaris*), a small lagomorph, in the south-west Yukon. 2 All

three species appeared to tolerate the removal of 58-61% of summer leaf production under natural conditions. Grazing history, which was defined by the location of plants located either < 2 m or > 6 m from boulderfields with a history of occupation by pikas, was the most significant factor determining shifts in leaf births and leaf deaths following herbivory. 3 The only detectable influence of current season herbivory for any measured species was a reduction of leaf length of Kobresia. 4 A comparison of historically grazed with historically ungrazed plants indicated several changes in leaf demography and morphology. Kobresia leaves were generally shorter and had higher rates of production of new leaves. Oxytropis had higher rates of new leaf production. Erigeron had fewer leaf births throughout the summer, but showed a large and highly significant delay in the timing of leaf senescence. 5 These responses can be largely understood as strategies to avoid the predictable intensive late season foraging that is characteristic of pikas. Morphological mechanisms allow these species to tolerate and, more importantly for the herbivore, persist under heavy and chronic grazing.

McKee, C., 2002. Critical [invasive] Species for Data Collection - 2002. Cooperative Extension Service, Fairbanks. *VEGETATION; invasive species*

The following list was taken from a Cooperative Extension Service document titled **WORSTWEEDS.xls**; available at from their office at UAF (PO Box 756180, Fairbanks, AK 99775-6180, PHONE 474-7246; FAX 474-6971)

Giant Hogwort
Brass Buttons
Canada Thistle
Common Dandelion
Narrow-Leaf Hawksbeard
Narrow-Leaf Hawkweed
Orange Hawkweed
Oxe-Eye Daisy
Perennial Sowthistle
Pineapple Weed
Russian Knapweed
Scotch Thistle
Spotted Knapweed
Tansy Ragwort
Ball Mustard
Garlic Mustard
Shephards Purse
Corn Spurry
Lambsquarters
Field Bindweed
Leafy Spurge
Scotch Broom
Sweet Clover (White)
Tufted (Bird) Vetch
Eurasian Watermilfoil
Hempnettle
Purple Loosestrife
Candlegrass
Foxtail Barley
Quackgrass
Reed Canary Grass
Black Bindweed

Japanese Knotweed

Sheep Sorrel

Korean Willow

Butter-n-eggs

McKendrick, J., 2001. Inventory of grasses along the Trans-Alaska Pipeline- 1999. *Agroborealis* 33, 4-20. *INCOMPLETE (need abstract); VEGETATION; grasses; invasive species*

McKenna, R.A., 1932. The Indians of the Upper Tanana, Alaska [microform]: Cambridge, Mass, Harvard University, Ph.D., 507, maps p *PEOPLE; subsistence; history; anthropology; traditional food; INCOMPLETE (need abstract)*

McKnight, D., 1962. A population study of waterfowl on the Tetlin-Northway area of interior Alaska, Washington State University, 89 p *INCOMPLETE (need abstract); POPULATION; birds; waterfowl; goose; duck; sandhill crane; swan; demographics; distribution*

McLean, D., 1975. Mosquito-borne arboviruses in Arctic America. *Medical Biology* 53 (5), 264-

270. *POPULATION; virus; distribution; insects; mosquito; mammals; snowshoe hare; squirrel*

Mosquito-borne arboviruses are prevalent throughout subarctic regions of Canada and Alaska, principally in the boreal forest extending between latitudes 53 and 66 degrees N, but they have been identified in tundra regions as far north as 70 degrees N. All mosquito-borne agents have been bunyaviruses, comprising principally the snowshoe hare subtype of California encephalitis (CE) virus, but also Northway virus. Mosquito vectors comprise several *Aedes* species and *Culiseta inornata*, all of which have supported replication of CE virus following incubation at 13 degrees C or lower temperatures. Isolation of virus from wild-caught larvae points towards transovarial transfer. Principal vertebrate reservoirs of infection are mammals, especially snowshoe hares (*Lepus americanus*) and ground squirrels (*Citellus undulatus*). Where the boreal forest merges into prairie grassland around 53 degrees N, *Culex tarsalis* mosquitoes become prevalent, and an alphavirus, western equine encephalomyelitis, is detected more frequently than CE virus.

McLean, D., Gubash, S., Grass, P., Miller, M., Petric, M., and Walters, T., 1975. California encephalitis virus development in mosquitoes as revealed by transmission studies, immunoperoxidase staining, and electron microscopy. *Canadian Journal of Microbiology/Revue Canadienne de Microbiologie* 21 (4), 453-6-462. *POPULATION; mammals; snowshoe hare; insects; mosquito; parasitic infection; biochemistry*

Isolates of the snowshoe hare subtype of California encephalitis (CE) virus from Yukon mosquitoes during 1972 and 1973 were transmitted by bites of *Aedes aegypti* mosquitoes after 4 to 5 weeks of extrinsic incubation at 55 degrees F after intrathoracic injection, and the 1973 strain was transmitted after mosquitoes were fed virus and held for 3 to 4 weeks at 75 degrees F. Antigen of a 1971 isolate of CE virus (Marsh Lake 23) was detected in salivary glands of infected mosquitoes by the immunoperoxidase technique, using highly purified antiserum before and after conjugation with horseradish peroxidase, plus the use of orthotolidine as a substitute for benzidine. enveloped virions 45 nm in diameter were observed in thin sections of salivary glands of *Culiseta inornata* mosquitoes 59 days after intrathoracic injection with the 1971 isolate, after incubation at 55 degrees F.

McLean, D., 1983. Yukon isolates of snowshoe hare virus, 1972-1982. *Progress in clinical and biological research* 123, 247-256. *POPULATION; mammals; snowshoe hare; health (condition); parasitic infection; virus*

Bunyaviruses including 53 strains of snowshoe hare (SSH) and 4 of Northway (NOR) were isolated from 132,428 unengorged adult female mosquitoes of 7 species collected

throughout the boreal forest of the Yukon Territory and open woodland terrain in the Mackenzie Valley, Northwest Territories, Canada during 8 of 11 arctic summers from 1972 through 1982. Isolations of SSH virus were also achieved from mosquito larvae during 1974 and 1975. Percentage virus infection rates of important vectors were *Aedes communis* (0.038) and *Culiseta inornata* (0.124). Isolations of NOR virus were achieved during 1976 and 1978 only. Infection thresholds of SSH virus for *Ae. communis* were 0.1 mouse LD50, when virus transmission occurred both after virus feeding and after intrathoracic injection and *Cs. inornata* transmitted SSH virus after intrathoracic injection. Both *Ae. communis* and *Cs. inornata* were infected after injection of 3 plaque-forming units (PFU) NOR virus, and transmitted after injection of 300 PFU, but they also became infected after feeding on 30 PFU virus.

McLean, R., Oswood, M.W., Irons, J.I., and McDowell, W., 1999. The effect of permafrost on stream biogeochemistry: A case study of two streams in the Alaskan (U.S.A.) taiga. *Biogeochemistry* 47 (3), 237-265. *WATER QUALITY; ground ice / permafrost; soil; hydrology; nutrient cycling; carbon; nitrogen*

Understanding interactions between permanently frozen soils and stream chemistry is important in predicting the effects of management, natural disturbance and changing permafrost distribution on stream ecosystems and nutrient budgets in subarctic watersheds. Chemical measurements of groundwater, soil water and stream water were made in two watersheds in the taiga of interior Alaska. One watershed (HiP) had extensive permafrost and the other (LoP) had limited permafrost. Soil water collected within the rooting zone (0.3--0.5 m) in both watersheds was high in dissolved organic carbon (DOC), dissolved organic nitrogen (DON) and dissolved inorganic nitrogen (DIN) but low in dissolved minerals (dominantly Ca, Mg and Na) and conductivity. The reverse was true for groundwater from springs and wells. Permafrost in the HiP basin prevented deep percolation of water and generated stormflows rich in DOC. The presence of permafrost in HiP resulted in higher fluxes of DOC, DON and DIN into stream water from upland soils.

McLeay, D., Knox, A., Malick, J., Birtwell, I., Hartman, G., and Ennis, G., 1983. Effects on Arctic grayling (*Thymallus arcticus*) of short-term exposure to Yukon placer mining sediments: Laboratory and field studies. # 1171. Department of Fisheries and Oceans, *MINING; sediment; health (effects); fish; grayling; stress*

A program of controlled laboratory and in-situ field bioassays was conducted during 1982/83 to examine the acute effects of suspensions of Yukon placer mining sediment on underyearling Arctic grayling (*Thymallus arcticus*). Wild grayling, captured as swimup fry or young fingerlings, were acclimated to warmwater (15 degree C) or coldwater (5 degree C) conditions for 7-12 weeks, and subjected to a range of concentrations of organic sediment (overburden) and/or inorganic sediment (paydirt) suspensions in recirculating test tanks. On two occasions (August and September 1982), grayling fingerlings were captured from central Yukon clearwater streams and held for 4 or 5 days in cages within turbid creekwater (Hight Creek) downstream of placer mining activities, and at a nearby clearwater site (Minto Creek upstream of its junction with Hight Creek). It was concluded that the short-term exposure of Arctic grayling to sublethal concentrations of suspended inorganic or organic sediment can cause a number of effects including acute stress responses.

McLeay, D., Ennis, G., Birtwell, I., and Hartman, G., 1984. Effects on Arctic grayling (*Thymallus arcticus*) of prolonged exposure to Yukon placer mining sediment: A laboratory study. # 1241. Department of Fisheries and Oceans, Vancouver, B.C. *MINING; gold; sediment; health (effects); fish; grayling*

The effects on underyearling Arctic grayling (*Thymallus arcticus*) of a 6-week exposure to differing strengths of suspended placer mining sediment was examined under controlled laboratory conditions during the summer of 1983. Results are given.

McLeay, D., Birtwell, I., Hartman, G., and Ennis, G., 1987. Responses of Arctic grayling (*Thymallus arcticus*) to acute and prolonged exposure to Yukon placer mining sediment. *Canadian Journal of Fisheries and Aquatic Sciences/Journal Canadien des Sciences Halieutiques et Aquatiques* Ottawa 44 (3), 658-673. *MINING; fish; grayling; health (effects); water quality; sediment; growth/development; distribution*

Underyearling Arctic grayling (*Thymallus arcticus*) from the Yukon River system were exposed for 4 d to suspensions of fine inorganic (less than or equal to 250 g/L) and organic (plus or minus 50 g/L) sediment and for 6 wk to inorganic sediment (plus or minus 1000 mg/L) under laboratory conditions. The test sediments were collected from an active placer mining area near Mayo, Yukon Territory. The exposures evoked sublethal responses but did not cause gill damage. Mortalities (10 and 20%) occurred only in experiments at 5 degree C with inorganic sediment concentrations greater than or equal to 20 g/L. Six weeks of exposure to sediment concentrations > 100 mg/L impaired feeding activity, reduced growth rates, caused downstream displacement, colour changes, and decreased resistance to the reference toxicant pentachlorophenol, but did not impair respiratory capabilities.

McMahon, B.J., Beller, M., Williams, J., Schloss, M., Tanttila, H., and Bulkow, L., 1996. A program to control an outbreak of hepatitis A in Alaska by using an inactivated hepatitis A vaccine. *Archives of Pediatrics & Adolescent Medicine* 150 (7), 733-9. *PEOPLE; health (condition); health care; hepatitis; biochemistry; enzymology*

OBJECTIVE: To stop an epidemic of hepatitis A in rural Alaska by mass immunization of susceptible persons with 1 dose of an inactivated hepatitis A vaccine. DESIGN: Nonrandomized, uncontrolled trial. Hepatitis A vaccine was offered to all persons in susceptible age groups in villages with documented cases of hepatitis A. Immune globulin was not offered at the time of vaccination. SETTING: Twenty-five rural communities located in interior Alaska and along the northwest coast of the Bering Sea and Arctic Ocean. PARTICIPANTS: Persons without a history of acute hepatitis A in age groups selected by applying results of a previous serosurvey conducted on serum collected before the epidemic. INTERVENTION: One dose of a formalin-inactivated hepatitis A vaccine was given to each participant. Adults 20 years of age and older received 1440 enzyme-linked immunosorbent assay units and persons younger than 20 years received 720 enzyme-linked immunosorbent assay units. Prevaccination and postvaccination levels of antibody to hepatitis A IgG were obtained from 136 participants. MAIN OUTCOME MEASURES: An active surveillance system was established to detect persons with symptomatic illnesses compatible with hepatitis A; persons who met the illness criteria were tested for antibody to hepatitis A IgM. One area (the Kotzebue region), where all communities were offered vaccine, was selected for intensive surveillance and analysis. RESULTS: During the 12-month period before the vaccine trial, 529 cases of icteric hepatitis A were reported, and 443 were confirmed to be positive for antibody to hepatitis A IgM. Hepatitis A vaccine was administered to 4930 persons, 3517 of whom were younger than 20 years. After vaccination began, 237 persons positive for antibody to hepatitis A IgM were identified during a 60-week surveillance period; 46 were vaccines and 191 were unvaccinated susceptible persons. In the Kotzebue region, in communities in which more than 80% of persons considered susceptible were vaccinated, the outbreak ceased in 4 to 8 weeks, whereas in 1 large community in which less than 50% of susceptible persons were vaccinated, the outbreak continued for more than 50 weeks. More than 90% of seronegative persons developed antibody to hepatitis A IgG 3 to 4 weeks after vaccination. CONCLUSION: This trial

suggested that by providing both short-term and long-term protection, hepatitis A vaccine used without immune globulin halted an established epidemic of hepatitis A in rural Alaska.

Meade, N., Hinzman, L., and Kane, D., 1998. Baseline Data Collection at Caribou-Poker Creeks Research Watershed In Support of Soil Moisture Predictions Using Synthetic Aperture Radar. INE/WERC 99.05. Water and Environmental Research Center, University of Alaska, Fairbanks. <http://www.uaf.edu/water/publications/trwrpt.pdf> *HYDROLOGY; SOIL; ground water; ground ice / permafrost; modeling; vegetation; mapping; imaging (remote sensing); radiometry*

The purpose of this research is to develop a viable method to predict the soil moisture levels under several types of forest canopy of varying density through analysis of synthetic aperture radar (SAR) imagery. This work represents an extension of current research efforts to examine the sensitivity of SAR imagery to soil moisture levels in the boreal forest using satellite SAR imagery and maps of vegetation type, soil type, discontinuous permafrost, and aspect. This current activity entails a preliminary investigation to verify the potential of SAR image analysis for quantifying soil moisture levels. In the next phase of the analysis, we propose to develop a technique (or combination of methods) to more confidently predict soil moisture levels using an adaptation of our current approach plus a combination of other techniques, including (a) hydrological modeling across landform and vegetation types and (b) LANDSAT image analyses.

We will approach this effort by applying a neural network analysis, incorporating field measurements of soil moisture, maps of vegetation classification, maps of discontinuous permafrost distribution, maps of soil type, and selected SAR images. We will investigate the practicality of relating soil moisture dynamics in areas with thick overstory to those in areas that are clearly viewed from satellites. Since vegetation is frequently mapped using LANDSAT image analysis, we intend to investigate the possibility of foregoing actual vegetation classification and instead use LANDSAT pixel values directly in the neural network analysis. We are presently involved in complementary efforts to investigate hydrologic processes in a sub-arctic watershed near Fairbanks, Alaska, named Caribou-Poker Creeks Research Watershed (CPCRW). Future efforts will include applying a physically based, spatially distributed hydrologic model to CPCRW to infer moisture levels across the watershed and between satellite viewing dates.

7.0 Conclusion

Efforts to date have focused upon field installation of grids and corner reflectors; obtaining Radarsat, ERS-2, and JERS imagery; collection of field soil moisture measurements concurrent with satellite imaging; and testing previously applied techniques of neural network analyses of soil moisture. Preliminary analyses indicate that field data quality is good. Although results generated to date have not demonstrated a viable technique to remotely measure soil moisture levels under forested canopies, we have clearly identified several sources of errors and have begun efforts to address those problems.

Near future efforts include:

- Improve radiometric corrections of ERS-2 and Radarsat.**
- Push for development of radiometric correction for JERS.**
- Create higher quality digital elevation data using interferometry.**
- Carry out further verification of the calibration curve for moisture content measurements by Vitel probe in organic soils.**

- **Apply and/or adapt spatially distributed hydrologic model for soil moisture estimation.**
- **Incorporate Landsat imagery into neural network analyses as an indicator of vegetation status.**

Meade, N., Hinzman, L., Kane, D., and Nolan, M., 1998. Baseline Data Collection and Preliminary Results of Soil Moisture Predictions Using Synthetic Aperture Radar at Caribou-Poker Creeks Research Watershed. INE/WERC 99.09. Water and Environmental Research Center, University of Alaska Fairbanks, <http://www.uaf.edu/water/publications/trwrpt2.pdf>
HYDROLOGY; SOIL; ground water; ground ice / permafrost; vegetation; imaging (remote sensing); mapping

The purpose of this research is to develop a viable method to measure soil moisture under several types of forest canopy using synthetic aperture radar (SAR) images. This work is an extension of current research efforts to examine the sensitivity of SAR images to soil moisture levels in arctic tundra. We approach this work by applying a neural network analysis because a simple linear relationship between SAR pixel amplitude and soil moisture has already been found not to exist. Inputs to the neural network include field measurements of soil moisture, maps of vegetation, maps of discontinuous permafrost distribution, maps of soil type, and the various SAR images (JERS-1, ERS-2, RADARSAT). Since vegetation is frequently mapped using LANDSAT image analysis, we intend to investigate the possibility of foregoing field vegetation classification and instead use LANDSAT pixel values directly in the neural network analysis. We are presently involved in complementary efforts to investigate hydrologic processes in a sub-arctic watershed near Fairbanks, Alaska, named Caribou-Poker Creeks Research Watershed (CPCRW). We are also investigating the feasibility of relating soil moisture dynamics in areas with a thick overstory to those with no tree cover. Future efforts will include applying a physically based, spatially distributed hydrologic model to CPCRW to infer moisture levels across the watershed and between satellite viewing dates.

Mech, L., T Meier, J Burch, and L G Adams, 1996. Patterns of prey selection by wolves in Denali National Park, Alaska. In: Carbyn, L., Fritts, S., and Seip, D., eds., Ecology and conservation of wolves in a changing world. Canadian Circumpolar Institute, University of Alberta, Edmonton, Alberta. *POPULATION; mammals; predation; wolf; moose; caribou; sheep; health (condition); behavior (feeding); reproduction*

The patterns of selection by wolves preying on moose, caribou, and Dall sheep in Denali National Park and Preserve, Alaska were studied from 1986 through early 1992. Wolves and their prey were legally protected or relatively unharvested in most of the area, and wolf numbers doubled during the study. Based on remains of 294 moose, 225 caribou, and 63 sheep, wolves killed calves and old adults disproportionately, and also individuals with low marrow fat, jaw necrosis, or arthritis. Seasonal trends in proportions of various species, ages, and sex of kills were found. During the winters [spring?] following winters of deep snowfalls, wolves greatly increased the proportion of caribou cows and calves taken. We conclude that in a natural system, wolves can survive on vulnerable prey even during moderate weather, and when snowfall exceeds average, they can respond by switching to newly vulnerable prey and greatly increasing their numbers.

Mech, L., Adams, L., Meier, T., Burch, J., and Dale, B., 1998. The Wolves of Denali. Univ. Minnesota Press, Minneapolis, MN. *POPULATION; demographics; mammals; wolf; behavior (feeding); behavior (reproductive/nesting); behavior (territorial); nutrition; genetics; predation; caribou*

CONTENTS: The Book Chapters include: 1. Introduction 2. In the Shadow of the Mountain (description of study area and wildlife populations in Denali National Park) 3. Technology Yields the Data (describes experimental design and techniques employed in the research) 4. Denali Wolf Packs (description of packs and their territories) 5. Denali Wolf Social Ecology (territoriality, spatial organization, dynamics of spacing, and genetic

aspects of social organization) 6. The Wolf is Kept Fed by His Feet (prey, seasonal movements, hunting behavior, and wolf/pack dispersal) 7. Patterns of Prey Selection (annual/monthly variation, age/sex structure, and nutritional condition of prey) 8. The Caribou Calving Season: A Scramble for Survival (defensive strategies of caribou, cow-calf relations, and calf survival) 9. The Denali Wolf-Prey System (wolf-prey dynamics, wolf population turnover, wolf numbers and caribou vulnerability, and prey exploitation) 10. Wolves in Perpetuity 11. Literature Cited + Appendices

Mecum, R.D., 1984. Habitat utilization by fishes in the Tanana River near Fairbanks, Alaska, University of Alaska, Fairbanks, M.S., 128 p *INCOMPLETE (need abstract); POPULATION; fish; habitat selection; behavior (territorial)*

Meier, T., Burch, J., Mech, L., and Adams, L., 1996. Pack structure and genetic relatedness among wolf packs in a naturally-regulated population. In: Carbyn, L., Fritts, S., and Seip, D., eds., Ecology and conservation of wolves in a changing world. Canadian Circumpolar Institute, University of Alberta, Edmonton, Alberta, pp. 293-302. *POPULATION; mammals; wolf; distribution; genetics; reproduction; behavior (reproductive/nesting); behavior (territorial); behavior (feeding)*

Observations of wolf pack dynamics over a six-year period in Denali National Park and Preserve, Alaska, found high rates of intraspecific strife, wolf pack dissolution and new pack formation, and the acceptance of new wolves into established packs. These observations corroborate genetic studies that found more genetic links between packs, than would be expected if most packs were composed of an unrelated breeding pairs and their offspring. Longevity of packs, stability of pack territories, and the incidence of inbreeding all appear to be less than previously suggested, even in the absence of significant human disturbance. The formation of new packs by two or more local dispersers, the acceptance of unrelated wolves into existing packs, and the presence of multiple breeding females within packs would tend to blur genetic distinctions between the packs in a population.

Meiners, D., 1983. The lipids of the Devil's Club, University of Alaska, Fairbanks, 50 p *VEGETATION; devil's club; traditional medicine*

Menough, J., 1998. Screening studies on the adsorption of monochloramine by various resins, University of Alaska Fairbanks, M.S., 82 p *WATER QUALITY; INCOMPLETE (need abstract); chlorine*

Mercurieff, L., 1997. Western Science and Traditional Knowledge and Wisdom: A Working Proposal for Cross-Cultural and Multidisciplinary Bering Sea Ecosystem Research. *Proceedings Bering Sea Ecosystem Workshop REFERENCE; modeling; monitoring; native perspective; traditional knowledge*

WESTERN SCIENCE AND TRADITIONAL KNOWLEDGE AND WISDOM: A WORKING PROPOSAL FOR CROSS-CULTURAL AND MULTI DISCIPLINARY BERING SEA ECOSYSTEM RESEARCH Presented by Larry Mercurieff, Bering Sea Coalition, at the Bering Sea Ecosystem Workshop, December 4-5, 1997

Kelux Exumax, Kelux Kusuthax. The morning tastes good-in the Aleut language. I would like to thank Dr. Loh, Debra Williams, and the conference steering committee for providing a forum for a presentation on traditional knowledge and wisdom, and for inviting me to make the presentation. And I am glad to have another opportunity to speak with you this morning. I would like to preface my remarks by telling you I do not ordinarily write my presentations since, as I was taught by a wise elder, speaking without

the aid of a prepared document allows us to speak directly from the heart. However, I am making an exception in this case because it is my hope that some will distribute this presentation to all interested parties. I also wish to depart from my usual presentation messages in a forum such as this and speak of my own personal truths and insights I have gained from over twenty years of advocating for native peoples and the Bering Sea. We have all heard the same speeches too many times and I am sure that many of you feel as I do: I don't want another Groundhog Day! That script is getting old and tiresome.

We all know each other, have been traveling the same road for many years, and share, I believe, a profound concern over the health of one of the world's richest marine ecosystems-the Bering Sea. We have struggled to find substantive ways to address our varied concerns and interests over the obvious distress within this ecosystem: some of us approach it on the level of scientific inquiry and research, some on the level of adjusting and adapting wildlife management policies, and some on a level that speaks to the spiritual and traditional conservation ethics of the indigenous peoples whose history, culture, nutrition, spirituality, and basic economies are inseparably tied to the Bering Sea. All of these approaches are very important. Most significantly however, they are interdependent. One will not work without the other. And any success we have in understanding the complex nature of this ecosystem demands a vigorous effort on all our parts to work more cooperatively.

I have attended countless scientific and native forums on the issues of the Bering Sea as all of you have. I have discussed the issues with dozens and dozens of scientists, researchers, managers, and native leaders. I have studied as many of the research reports, studies, conference reports, and white papers as I could get my hands on over the past twenty years. I did so in hopes of gleaning some insight into what our challenges truly are underneath the diplomatic language we all have used, with the understanding that there are many truths, and that these truths need to be articulated and addressed if constructive change is to occur. I am pushing for change from status quo as one advocate for the Bering Sea residents because the scale and duration of the precipitous and sustained declines of at least sixteen higher trophic species is probably about to take another turn for the worse over the next two years or so. Even if it does not, the scale of ecosystem wide declines is threatening the very fabric of Bering Sea coastal cultures. Indeed, I would characterize this situation as dramatic enough that it is akin to that of the rainforest people of South America, except this rainforest is in our own backyard.

Part of this truth I am referring to includes the host of daunting challenges that western scientists and policy-makers face, and which must be dealt with if there is to be any coordinated multi-disciplinary and cross cultural ecosystem based approaches to the problems in the Bering Sea. There are a litany of challenges that scientists alone could not hope to address without more political, public, and financial support:

- different disciplines have different research and data gathering methodologies, making it difficult if not impossible, to correlate data and findings, or to coordinate research efforts.

- funding and research emphasis is inconsistent as administrations and public priorities change, making it difficult if not impossible to pursue sorely needed long term research programs or to even synthesize existing data and findings.

-different departments and research institutions must singularly pursue their own respective missions and funding priorities in order to remain on the political radar, to meet their minimum statutorily mandated missions, and to simply survive. Such an environment is not conducive to coordinated research.

-institutional support of independent researchers is non-existent, lessening the pool of different perspectives.

-research and information exchange protocols between Russia and the U.S. are inadequate or non-existent for researching and managing migratory species or the same species in one ecosystem.

-data gathering and research methodologies between Russia and the U.S. are different, making comparison of findings difficult if not impossible or very costly.

-most research and management regimes are single species oriented, which in some cases, results in strong resistance to different approaches; and by the same token, there is a dearth of critical scientific and philosophical debate, or public understanding, of what any ecosystem approach means. Such a situation leaves scientists without support or direction they need to move forward substantively.

-Cartesian based science and peer group review systems are simply not equipped to validate traditional knowledge and wisdom. It would be unfair to expect this system, which is a quantitative world view based on time-series data gathering and computer models, to assess the veracity of information from indigenous systems which are qualitative and unwritten. Defacto, this situation disenfranchises the primary stakeholders in the Bering Sea and substantially diminishes access to information which will prove to be invaluable to understanding what is going on with single species and the ecosystem.

-the sheer number of variables impinging on individual species may be untenable in terms of our current scientific capacity to deal with. Given this, we understand how daunting it seems, to deal with an entire complex and synergistic ecosystem in a constant state of flux.

-scientists are put to an impossible test to prove definitively that any particular anthropogenic factor is an underlying cause for adverse fish and wildlife population trends before policy-makers and managers take action.

-late fall, winter, early spring higher trophic specie research is virtually non-existent due to funding limitations and the sometimes extreme human discomfort and hazards posed by conducting research during these times. I know I would not want to be on a small research vessel in the middle of the Bering Sea in January facing 80 knot winds and 40 foot seas.

-ecosystem monitoring systems for the Bering Sea are nonexistent and therefore changes in key ecosystem parameters which may dramatically affect wildlife population trends are not tied to management decision-making.

-professional jealousies impede efforts to understand what is happening to different species and the systems or subsystems that sustain them.

-research funding and programs are frequently reactive rather than preventative or proactive.

-native peoples and scientists alike, must deal with a historic distrust of each others intentions and motives(sometimes justifiable sometimes not), making substantive cross-cultural cooperation extremely difficult at best, and no program exists to deal with these challenges from either side.

This is a litany of real challenges and impediments to any change in status quo which we cannot expect the scientists and researchers alone to deal with. We must create the public, political, financial support to go along with the commitment of the scientific and native communities to work together.

What I put before you today is a proposal that accomplishes this; a proposal that combines the vested interests and abilities of Bering Sea communities, the scientific/management/policy-making communities, commercial fishers, and environmentalists. I have no illusions that this body can bring this proposal to fruition even if there was unanimity and a sincere commitment to do so. However, I am providing this to seek your support and to give you a heads up to what I am proposing that the Bering Sea communities strongly advocate for. I invite further ideas and constructive critiques of this vision for the Bering Sea.

I propose that Bering Sea communities be supported in building their own capacity to conduct their own research, exchange information and observations in a formalized and systematic process. By doing so, we will have the unprecedented opportunity to receive useful information throughout the year around an entire marine ecosystem. It can serve as an early warning system of trouble, and systematic observations throughout a wide geographic range can aid scientists in constructing scientific hypotheses perhaps in a more timely fashion, and perhaps allow a quicker targeting of causative factors for adverse wildlife population trends. It creates a legitimate and meaningful role of stewardship by the people whose cultural viability depends on informed and decisive action.

I propose the establishment of a Bering Sea bulletin board and information clearinghouse accessible and useful to serious researchers, the lay public, and stakeholders.

I propose the establishment of international research centers equipped to conduct demonstration projects of innovative ecosystem and ecosystem monitoring approaches, and cooperative cross- cultural research programs. There should be two primary research centers-one located in the eastern Bering Sea and the other in the western Bering Sea. The centers would be tightly coordinated in terms of research targets, methodologies, and information exchanges. One specific mandate to these centers is to explore the feasibility and usefulness of mesoscale scientific research approaches in monitoring entire marine ecosystems.

This concept has been pioneered in the Bering Sea by the Pribilof Aleuts and Dr. Mikhail Flint who is now the new director of the Shirshov Institute of Oceanology in the Russian Academy of Sciences. Dr. Flint oversees a thousand Russian marine scientists and he is committed to working in the Bering Sea.

I propose a formalized effort to develop lateral partnerships and fora between coastal communities, secondary stakeholders, federal and state agencies, and environmental organizations which are focused on close cooperation, collaboration, and mutual support for stewardship in the Bering Sea. Given the varied interests in the Bering Sea and the international scope of the issues we are dealing with, a top down approach will not work here. World history is replete with this lesson when dealing with environmental and economic interests. There are some issues which will require a top down approach, so a two tiered approach is required here-top down and bottom up.

I propose the establishment of a high quality pool of western scientific advisors to the Bering Sea Coalition to explore with us the development of pioneering ways to use indigenous knowledge and wisdom garnered on an ecosystem wide basis.

I propose the recruitment of coastal school districts willing to work together under the guidance of native and non-native scientists (and perhaps the University) to explore development of high school biology programs which sample and monitor near shore indicators and relevant ecological parameters which can aid in getting the big picture. These school districts would administer identical science projects adjusted for local needs and conditions, and tied together by e-mail and the Bering Sea Bulletin Board.

We will be articulating this vision in more detail, as a draft, for distribution to the Bering Sea Coastal communities. It is my hope we will have a forum for these communities to discuss, debate, and change this vision sometimes next year, subject to funding. In addition, we will continue to work with the World Wildlife Fund which has identified the Bering Sea as one of six sites to focus on and for which they are attempting to raise 10 million dollars. We will continue to work with the Nature Conservancy which is now exploring the feasibility of raising \$700,000 to launch Bering Sea stewardship programs. We will continue to work with Senator Stevens to provide substantial funding for Bering Sea stewardship initiatives over the long term. We will continue to work with the Center for Marine Conservation as it strives to determine its role in the Bering Sea. And finally, we will continue to work with President Clinton's administration in defining their vision for the Bering Sea.

Finally I wish to say this: We, the coastal communities, cannot accomplish what we want without you, and you cannot accomplish the task of maximizing understanding of the Bering Sea ecosystem without us. Initially this can be called a shot-gun wedding, but ultimately the need for reciprocity will become a desire for reciprocity by all involved. I am convinced of this. All we need is the conviction that change is needed and status quo is no longer acceptable.

Anyone interested in receiving copies of this presentation, please let me know or contact the conference organizers.

Thank you.

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Middaugh, J., Ryan, C., Metzler, C., and Dixon, C.L., 1983. Otitis media and hearing impairment among selected racial groups in Alaska. Department of Health and Social Services, Division of Epidemiology, Anchorage. *PEOPLE; children; adults; health (condition); hearing loss; otitis media*

Sweeping and dramatic changes in the epidemiology of otitis media have occurred in Alaska. Otitis media with effusion was found among 8.9% of children between 0-19 years of age, and among 21% of children 0-4 years of age. Few differences between racial groups were seen, except in the 5- to 9-year-old age group, in which Indians had a much higher prevalence (22%) than the other racial groups (5%). Except for Indians in the 5- to 9-year age group, these rates of otitis media with effusion are similar to rates described in other populations. In contrast to the high prevalence of serious infections and complications of otitis media in Alaska described in past studies, few cases of acute otitis media or perforation were found in this study. Dramatic improvements in otitis media and its complications have occurred in these populations.

High frequency hearing loss was epidemic in Alaskans of all races, particularly among male Eskimos and Indians, where as many as 60% of adult male and 8% of adult females were affected. In addition to high frequency hearing loss, mixed, conductive, and sensorineural loss were also prevalent among the adult population. These findings indicate that major public health programs should be established to prevent high frequency hearing loss and to provide rehabilitative services to the hearing impaired in Alaska.

Miles, M.D., 1985. Sediment transport computer models for river training design, University of Alaska, Fairbanks, M.S., 63 p *SEDIMENT; distribution; modeling; engineering; surface water*

Miller, C., Knight, R., McEwen, L., and George, T., 1994. Responses of nesting savannah sparrows to fluctuations in grasshopper densities in interior Alaska. *Auk* 111 (4), 962-969. *POPULATION; birds; sparrow; agriculture; grasshopper*

Grasshopper populations on the Delta Agricultural Project area in interior Alaska exhibit a strong biennial periodicity. This phenomenon allowed us to study dietary, reproductive, and numerical responses of nesting Savannah Sparrows (*Passerculus sandwichensis*) to fluctuations in prey abundance. Grasshopper densities exceeded 25/m² in 1990 but were less than 1/m² in 1991. In 1990, 61% of the identifiable food items brought to the nest were grasshoppers. In 1991, Lepidoptera larvae and Diptera were the most common items brought to the nests and no grasshopper deliveries were observed. Fledging success was 97% in 1990 and 96% in 1991. At least one nestling per nest successfully fledged each year. Mean clutch size was significantly higher during the high grasshopper densities in 1990. Reduced growth measurements of nestlings were obtained in 1991 compared to 1990. Effects on growth appeared to be greater early in development, rather than prior to fledging. Savannah Sparrow densities did not differ between the two years. Although a positive response to high grasshopper densities was observed, the magnitude of the response was diminutive compared with the large difference in prey abundance between years. This suggests that factors other than food limit reproductive output in this population of Savannah Sparrows.

Miller, C., and McEwen, L., 1995. Diet of nesting savannah sparrows in interior Alaska. *Journal of Field Ornithology* 66 (1), 152-158. *POPULATION; birds; sparrow; nutrition; reproduction; seasonality; agriculture*

Grasshopper populations on the Delta Agriculture Project area in interior Alaska exhibit a strong biennial periodicity (>25/m super(2) in one year and <1/m super(2) in the next).

Savannah Sparrow (*Passerculus sandwichensis*) stomach contents were examined during the breeding seasons over a 3-yr period. Grasshoppers constituted the largest portion (>45%) of the diet of adult Savannah Sparrows in the high grasshopper years of 1990 and 1992. Beetles and hemipterans comprised the majority (66.5%) of their food in the low grasshopper year of 1991. Grasshopper presence in the diet varied in individual birds and among years. Occurrence in the diet of other arthropod taxa was independent of year, but varied among individuals. Almost no utilization of plant material was recorded. The results illustrate the responsiveness of breeding birds to a variable food supply and preference for highly nutritious grasshoppers when they are available.

Miller, C., and Fair, J., 1997. Effects of blow fly (*Protocalliphora spatulata*): Diptera: Calliphoridae) parasitism on the growth of nestling savannah sparrows in Alaska. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 75 (4), 641-644. *POPULATION; birds; sparrow; reproduction; growth/development; parasitic infection ;blow fly; agriculture*

We investigated the effect of blow fly larvae (*Protocalliphora spatulata*) on nestling savannah sparrows (*Passerculus sandwichensis*) in Alaska subject to biennially fluctuating prey abundance. Grasshopper populations in some regions of interior Alaska can show a strong biennial periodicity. Growth of nestling savannah sparrows, numbers of blow fly larvae in nests and on nestlings, and grasshopper populations were monitored during four breeding seasons (1990-1993) on the Delta Agriculture Project site near Delta Junction, Alaska. Growth parameters for parasitized and nonparasitized nestlings were compared within and between years. There were no significant differences in growth parameters between parasitized and nonparasitized nestlings between any years. There were also no differences in growth parameters within years, except for tarsus length in 1991 and nestling mass in 1993 (low grasshopper years); in 1993, parasitized nestlings were heavier and the sample size was small. Additionally, there were no differences in fledging success within years. Although parasitism combined with other factors (e.g., food limitation) may have an impact on avian reproduction, our data do not support this.

Miller, S., White, G., Sellers, R., Reynolds, H., Schoen, J., Titus, K., Barnes, V., Smith, J., R, Nelson, R., Ballard, W., and Schwartz, C., 1997. Brown and black bear density estimation in Alaska using radiotelemetry and replicated mark-resight techniques. *Wildlife Monographs* 133, 1-55. *POPULATION; mammals; black bear; grizzly bear; distribution; monitoring; management*

Accurate density and population estimates are needed to manage bear populations but are difficult to obtain. Most such estimates reported for bears are largely subjective and lack estimates of precision. Fifteen brown bear (*Ursus arctos*) and 3 black bear (*U. americanus*) density estimates were obtained in Alaska during 1985 through 1992 using 2-9 replicates of capture-mark-resight (CMR) techniques in 17 different areas. Our studies used radiotelemetry to document movements of marked animals into and from search areas. This procedure essentially eliminated the need to correct density estimates for edge or periphery effects caused by absence of geographic closure. To estimate population size, we used a maximum-likelihood estimator modified to accommodate temporary movements of marked animals into and from our search areas. Our approach permitted direct calculations of density from our population estimates. Our procedures provided density estimates that were repeatable, were comparable among areas, included estimates of precision, and were more objective than methods historically used to estimate bear abundance. Our density estimation procedures have widespread

applicability for other wildlife studies using radiotelemetry. Our estimates were obtained within a wide spectrum of habitats and provided a range of Alaskan densities from 10.1 to 551 brown bears (all ages)/1,000 km² and from 89 to 289 black bears (all ages)/1,000 km². Our highest brown bear density is probably near the maximum for this species, but areas with lower densities (3.9/1,000,km²) have been reported in Alaska. Areas with black bear densities higher than in our study areas probably occur in Alaska. Brown bear densities were 6-80 times greater in coastal areas where abundant runs of multiple species of salmon (*Oncorhynchus* spp.) were available to bears than in interior areas. Our CMR technique provided useful data for bear population management and impact assessments and has potential for application to other species and areas.

Milner, A., and Oswood, M., eds., 1997. Freshwaters of Alaska: Ecological Syntheses. Ecological Studies. Springer, New York. v. 119 *LIMNOLOGY; NUTRIENT CYCLING; POPULATION; birds; waterfowl; fish; salmon; forestry*

Alaska's great size is mirrored by the large number and diversity of its freshwater ecosystems. This volume reviews and synthesizes research on a variety of Alaskan freshwaters including lakes, rivers and wetlands. The vast range of Alaskan habitats ensures that the chapters in this book will provide valuable information for readers interested in freshwaters, particularly nutrient dynamics, biotic adaptations, recovery mechanisms of aquatic biota, stream succession and the management of human-induced changes in aquatic habitats.

Contents: The Alaskan landscape: an introduction for limnologists.- A history of limnology in Alaska.- The limnology of Toolik Lake.- The Kuparuk river: a long-term study of biological and chemical processes in an Arctic river.- The limnology of Smith Lake.- Waterfowl and wetland ecology in Alaska.- The effect of salmon carcasses on Alaskan freshwaters.- An overview of Alaska lake-rearing salmon enhancement strategy: nutrient enrichment and juvenile stocking.- Alaska timber harvest and fish habitat.- Gold placer mining and stream ecosystems of interior Alaska.- Ecology of overwintering fishes in Alaskan freshwaters.- Glacial recession and stream ecosystems in coastal Alaska.- Themes of Alaskan limnology.

Milner, A.M., Irons, J.I., and Oswood, M.W., 1997. The Alaskan landscape: An introduction for limnologists. In: Milner, A., and Oswood, M., eds., Freshwaters of Alaska Ecological Synthesis. Ecological Studies. SpringerReynolds, JB, New York, NY, pp. 1-44. *LIMNOLOGY; vegetation; surface water; hydrology; ground ice / permafrost; river ice; water quality; climate*

This chapter hopefully has provided the reader with an insight into the wide diversity of landscapes in Alaska from the southeast region of the state to the arctic slope. Across this landscape climate, topography, vegetation, and surface features vary enormously. Wetlands, lakes, rivers, and streams are a dominant feature. Across the hydrologic regions of Alaska, characteristic hydrothermal regimes of rivers and streams are of particular significance to the biotic communities, especially in relation to accumulated temperature units (degree days) and the length of the ice-free season. Ice is an increasingly important factor influencing biotic communities with increasing latitude. Virtually all of Alaska's streams and rivers are unregulated including all the major rivers: this is a unique feature compared with the remainder of North America. Water quality has been influenced in a number of geographical areas by specific disturbances; these include placer mining in interior Alaska, timber harvest in southeast Alaska, and urbanization in Anchorage and Juneau. Nevertheless most of the freshwater within the state is unimpaired.

Modafferi, M.M., 1972. Aspects of the reproductive biology of the red squirrel (*Tamiasciurus hudsonicus*) in Interior Alaska: College, Alaska, University of Alaska, M.S.*POPULATION; mammals; squirrel; behavior (reproductive/nesting)*

Mohatt, J., Gilliam, L., Bekris, L., Ebbesson, S., and Lernmark, A., 2002. Type 1 diabetes-related autoantibodies are rare in Alaska native populations. *International Journal of Circumpolar Health* 61 (1), 21-31. *PEOPLE; health (condition); diabetes*

OBJECTIVES: When clinical data were initially gathered from the Alaskan Eskimos in the 1950's, diabetes mellitus was noted to be quite rare. The prevalence of diabetes has increased significantly since that time, with rates of 10% reported recently in some Alaska native populations. Our goal was to understand the pathogenesis of diabetes among these groups, with the hypothesis that Alaskan Eskimos were predominantly affected by type 2 diabetes, not by latent autoimmune diabetes in adults (LADA). **STUDY DESIGN:** Population based case control study **METHODS:** We tested sera from subjects in two Eskimo villages for the presence of type 1 diabetes-related autoantibodies against glutamic acid decarboxylase (GAD65Ab) and tyrosine phosphatase-like islet antigen-2 (IA-2Ab). **RESULTS:** Among subjects from one Inupiat village (#1) and one Siberian Yup'ik village (#2), there were 21 subjects with diabetes mellitus (DM), 17 with impaired glucose tolerance (IGT), and 226 healthy controls with normal glucose tolerance (NGT). In village 1, GAD65 antibodies were not present in either diabetic subjects or those with IGT. One of the healthy controls (1%; 1/97) was positive for GAD65Ab. Similarly, no subjects from this village with DM or IGT had positive IA-2Ab titers, and one healthy control (1%; 1/97) was positive for IA-2Ab. In village 2, no DM subject was GAD65Ab positive. One (10%; 1/10) of the IGT subjects and two (1.6%; 2/129) of the healthy controls were positive for GAD65Ab. In this village, two of the DM subjects (12%; 2/17), one of the IGT subjects (10%; 1/10), and one of the healthy controls (0.8%; 1/129) were IA-2Ab positive. No individual was positive for both GAD65Ab and IA-2Ab. **CONCLUSION:** Alaskan Inupiat and Siberian Yup'ik Eskimos appear to be predominantly affected by type 2 diabetes, not LADA.

Moodie, S., Grout, J., and Finster, A., 2000. Juvenile chinook salmon (*Oncorhynchus tshawytscha*) utilization of Croucher Creek, a small non-natal tributary of the upper Yukon River during 1993. # 2531. Department of Fisheries and Oceans, Burnaby, BC (Canada) Science Branch, *POPULATION; fish; salmon; chinook; trout; sculpin; grayling; sucker; chub; pike; distribution; habitat selection*

The use of Croucher Creek, a small non-natal tributary of the Upper Yukon River, by juvenile chinook salmon (*Oncorhynchus tshawytscha*) was investigated. Fish utilization of the stream was assessed by fishing minnow traps once a week between May and October, 1993. Age-1 chinook juveniles with a mean fork length of 79 mm and mean weight of 4.8 g were present at the beginning of May and increased rapidly in size before apparently leaving Croucher Creek in June at a mean size of 89 mm and 7.3 g. After mid-June only 2 age-1 chinook juveniles were caught. Age-0 chinook were first caught in Croucher Creek in June. Their mean fork length was 53 mm and mean weight was 1.5 g. Age-0 juveniles were caught in the stream for the remainder of the sampling period. Growth of age-0 chinook was rapid from June through August but growth slowed as water temperatures declined in September. At the end of October, age-0 chinook had a mean size of 71 mm and 3.4 g. Overall catch per trap of age-0 fish declined with the onset of the fall season. Fewer age-0 chinook were caught in the upper parts of the creek but these fish were significantly larger than those caught nearer to the creek mouth. Croucher Creek was not utilized by chinook juveniles of hatchery origin as no fish with dipose fin clips were captured. Other species caught in Croucher Creek included rainbow trout (*Oncorhynchus mykiss*), slimy sculpin (*Cottus cognatus*), arctic grayling (*Thymallus arcticus*), longnose sucker (*Catostomus catostomus*), lake chub (*Couesius plumbeus*) and juvenile northern pike (*Esox lucius*).

Moorhead, D., Linkins, A., and Everett, K., 1996. Road Dust Alters Extracellular Enzyme Activities in Tussock Tundra Soils, Alaska, U.S.A. *Arctic, Antarctic, and Alpine Research* 28 (3), 346-351. *INFRASTRUCTURE; road; VEGETATION; SOIL; disturbance; NUTRIENT CYCLING; carbon; phosphorus; nitrogen; biochemistry; nutrition; enzymology; recovery; ecology*
Dust from gravel roads affects soil physical-chemical characteristics, microclimate, and plant communities of tussock tundra ecosystems in northern Alaska, U.S.A. We found that activities of extracellular enzymes associated with cellulose decay and phosphorus mineralization in soils were inversely proportional to dust loading along the Dalton Highway, Alaska. Overall, endocellulase, exocellulase, and phosphatase activities within 5 m of this gravel road were reduced by 88, 74, and 45%, respectively, of activity levels at 500 m. Detailed examinations of soil components showed that phosphatase enzyme activities were displaced from organic matter complexes by dust inputs and became adsorbed onto mineral materials. This decreased the rate of enzyme-mediated reactions. Mathematical models incorporating these reduced levels of enzyme activities projected substantial reductions in carbon (from cellulose) and phosphorus mineralization. Moreover, reduced carbon utilization by decomposer microbiota, resulting from slower cellulose decay, also decreased microbial immobilization of nitrogen, thus increasing simulated net nitrogen mineralization. Such changes in soil nutrient dynamics would be expected to affect the structure of plant communities, as has been reported for vegetation adjacent to the Dalton Highway. However, concurrent changes in other environmental characteristics of the soil environment near this road (e.g., drainage) limit our ability to establish causal relationships.

Moran, C.L., 2000. Spatial-temporal variation in reproduction and site fidelity of spectacled eiders on the Yukon-Kuskowkim Delta, Alaska, University of Alaska Fairbanks, M.S., 73 p *POPULATION; birds; waterfowl; eider; reproduction; behavior (reproductive/nesting); migration; predation; habitat selection*

"In response to recent decline, we compared migration and nesting chronology, nest success, and clutch size of spectacled eiders nesting at Kigigak Island with those nesting on Kashunuk River to better understand regulation of the spectacled eider breeding population on Y-K Delta. We also examined and compared subpopulation relationships between nest site fidelity and breeding performance. We examined the relationship between female age and distance moved between consecutive year nest sites. Clutch sizes were comparable between the two sites and declined seasonally with older females laying earlier and larger clutches. Mayfield nest success was higher due to lower predation and females moved shorter distances between nest sites at Kigigak Island. Breeding performance measures were not related to distance moved within study areas. Among study areas, successful females moved shorter distances. High adult survival, nest success, and probably different site fidelity at Kigigak Island have resulted in an increasing population, in contrast to Kashunuk River"

Morehouse, K.A., 1974. Development, energetics and nutrition of captive pacific Brant (*Branta bernicla orientalis*, Tougarinov), University of Alaska, Fairbanks, M.S., 104 p *POPULATION; birds; waterfowl; goose; Brant; growth/development; nutrition; metabolism*

Morewood, W.D., and Wood, D.M., 2002. Host utilization by *Exorista thula* Wood (sp. nov.) and *Chetogena gelida* (Coquillett) (Diptera: Tachinidae [tachnid flies]), parasitoids of arctic *Gynaephora* species (Lepidoptera: Lymantriidae [gypsy moth]). *Polar Biology* 25 (8), 575-582. *POPULATION; invertebrates; insects; parasitic infection*

Studies of host-parasitoid interactions undertaken at Alexandra Fiord, Ellesmere Island, Canada, during the summers of 1994, 1995, and 1996 revealed only two species of tachinid flies parasitic on arctic *Gynaephora* species. *Exorista thula* sp. nov. (described herein by D.M. Wood) is from the North American Arctic and is parasitic on *Gynaephora*

groenlandica. Remarks on the systematics of Exorista subgenus Exorista in North America and an identification key for arctic and subarctic species of the tribe Exoristini are included. Chetogena gelida, parasitic on Gynaephora rossii, and E. thula were found to be extremely host specific. Both species of parasitoids developed predominantly on final-instar larvae of their respective hosts, but E. thula also emerged from the penultimate instar (9% of E. thula adults, 19% of hosts) and occasionally from the pupal stage (4% of E. thula adults, 3% of hosts) of G. groenlandica.

Morrow, J.E., 1980. The freshwater fishes of Alaska. Alaska Northwest Publishing Company, Anchorage. *INCOMPLETE (need abstract); POPULATION; fish; lamprey; inconnu [sheefish]; whitefish; grayling; trout; dolly varden; arctic char; salmon; sockeye; coho; chinook; chum; pike; blackfish; chub; sucker; trout; perch; burbot; sculpin*

Morse, G.A., 1980. Temperature and the regulation of enzyme activity in the hibernator: a kinetic and spectroscopic study of muscle pyruvate kinase from the arctic ground squirrel, University of Alaska, Fairbanks, M.S., 51 p *INCOMPLETE (need abstract); POPULATION; mammals; rodents; squirrel; metabolism; biochemistry; enzymology; seasonality; hibernation*

Morse, K.T., 1997. The nature of gold: an environmental history of the Alaska/Yukon gold rush, University of Washington, Ph. D., 419 p *MINING; gold; INCOMPLETE (need abstract)*

Mountjoy, P.K., 1986. Velocity profile prediction in culverts for fish passage design considerations, University of Alaska, Fairbanks, M.S., 86 p *HYDROLOGY; surface water; fish; management; engineering*

Mowat, G., and Slough, B., 1989. Some observations on the natural history and behaviour of the Canada Lynx, *Lynx canadensis*. Canadian field-naturalist 112 (1), 32-36. *POPULATION; mammals; lynx; demographics; reproduction; nutrition*

We made observations of Canada Lynx (*Lynx canadensis*) natural history during a long-term study of lynx population dynamics in southwest Yukon. We found evidence of adult lynx mating during Snowshoe Hare (*Lepus americanus*) population lows. We also found evidence of adult lynx litter sizes as large as eight and of adult and yearling lynx giving birth to kittens as much as six weeks later than normal, during hare highs. We document one instance in which a late-born litter of five survived to April when hares were abundant. We present evidence to suggest that some female lynx may lose their litters shortly after parturition during periods of food shortage. The above adaptations allow lynx the flexibility to respond demographically to changes in food supply faster than other species its size. We present evidence to suggest that the bond between related female lynx continues into their adult lives, as in other felids.

Mowat, G., Boutin, S., and Slough, B., 1996. Using placental scar counts to estimate litter size and pregnancy rate in lynx. Journal of Wildlife Management 60 (2), 430-440. *POPULATION; lynx; reproduction; snowshoe hare*

We compared post-partum estimates of litter size and pregnancy rate (Mowat et al. 1996) with those estimated from placental scar counts to test the accuracy of the placental scar method. We counted placental scars on uteri taken from lynx (*Lynx lynx*) carcasses collected from trappers over 3 years of a hare peak and decline in southwest Yukon. We classified scars into less than or equal to 6 categories based on coloration, though we lumped scars into subjective categories called light, medium and dark for analysis. In utero estimates of litter size were equally close to post-partum litter size when light placental scars were included or excluded. However, pregnancy rate was closest to live birthrate when all scars were included. We recommend researchers classify placental scars after Englund (1970) (or Lindstrom [1981]) with the addition of a seventh category

for scars from previous years. We suggest researchers include all scars to estimate pregnancy rate and litter size, except those from previous years. This will increase precision and comparability among studies.

Mowat, G., Slough, B., and Boutin, S., 1996. Lynx recruitment during a snowshoe hare population peak and decline in southwest Yukon. *Journal of Wildlife Management* 60 (2), 441-452. *POPULATION; lynx; demographics; monitoring; reproduction; nutrition; trapping; management*

We estimated litter size, birthrate (proportion of F with young in mid-June), and survival of young to winter for lynx (*Lynx lynx*) in southwest Yukon between 1990 and 1992. Radiocollared females were located shortly after parturition to count young, and relocated in winter to count the number of surviving young from tracks. Hare (*Lepus americanus*) density, as estimated by pellet transects, peaked at 7.4 hares/ha in 1990 and began to decline in winter 1990-91. Reproducing lynx faced a declining food supply in spring 1991. Litter size averaged 5.3 (n = 12) for adults (>2 yr) and 4.2 (n = 5) for yearlings in 1990, and all females monitored had litters in mid-June. Adult litter size was 4.9 in 1991 (n = 15) and 16 of 19 adult females (84%) had litters in mid-June. None of 7 yearlings retained litters in 1991. In 1992 none of 7 adult or 3 yearling females retained litters. Minimum survival estimated from track counts was 0.63 in 1990 and 0.75 in 1991 for kittens of adult mothers. Survival was 0.26 in 1990 for kittens of yearlings. Recruitment to 1 year of age was 2.8 kittens per adult female, and 0.55 kittens per yearling female in 1990. In 1991 recruitment was 3.2 from adults and 0.08 from yearlings. Lynx recruitment went from a peak in 1990 to zero reproductive output in 1992. Adult females managed to recruit young the year after the hare peak, but recruitment from yearlings virtually ceased in the first year of the hare decline. Recruitment from yearlings was surprisingly low, even in the peak hare year. If this observation describes other lynx populations, it has serious ramifications for trapped populations, which are often composed largely of yearlings. Population models which have based yearling recruitment on in utero data probably have overestimated recruitment and sustainable harvest.

Mueller, K.A., and Matz, A.C., 2000. Organochlorine Concentrations in Burbot (*Lota lota*) Livers from Fairbanks, Alaska, and Kanuti, Tetlin, and Yukon Flats National Wildlife Refuges, Alaska, 1998. Technical Report NAES-TR-00-01R. U.S. Fish and Wildlife Service, Ecological Services, Fairbanks. *CONTAMINANTS; POPs (persistent organic pollutants); fish; burbot*

EXECUTIVE SUMMARY

This study was conducted by U.S. Fish and Wildlife Service biologists during 1998 and 1999. Burbot liver was the tissue of choice for this study because chlorinated hydrocarbons, or organochlorine compounds, are lipophilic and burbot use the liver as their main somatic fat reserve (Love 1980). In addition, burbot consume high on the aquatic food chain and, therefore, are subject to the effects of biomagnification. The objectives of this study were to: determine the concentrations of organochlorine compounds in burbot livers at four sample sites in Interior Alaska; determine the significance of these data by comparing organochlorine concentrations in burbot livers with regional data for organochlorines in burbot and concentrations shown to cause effects in fish; and determine if further investigation of organochlorine contamination in biota of interior Alaska is warranted. Organochlorines are a particularly onerous group of compounds because they are lipophilic, persistent in the environment, bioaccumulate and biomagnify, and are neuroactive agents (Hoffman et al. 1995). Examples of organochlorine compounds are polychlorinated biphenyls (PCBs), DDT and its degradation products DDE and DDD, variations and degradation products of chlordane, and chlorinated benzenes such as hexachlorobenzene (HCB). With some exceptions, e.g., PCBs (Loganathan and Kannan 1994), concentrations of organochlorines in biota

are generally declining (Schmitt et al. 1999) due to numerous prohibitions on their use and production.

Burbot liver samples were collected from the Tanana River below Fairbanks, Kanuti National Wildlife Refuge at Bettles (Koyukuk River), Tetlin National Wildlife Refuge (Tanana River), and Yukon Flats National Wildlife Refuge at Beaver (Yukon River). Twenty-nine burbot were collected. Liver samples were dissected using hexane-cleaned stainless steel instruments at a Fish and Wildlife Service laboratory in Fairbanks. In general, there were greater contaminant concentrations from the site below Fairbanks and Yukon Flats than from Tetlin and Kanuti. Analysis of the data was complicated by differing lipid concentrations in samples, differing fish weights among sites, and by a low sample size at Yukon Flats. Lipid concentrations of samples from Fairbanks and Yukon Flats were significantly greater than those of samples from Kanuti ($F_{3,25} = 8.5$, $P < 0.001$). There were greater concentrations of DDT and its metabolites at Fairbanks than at other sites, probably reflecting historical use of that pesticide within the city of Fairbanks and at nearby military bases. Concentrations of SDDT from Fairbanks are up to two orders of magnitude greater than from five of six studies in Canada. The range of SPCB concentrations from our study are similar to those from four of six Canadian studies cited and were generally less than laboratory-derived effects values. Toxaphene concentrations from our study were generally low. Further studies would help illuminate whether the concentrations we found at Fairbanks and Yukon Flats are of concern to fish and wildlife resources.

Mueller, S.H., Goldfarb, R.J., Farmer, G.L., Sanzolone, R., Adams, M., Theodorakos, P.M., Richmond, S.A., and McCleskey, R.B., 2002. Trace, Minor and Major Element Data for Ground Water Near Fairbanks, Alaska, 1999-2000. Open-File Report 02-0090. United States Geological Survey, Fairbanks. <http://pubs.usgs.gov/of/2002/ofr-02-0090/OFR0290.pdf> WATER QUALITY; ground water; hydrology; CONTAMINANTS; metals; arsenic; seasonality; mining; gold

INTRODUCTION

A groundwater geochemical study was carried out from August 1999 to August 2000 near Fairbanks, Alaska. Groundwater samples were collected at two-month-intervals from 17 domestic water supply wells located throughout the Fairbanks (Fig 1) area to (1) comprehensively define the baseline geochemical signature of the groundwater, (2) examine the spatial variability, (3) examine any seasonal variability, and (4) determine the concentration of arsenic species in the groundwater. This report presents the methodology and analytical results for the groundwater samples taken during this study.

Muhs, D., Ager, T., and Beget, J., 1999. Vegetation and paleoclimate of the last interglacial period in central Alaska and a data-model comparison. *Proceedings 50th Arctic Science Conference: Science in the North - 50 Years of Change*, Denali Park, AK INCOMPLETE (need abstract); VEGETATION; CLIMATE; modeling; ground ice / permafrost

Mulder, C., Ruess, R., and Sedinger, J., 1996. Effects of environmental manipulations on *Triglochin palustris* [arrowgrass]: Implications for the role of goose herbivory in controlling its distribution. *Journal of Ecology* 84 (2), 267-278. VEGETATION; arrowgrass; nutrition; nutrient cycling; waterfowl; goose; herbivory (avian)

Arrowgrass (*Triglochin palustris*) is a preferred forage species of geese in the Yukon-Kuskokwim Delta (south-western Alaska) where it is found primarily on slough levees in coastal areas. Geese may affect nutrient availability, interspecific light competition, and salinity. These variables were manipulated in order to identify interactive effects of interspecific competition and abiotic factors on arrowgrass size, biomass allocation and distribution, which are likely to be significant in relation to the effects of herbivory on arrowgrass abundance and distribution. Arrowgrass individuals were transplanted from

two slough levee communities to the same two communities and to the adjacent slough margin and wet *Carex* meadow communities. Geese were excluded and nutrient availability, light competition and salinity levels were manipulated. When light levels were not manipulated, fertilization had a negative effect on plant biomass and allocation to bulbs. Under decreased competition for light, plant biomass of fertilized plants was not significantly different from that of control plants. Fertilization appears to have a negative effect on arrowgrass as a result of increased competition for light. Plants in the slough margin habitat were smallest, had the lowest allocation to leaves and stolons, and the lowest N concentrations and total N mass. Results from the fertilization treatment suggest plants in this community are limited primarily by physical factors. Plants in the *Carex* wet meadow had higher allocation to leaves than in other communities under unfertilized conditions, but decreased allocation to leaves under fertilization. Plants in this community appear light- and nutrient-limited under unfertilized conditions, and primarily light-limited under fertilization. Our results suggest that the presence of geese may control arrowgrass distribution because (a) faeces deposition has a negative effect on arrowgrass, (b) this negative effect is ameliorated by consumption of neighbours, and (c) the combination of high light competition and highly selective foraging for arrowgrass limit expansion of arrowgrass into the *Carex* meadow community. These explanations can now be tested.

Mulder, C., and Ruess, R., 1999. Relationships between size, biomass allocation, reproduction, and survival in *Triglochin palustris* [arrowgrass]: implications for the effects of goose herbivory. *Canadian Journal of Botany/Revue Canadienne de Botanique* 76 (12), 2164-2176. *VEGETATION; arrowgrass; nutrient cycling; waterfowl; goose; herbivory (avian)*

Triglochin palustris (arrowgrass) on the Yukon-Kuskokwim Delta reproduces primarily vegetatively, and is heavily grazed by geese. To link effects of herbivory on individuals to population-level effects, we examined relationships between plant size or biomass allocation and survival or reproduction by matching more than 400 individuals into groups and sequentially harvesting individuals from each group. We compared size and biomass allocation for nonreproductive plants and plants with either or both modes of reproduction in exclosed plots, and examined effects of clipping leaves or inflorescences in flowering and nonflowering plants. Survival and vegetative reproduction increased with plant size, particularly bulb size, but was unrelated to biomass allocation. Very small plants do not reproduce, very large plants produce both flowers and stolons, and intermediate sized plants produce either flowers or stolons. Inflorescences require greater biomass investment than stolons, resulting in decreased allocation to all vegetative plant parts except roots. Plants that produce flowers seldom regenerate overwintering bulbs on the parent plant, indicating a trade-off with survival. Geese may decrease flowering by reducing plant size and consuming inflorescences. Flowering plants have much higher rates of herbivory than other plants, suggesting that increased risk of herbivory results in low rates of flowering.

2001. Long-term effects of changes in goose grazing intensity on arrowgrass populations: A spatially explicit model. *Journal of Ecology* 89 (3), 406-417. *VEGETATION; arrowgrass; herbivory (avian); management; modeling; goose*

1. Field studies on effects of geese on arrowgrass (*Triglochin palustris*) on the Yukon-Kuskokwim Delta (SW Alaska) have demonstrated that Pacific black brant geese (*Branta bernicla nigricans*) can have both positive and negative effects on arrowgrass populations, but cannot predict unambiguously the effects of increased goose numbers on arrowgrass demography. 2. A cellular automata model was used to predict effects of changes in goose grazing intensity on small-scale (within-patch) arrowgrass dynamics. We examined effects of making some of the plant competitors edible to geese, of goose faeces increasing arrowgrass reproduction but reducing size of ungrazed arrowgrass,

and of the presence of other species protecting arrowgrass from grazing. We also compared the effects of a random vs. patchy distribution of geese, and of incorporating threshold numbers of arrowgrass below which grazing ceased. 3. The results indicate that arrowgrass populations are likely to be highest at medium to high levels of grazing. Inclusion of edible competitors and positive effects of faecal deposition resulted in greater changes in arrowgrass population dynamics than did inclusion of associative refuges. 4. For a given grazing intensity, models generally resulted in lower arrowgrass populations with increased grazing aggregation if distributions of geese were patchy, suggesting that decreased colonization may result from lower dispersal. 5. Inclusion of a feedback effect (grazing only above a certain plant population) caused arrowgrass populations to persist for much longer. Temporal variability in whether plots were grazed (unrelated to arrowgrass numbers) could not account for this result. 6. The model results suggest that knowledge of both small-scale and large-scale foraging behaviour is needed to predict the long-term effects of goose grazing on arrowgrass. Small-scale effects on the population may be particularly important where dispersal distances are short. The ability of plant populations to persist locally may be increased if grazing is suspended when herbivory reduces forage plants below a threshold level.

Murie, O., 1935. Alaska-Yukon caribou. *North American Fauna* 54, *INCOMPLETE (need abstract)*; *POPULATION*; *mammals*; *caribou*; *demographics*; *reproduction*; *habitat selection*

Murphy, S., Kessel, B., and Vining, L., 1984. Waterfowl populations and limnologic characteristics of taiga ponds. *Journal of Wildlife Management* 48 (4), 1156-1163. *POPULATION*; *birds*; *waterfowl*; *duck*; *habitat selection*; *limnology*; *nutrition*; *nutrient cycling*; *phosphorus*; *nitrogen*; *hydrology*; *surface water*

A study of duck habitat use patterns and limnology in eastern interior Alaska revealed that ponds hydrologically connected to a creek system had greater use by ducks and higher levels of most nutrients and ions than those hydrologically isolated from a system. Phosphate level was the best limnologic characteristic for discriminating between connected and isolated ponds. Levels of both phosphate and nitrite were highly correlated with levels of duck use, and both emerged in regression equations as predictors of duck species richness and duck density. Hydrologic connection with a creek system appeared to be the key link in the nutrient dynamics of the system and was reflected in the patterns of habitat use by ducks.

Murphy, N., Schraer, C., and Bulkow, L., 1992. Diabetes Mellitus in Alaska Yup'ik Eskimos and Athabascan Indians after 25 Years. *Diabetes Care* 15, 1390-1392. *PEOPLE*; *health (condition)*; *health (comparative)*; *diabetes*; *endocrinology*

Murphy, N., Bulkow, L., Schraer, C., and Lanier, A., 1993. Prevalence of diabetes mellitus in pregnancy among Yup'ik Eskimos, 1987-1988. *Diabetes Care* 16 (1), 315-317. *PEOPLE*; *health (comparative)*; *health (condition)*; *biochemistry*; *endocrinology*; *diabetes*; *behavior*; *metabolism*

OBJECTIVE--To evaluate the prevalence of diabetes mellitus in pregnancy in Yup'ik Eskimos. RESEARCH DESIGN AND METHODS--A retrospective review of consecutive birth-log data and medical records was conducted. Records were taken from the primary care and tertiary referral facilities in Alaska Area Native Health Service. Some 630 consecutive deliveries were reviewed from 1 March 1987 to 29 February 1988, with 25 excluded for ancestry other than Alaska Native. Another 605 Alaska Native patient charts were reviewed, with 545 Alaska Native patients screened for diabetes in pregnancy. The study population had a mean age of 25.6 yr, mean gravidity of 3.4, mean parity of 1.9, and mean birth weight of 3567 +/- 493 g. RESULTS--Patients were screened with a 50-g glucose oral load with a plasma glucose 1 h later. 156 of 605 (25.7%) patients, with a screen > or = 7.8 mM received a 100-g OGTT. Of 605, 35 (5.8%) patients met O'Sullivan

criteria, and 2 of 605 (0.3%) patients met WHO criteria for previous diabetes mellitus, for a total 37 of 605 (6.7% [corrected]) women with diabetes in pregnancy. The subjects who met O'Sullivan criteria had statistically greater mean age (29.9 yr), gravidity (4.9), parity (2.9), and birth weight of their infants (3678 +/- 389 g), compared with women with a screen < 7.8 mM. **CONCLUSIONS**--The prevalence of diabetes in pregnancy among Yup'ik Eskimos is twice the rate for the U.S. for all races, despite the Yup'ik having the lowest rate of diabetes mellitus among Alaska Natives. This may represent a large number of undiagnosed patients with impaired glucose tolerance, and may reflect the wide-spread dietary and life-style changes that have occurred in the Yup'ik in the last 30 yr. The Yup'ik present a unique opportunity to apply prevention techniques in a population with an emerging problem with glucose tolerance.

Murphy, E., and Lehnhausen, W., 1998. Density and foraging ecology of woodpeckers following a stand-replacement fire. *Journal of Wildlife Management* 62 (4), 1359-1372. *POPULATION; birds; woodpecker; disturbance; wildfire; wood borers; spruce beetles*

Throughout its geographic range, the black-backed woodpecker (*Picoides arcticus*) is rare and appears very similar in its foraging ecology to 2 broadly sympatric congeners, the three-toed (*P. tridactylus*) and hairy woodpecker (*P. villosus*). The purposes of our study were to test for differences in foraging ecology of the black-backed, three-toed, and hairy woodpeckers following a stand-replacement fire and to evaluate the importance of such fires to the viability of populations of the black-backed woodpecker. In boreal forests of Interior Alaska, endemic population densities of three-toed woodpeckers are low (<0.1/ha), and black-backed woodpeckers are extremely rare. Following the Rosie Creek fire near Fairbanks, Alaska, in June 1983, both species increased markedly. Densities of both species briefly exceeded 0.2/ha and remained high in a 67-ha plot at the edge of the burn during the following 2 years. By December 1986, densities had declined to <0.1/ha. Black-backed woodpeckers fed primarily on charred portions of moderately to heavily burnt spruces and almost exclusively by excavating larval wood-boring beetles (Cerambycidae). Three-toed woodpeckers fed on less-burnt spruces and foraged in and immediately under the bark; bark beetle (Scolytidae) larvae predominated in their diet. In contrast to earlier studies, our results demonstrate substantive differences in foraging sites, behavior, and diet of these 2 species. Foraging ecology of male hairy woodpeckers and black-backed woodpeckers, particularly females, was similar. In all 3 species, particularly the hairy woodpecker, females fed lower on trees and were far less numerous than males in the study area, which suggested intersexual displacement from foraging sites and habitats selected by males. In summer 1985, following initial adult emergence of the 1983 cerambycid and scolytid cohorts, woodpeckers declined markedly and were absent by late spring 1986. Our results suggest the black-backed woodpecker is extremely specialized in its foraging niche, exploiting outbreaks of wood-boring beetles in dying conifers for only 2-3 years after fires. Consequently, this species may be particularly vulnerable to local and regional extinction as fire suppression intensifies and programs of intensive salvage logging are pursued following fires.

Murray, D.F., Murray, B.M., Yurtsev, B.A., and Howenstein, R., 1983. Biogeographic significance of steppe vegetation in subarctic Alaska. *Proceedings Permafrost: fourth international conference proceedings*, National Academy Press, Washington, D.C. *INCOMPLETE (need abstract); VEGETATION; distribution; ground ice / permafrost; hydrology*

Murray, C., Henderson, M., and Beacham, T., 1990. Size and scale characteristics of upper Yukon River juvenile chinook salmon (*Oncorhynchus tshawytscha*). #1767. Department of

Fisheries and Oceans, Biological Sciences Branch, Nanaimo, B.C. (Canada). *POPULATION; fish; salmon; chinook; demographics; morphology; growth/development*

Juvenile chinook salmon (*Oncorhynchus tshawytscha*) were collected from upper Yukon River tributaries in 1987 and 1988. Scale interpretations indicated that the majority of juveniles (92.2%) were in their first summer of life (age 0.0) and their fork length ranged from 47 to 96 mm. The remaining juveniles were in their second summer of life (age 1.0) and their fork length ranged from 65 to 105 mm. Juveniles collected in May 1988 had no identifiable freshwater annulus. If an annulus was forming on the scales of these fish then it was completed sometime after May or it became more distinct with the addition of spring or plus growth during the downstream migration.

Murray, D.L., Boutin, S., O'Donoghue, M., and Nams, V., 1995. Hunting behaviour of a sympatric felid and canid in relation to vegetative cover. *Animal Behaviour* 50 (5), 1203-1210. *POPULATION; mammals; coyote; lynx; snowshoe hare; predation; habitat selection; vegetation*
Carnivore foraging behaviour is suited for hunting in specific vegetative cover types and therefore is largely stereotypical within taxonomic families. Felids typically employ dense cover to stalk or ambush prey, whereas canids do not make use of vegetation when hunting. Sympatric lynx, *Lynx canadensis*, and coyotes, *Canis latrans*, were tracked in snow for three winters and hunting behaviour in relation to vegetative cover was examined. The major prey of both species was snowshoe hare, *Lepus americanus*. Lynx chased hares more frequently in sparse spruce, *Picea glauca*, canopy than coyotes, whereas coyotes chased hares more often in dense spruce than lynx. Lynx initiated chases by stalking in sparse spruce and by ambushing from beds in dense spruce. Vegetative cover did not affect lynx hunting success, but lynx did have higher success when ambushing versus stalking hares. Coyotes chased hares from closer proximity than lynx and employed a pouncing hunting behaviour. Coyote chases were shorter and more successful in dense versus sparse forest. It is concluded that lynx hunting behaviour is variable according to cover, whereas that of coyotes is fixed. However, coyotes appeared to use vegetation as concealment when approaching hares: the possible influence of snow on hunting tactics of each predator species is discussed.

Nakanishi, A., and Dorava, J., 1994. Overview of environmental and hydrogeologic conditions at Saint Marys, Alaska. 94-481. United States Geological Survey, Earth Science Information Center, Denver, CO. *WATER QUALITY; risk assessment; waste (hazardous); contaminants; remediation; flooding*

The Federal Aviation Administration (FAA) owns or operates airway support facilities near Saint Marys along the Yukon River in west-central Alaska. The FAA is evaluating the severity of environmental contamination and options for remediation of environmental contamination at their facilities. Saint Marys is on a flood plain near the confluence of the Yukon and Andreafsky Rivers and has long cold winters and short summers. Residents obtain their drinking water from an infiltration gallery fed by a creek near the village. Surface spills and disposal of hazardous materials combined with potential flooding may affect the quality of the surface and ground water. Alternative drinking-water sources are available, but would likely cost more than existing supplies to develop.

1994. Overview of environmental and hydrogeologic conditions at Tanana, Alaska. 94-527. United States Geological Survey, Earth Science Information Center, Denver, CO. *WATER QUALITY; hydrology; surface water; risk assessment; waste (hazardous); contaminants; remediation; flooding*

The remote Native village of Tanana along the Yukon River in west-central Alaska has long cold winters and short summers. The Federal Aviation Administration owns or operates airway support facilities near Tanana and wishes to consider the subsistence lifestyle of the residents and the quality of the current environment when evaluating the severity of environmental contamination at these facilities. Tanana is located on the flood

plain of the Yukon River and obtains its drinking water from a shallow aquifer located in thick alluvium underlying the village. Surface spills and disposal of hazardous materials combined with annual flooding of the Yukon River may affect the quality of the ground water. Alternative drinking-water sources are available, but may cost more than existing supplies.

1994. Overview of environmental and hydrogeologic conditions at Fort Yukon, Alaska. 94-526. United States Geological Survey, Earth Science Information Center, Denver, CO. *WATER QUALITY; hydrology; ground water; surface water; flooding; geology; risk assessment; waste (hazardous); contaminants; remediation*

The village of Fort Yukon along the Yukon River in east-central Alaska has long cold winters and short summers. The Federal Aviation Administration operates and supports some airport facilities in Fort Yukon and is evaluating the severity of environmental contamination and options for remediation of such contamination at their facilities. Fort Yukon is located on the flood plain of the Yukon River and obtains its drinking water from a shallow aquifer located in the thick alluvium underlying the village. Surface spills and disposal of hazardous materials combined with annual flooding of the Yukon River may affect the quality of the ground water. Alternative drinking-water sources are available from local surface-water bodies or from presently unidentified confined aquifers.

1994. Overview of environmental and hydrogeologic conditions at Galena, Alaska. 94-525. United States Geological Survey, Earth Science Information Center, Denver, CO. *WATER QUALITY; hydrology; ground water; surface water; flooding; geology; risk assessment; waste (hazardous); contaminants; remediation*

The remote Native village of Galena along the Yukon River in west-central Alaska has long cold winters and short summers that affects the hydrology of the area. The Federal Aviation Administration owns or operates airport support facilities in Galena and wishes to consider the subsistence lifestyle of the residents and the quality of the current environment when evaluating options for remediation of environmental contamination at these facilities. Galena is located on the flood plain of the Yukon River and obtains its drinking water from a shallow aquifer located in the thick alluvium underlying the village. Surface spills and disposal of hazardous materials combined with annual flooding of the Yukon River may affect the quality of the ground water. Alternative drinking-water sources are available but at significantly greater cost than existing supplies.

Nakanishi, S., Curtis, J., and Wendler, G., 2001. The influence of increased jet airline traffic on the amount of high level cloudiness in Alaska. *Theoretical and Applied Climatology* 68 (3-4), 197-205. *CLIMATE; AIR QUALITY*

The high level cloudiness has increased over Alaska during the second half of this century, a period for which reliable data exist. This increase is most pronounced in areas close to the much traveled air routes from Europe to Anchorage which could be demonstrated by a comparison with two remote stations in western Alaska. This might be taken as an indication that the observed high cloudiness increase is caused by jet contrails. Seasonally, summer and spring give the greatest increases. Cloudiness is, of course, an important parameter for climatic change, and increased high level cloud amount in arctic and subarctic areas would lead to warmer temperature; these have been observed in Alaska.

Nams, V., Folkard, N., and Smith, J., 1993. Effects of nitrogen fertilization on several woody and nonwoody boreal forest species. *Canadian Journal of Botany/Revue Canadien de Botanique* 71 (1), 93-97. *VEGETATION; spruce; nutrition; nitrogen*

The effects of three levels of fertilizer were tested on the growth of several woody and nonwoody plants from a boreal forest community in southwestern Yukon. The effects of fertilization were assessed by clipping ground layer vegetation and measuring twig

growth at the end of the second summer. Over the 2 years of fertilization there were significant increases in growth over control levels for perennial grasses (*Festuca altaica* and *Calamagrostis lapponica*), two herbs (*Epilobium angustifolium* and *Achillea millefolium*), and two deciduous shrubs (*Salix glauca* and *Betula glandulosa*). However, the growth of white spruce trees (*Picea glauca*) increased only slightly in response to increasing nitrogen levels, and the evergreen dwarf shrub *Arctostaphylos uva-ursi* showed no response.

Natcher, D.C., 1996. Impact of non-indigenous fire policies on land and resource use of the Gwich'in Athabaskans of Birch Creek and adjacent areas, Alaska, University of Alaska Fairbanks, M.A., 79 p *INCOMPLETE (need abstract); MANAGEMENT; wildfire; subsistence; PEOPLE; economics*

Nava, J.A., 1970. The reproductive biology of the Alaska lynx (*Lynx canadensis*): College [Fairbanks], University of Alaska, M.S. *POPULATION; mammals; lynx; behavior (reproductive/nesting); INCOMPLETE (need abstract)*

Nelson, R., 1989. Hunters and Animals in a Native Land. *Orion* 8 (2), 48-53. *PEOPLE; subsistence; hunting; moose; caribou; native perspective (interpreted)*

The Koyukon people live in eleven villages along the Yukon and Koyukuk rivers in Alaska. They have lived a hunting and gathering lifestyle there for thousands of years without ever endangering any animal species, without abusing the land. They assign certain rights to animals and to nature, and they treat them with respect. However, growing populations of nonnatives and increased development and regulatory pressure in Alaska are threatening to change the relationship between Native villagers and their environment. Native rights to pursue traditional subsistence and maintain authority over community homelands are now among the most volatile political issues in the state, and will probably remain so into the next century. Most Native Alaskans do not think of their animals as "resources" to be parceled out among groups of "users" or of their respect toward animal populations as a form of "game management." Threats to animal species like moose and caribou are bringing the Koyukon and other Native Alaskans together in a revitalized sense of responsibility toward the environment. In some cases, it is Native corporations themselves, such as logging operations, that are jeopardizing environmental integrity. In the coming century, survival of many animal species, on this continent and the Earth itself, may depend on whether Western society rediscovers the wisdom of moral responsibility and ethical self-restraint that the Koyukon people practice.

Nelson, S.M., 2000. Alaska Resource Data File; Survey Pass quadrangle. open file report 00-328. US Geological Survey, Anchorage, AK.

ftp://pluton.wr.usgs.gov/pub/ardf_data/SurveyPass.pdf *MINING; INFRASTRUCTURE; gold; copper; lead; zinc; tin*

Descriptions of the [43] mineral occurrences shown on the accompanying figure follow. See U.S. Geological Survey (1996) for a description of the information content of each field in the records. The data presented here are maintained as part of a statewide database on mines, prospects and mineral occurrences throughout Alaska. This and related reports are accessible through the USGS World Wide Web site

<http://ardf.wr.usgs.gov>. Comments or information regarding corrections or missing data, or requests for digital retrievals should be directed to: Frederic Wilson, USGS, 4200 University Dr., Anchorage, AK 99508-4667, e-mail fwilson@usgs.gov, telephone (907) 786-7448.

Nicholas, J., and Hinkel, K., 1996. Concurrent Permafrost Aggradation and Degradation Induced by Forest Clearing, Central Alaska, U.S.A. *Arctic, Antarctic, and Alpine Research* 28 (3), 294-299. *CLIMATE; SOIL; ground ice / permafrost; disturbance; forestry; recovery*
Temporal variations in the annual depth of the active layer above permafrost reflect changing thermal and hydrological conditions that can occur at local and regional spatial scales. Among the most important local factors responsible for permafrost maintenance in the discontinuous and sporadic permafrost zones is a surficial layer of peat which, when dry, acts as a superb thermal insulator. The impact of this organic layer on the local soil energy balance is exemplified at a site near Fairbanks, Alaska. The natural cover of spruce trees and moss were cleared by bulldozing to prepare for land development, and the debris deposited in a number of large piles on the same property. This action resulted in permafrost degradation and development of thermokarst in the 12.7-ha cleared area within several years. In adjacent undisturbed regions, permafrost is encountered 0.4 to 0.5 m below the surface in late summer, but cannot be detected to depths of 1.2 m in the cleared section. Concurrently, permafrost underlying the debris piles was protected and has aggraded about 1.0 m upward into the core of a trenched mound. This study highlights the sensitivity of permafrost in this environment to anthropogenic surficial change.

Niemelä, P., Chapin III, F., Danell, K., and Bryant, J., 2001. Herbivory-Mediated Responses of Selected Boreal Forests to Climatic Change. *Climatic Change* 48 (2-3), 427-440. *CLIMATE; vegetation; distribution; herbivory; wildfire; modeling*

Recent efforts to project vegetation responses to climatic warming have emphasized the tight linkages between climate and vegetation distribution. Here we provide several examples indicating that the direct effects of climatic warming on boreal vegetation can be qualitatively different than the indirect effects mediated by climatic responses of herbivores. These herbivore-mediated vegetation responses to climatic warming will likely vary regionally. In southern Fennoscandia, we project that the climatically induced changes in animal populations should enhance the density of spruce at the expense of pine and broadleaved trees. In northern Fennoscandia we project reduced herbivory on broadleaved trees and increased herbivory on pine, leading to an increase in broadleaved trees and spruce and a reduction in pine. Climatic warming in interior Alaska may reduce herbivory on broadleaved trees and increase herbivory on evergreen spruce, thus reinforcing the impact of increased fire frequency.

2001. Animal-mediated responses of boreal forest to climatic change. *Climatic Change* 48, 427-440. *INCOMPLETE (need abstract); CLIMATE; VEGETATION; NUTRIENT CYCLING; ground ice / permafrost; modeling*

Nixon, W.A.C., 1990. Group dynamics and behavior of the Porcupine caribou herd during the insect season, University of Alaska Fairbanks, M.S., 109 p *POPULATION; caribou; insects; behavior (defensive); INCOMPLETE (need abstract)*

NOAA, 1999. Paleoenvironmental Atlas of Beringia Bibliography. National Oceanic and Atmospheric Administration: <http://www.ngdc.noaa.gov/paleo/parcs/atlas/beringia/bibliogr.html> *BIBLIOGRAPHY; VEGETATION; CLIMATE; geology; pollen*

Nobmann, E., 1997. Nutritional Benefits of Subsistence Foods. P0087553. EDN Nutrition Consulting, Anchorage.

<http://www.anhb.org/sub/epi/documents/nobman%20nutritional%20report.pdf> *PEOPLE; nutrition; traditional food; health (effects); diabetes; cancer; heart disease; obesity; risk assessment; dietary advisory*

EXECUTIVE SUMMARY

Foods from the land and sea have been nourishing Alaska Natives for thousands of years. They have, and they continue to nourish the body, the spirit and the community. Today people are asking, what should they eat? "Is my food safe?" Many non-Native foods are available. What should a person, Native or non-Native, eat? To answer this question, a person needs to know the benefits and the risks, if any, of eating subsistence foods and then weigh this information in terms of his or her personal values.

The Institute of Social and Economic Research (ISER) requested information to assist in developing a comprehensive program that assists individuals and agency personnel in understanding the nutritional aspects of subsistence foods so that they can make informed decisions about the consumption of subsistence foods. The purposes of this report are to 1.) Review and summarize published information about the nutritional benefits of subsistence or Native foods consumed in Alaska; 2.) Identify the gaps in written knowledge about the nutritional benefits, and 3.) Propose ways to address them. The report is intended for administrators in villages and agencies who may deal with subsistence foods. It also is intended for anyone interested in subsistence or Native foods in Alaska and their benefits.

Findings:

Published reports have shown:

- Subsistence foods make a substantial contribution to nutritional well being. Over half of the protein, iron, vitamin B-12 and omega-3 fatty acids in the diet of some Alaska Natives comes from subsistence foods.
- Subsistence foods have nutritional benefits that make them preferable to many purchased foods. They are rich in many nutrients, low in fat, and contain more heart-healthy fats and less harmful fats than many non-Native foods.
- Alaska Natives eating subsistence foods have lower signs of diabetes and heart disease. The diet of Alaska Natives may explain their lower rates of certain kinds of cancer.
- Eating and gathering subsistence foods has positive benefits in avoiding obesity.
- Eating and gathering subsistence, or Native, foods contributes to social mental and spiritual well being.

However, there are gaps in knowledge. Information is limited in the following areas:

- How does what a person eats affect him?
- What foods are eaten in different parts of Alaska? Information is fairly good on what foods are harvested but limited on what is actually eaten.
- How much of each food is eaten?
- Do people of different ages eat differently?
- How are eating practices changing over time and what are the results?
- What is the nutrient content of some foods?

Even less information is available on:

- What is the nutrient content for many foods for some nutrients?
- How do elements in foods protect the body from environmental hazards?
- What are the best ways to communicate information that is known?
- What are simple tools which individuals could use to interpret scientific findings and make informed decisions about what they eat?

Specific recommendations: The most important gaps in understanding the nutritional benefits of subsistence foods are in describing what and how much people eat and how this may be related to health.

1. Document what specific foods are eaten and how much is eaten within regions through the seasons. This includes identifying parts of plants and animals consumed

and preparation methods. This should be undertaken in collaboration with the local people in regions where there is interest.

2. Compile and distribute nutrient composition information on the most important nutrients in the most consumed foods. Based on their importance to health and the lack of existing information nutrients to investigate include vitamin E, omega-3 fatty acids, monounsaturated, polyunsaturated and saturated fatty acids, vitamin A, beta-carotene, selenium, dietary fiber, calcium, cholesterol, iron, fat, energy, protein, water and carbohydrate.

3. Develop and distribute information on the benefits and clarify any documented risks of consuming specific subsistence foods. Foods of particular interest include salmon, fish other than salmon, sea mammals, livers and kidneys of sea mammals, moose, caribou, and deer, livers and kidneys of land mammals, marine invertebrates and berries.

4. Investigations are needed on the relationships of food and health. This is challenging, as health is difficult to measure. Disease more often is measured. This is also difficult when there are few cases of the disease in a relatively small population.

5. Basic research is needed on the interactions of nutrients and contaminants and how this effects health. An alternate approach is to measure existing health status first and then compare results with intakes of nutrients and contaminants.

6. Identify and apply the most effective methods of communicating with those that may be interested or need to know about the nutritional benefits and possible risks of eating subsistence foods.

7. There is need for repeating existing findings. Sound, scientific conclusions are based on finding the same results time after time. There is also a need for approaching questions from different angles.

Noss, J.F., 1985. Spatial distribution of resources and human settlement and foraging in the Alaska Yukon River Valley, Harvard University, Ph.D., 476 p *PEOPLE; distribution; land use; anthropology; subsistence; traditional food; history*

NPS, 2000. Baseline Water Quality Data Inventory and Analysis: Yukon-Charley Rivers National Preserve. NTIS/PB99-170284. National Park Service, Water Resources Div., Fort Collins, CO. *WATER QUALITY; hydrology; surface water; seasonality; modeling; monitoring*

This document presents the results of surface-water-quality data retrievals for Yukon-Charley Rivers National Preserve from six of the United States Environmental Protection Agency's (EPA) national databases: (1) Storage and Retrieval (STORET) water quality database management system; (2) River Reach File (RF3); (3) Industrial Facilities Discharge (IFD); (4) Drinking Water Supplies (DRINKS); (5) Flow Gages (GAGES); and (6) Water Impoundments (DAMS). The document provides: (1) a complete inventory of all retrieved water quality data, water quality stations, and the entities responsible for data collection; (2) descriptive statistics and appropriate graphical plots of water quality data characterizing annual and seasonal central tendencies and trends; (3) a comparison of the park's water quality data to relevant EPA and Water Resources Division water quality screening criteria; and (4) an Inventory Data Evaluation and Analysis to determine what NPS-75 'Level I' water quality parameters have been collected in the park. The results of the retrievals for the study area from the IFD, DRINKS, and GAGES database located eight industrial dischargers, no drinking water intakes, and four gaging stations. The results of the STORET retrieval for the study area yielded 2,534 observations for 137 separate parameters collected by the EPA and the U.S. Geological Survey at 22 monitoring stations.

Nykanen, D., Fofoula-Georgiou, E., and Sapozhnikov, V., 1998. Study of spatial scaling in braided river patterns using synthetic aperture radar imagery. *Water Resources Research* 34

(7), 1795-1807. *HYDROLOGY; surface water; imaging (remote sensing); sediment; INCOMPLETE (need abstract)*

Oakley, K., Debevec, E., and Rexstad, E., 1998. Development of a long-term ecological monitoring program in Denali National Park and Preserve, Alaska (USA). *Proceedings North American Science Symposium: Toward a Unified Framework for Inventorying and Monitoring Forest Ecosystem Resources, Guadalajara, Mexico* *VEGETATION; POPULATION; mammals; birds; CLIMATE; ecology; monitoring*

A Long-term Ecological Monitoring (LTEM) program began at Denali National Park and Preserve, Alaska (USA) in 1992, as a prototype for subarctic parks. The early history of the Denali LTEM program provides insight into the challenges that can arise during monitoring program development. The Denali program has thus far taken a watershed approach, involving collocation of study effort for a mix of abiotic and biotic attributes within a small, headwater stream (Rock Creek) which crosses the tundra-taiga boundary. An initial effort at integration and synthesis of meteorological, vegetation, small mammal and passerine bird data for the first 7 years of the program found few correlations, but power was low. We will now attempt to balance the intensive work in Rock Creek by developing a cost-effective sampling design that includes more of the park. We are also working to improve linkages between the monitoring program and park management decision-making and to strengthen data management and reporting mechanisms.

O'Connell, W.T., 2001. Role of wetlands and endogenous factors on incubation behavior of nesting spectacled eiders on the Yukon-Kuskokwim Delta, Alaska, University of Alaska Fairbanks, M.S., 125 p *POPULATION; birds; waterfowl; eider; behavior (reproductive/nesting); behavior (feeding); habitat selection; nutrition; endocrinology; mortality*

Summary: "Patterns of nest attendance in ducks vary with endogenous and environmental factors. We examined variation in nest attendance of spectacled eiders on the Yukon-Kuskokwim Delta, Alaska, during 1997-1998. We also examined spatial and temporal variation in wetland characteristics and potential foods available to nesting spectacled eiders. Time spent foraging was greater when spectacled eiders traveled farther to feed, and nest attendance was lower when food was more abundant, suggesting that females made tradeoffs between foraging and energetic requirements of nesting in response to food abundance and wetland conditions. Wetlands were dynamic, and food abundance varied with pond depth and total dissolved solids. Spectacled eiders responded in complex ways to a suite of physiological and environmental variables, and employed an overall behavioral strategy that optimized foraging behavior in response to food abundance, while minimizing risk of depleting nutrient reserves sufficiently to force nest abandonment or increase the risk of female mortality"

O'Donoghue, M., Boutin, S., Krebs, C.J., and Hofer, E., 1997. Numerical responses of coyotes and lynx to the snowshoe hare cycle. *Oikos* 80 (1), 150-162. *POPULATION; coyote; lynx; snowshoe hare; demographics; reproduction; predation; behavior (feeding)*

Coyotes and lynx are the two most important mammalian predators of snowshoe hares throughout much of the boreal forest in North America. Populations of hares cycle in abundance, with peaks in density occurring every 8-11 yr, and experimental results suggest that predation is a necessary factor causing these cycles. We measured the numerical responses of coyotes and lynx during a cyclic fluctuation of hare populations in the southwest Yukon, to determine their effect on the cyclic dynamics. We used snow-tracking, track counts, and radio telemetry to directly examine changes in the numbers, population dynamics, and movements. Numbers of coyotes varied 6-fold and those of lynx 7.5-fold during a 26-44-fold fluctuation in numbers of hares, and the abundances of both predators were maximal a year later than the peak in numbers of snowshoe hares. Cyclic declines in numbers of coyotes were associated with lower reproductive output

and high emigration rates. Likewise, few to no kits were produced by lynx after the second winter of declining numbers of hares. High emigration rates were characteristic of lynx during the cyclic peak and decline, and low in situ survival was observed late in the decline. The delayed numerical responses of both "generalist" coyotes and "specialist" lynx were therefore similar, and would contribute to the cyclic dynamics.

O'Donoghue, M., Boutin, S., Krebs, C.J., Murray, D.L., and Hofer, E., 1998. Behavioural responses of coyotes and lynx to the snowshoe hare cycle. *Oikos* 82 (1), 169-183.

POPULATION; coyote; lynx; snowshoe hare; predation; nutrition; behavior (feeding); habitat selection

Coyotes and lynx are the two most important mammalian predators of snowshoe hares throughout much of the North American boreal forest. Populations of hares cycle in abundance, with peaks in density occurring every 8-11 years. We used snow-tracking to measure the diets, use of habitats, and hunting tactics of coyotes and lynx during a cyclic fluctuation of hare populations in the southwest Yukon. Our objective was to determine changes in foraging behaviour of the predators leading to functional responses to densities of hares. Coyotes and lynx both preferred snowshoe hares over available alternative prey at all phases of the cycle. Lynx switched to preying on red squirrels during the cyclic low and subsequent early increase. The pattern of changes in habitat use by coyotes and lynx paralleled that of snowshoe hares, and both concentrated their hunting activity in areas of high density of hares. Coyotes used more open cover to hunt voles during years of low abundance of hares and high numbers of small mammals. Lynx increasingly used ambush beds for hunting hares and red squirrels during the cyclic decline and low. Hunting success was not higher from beds. Lynx hunted in adult groups for the first time during the cyclic decline and low.

O'Donoghue, M., Boutin, S., Krebs, C.J., Zuleta, G., Murray, D.L., and Hofer, E., 1998.

Functional responses of coyotes and lynx to the snowshoe hare cycle. *Ecology* 79 (4), 1193-1208. *POPULATION; coyote; lynx; snowshoe hare; predation; behavior (feeding); nutrition*

Coyotes and lynx are the two most important mammalian predators of snowshoe hares throughout much of the boreal forest. Populations of hares cycle in abundance, with peaks in density occurring every 8-11 yr, and experimental results suggest that predation is a necessary factor causing these cycles. We measured the functional responses of coyotes and lynx during a cyclic fluctuation of hare populations in the southwest Yukon, to determine their effect on the cyclic dynamics. We used snow-tracking and radio telemetry to examine changes in the foraging behavior of the predators. Coyotes and lynx both fed mostly on hares during all winters except during cyclic lows, when the main alternative prey of coyotes was voles, and lynx switched to hunting red squirrels. Both predators showed clear functional responses to changes in the densities of hares. Kill rates of hares by coyotes varied from 0.3 to 2.3 hares/d, with the most hares killed one year before the cyclic peak, while those of lynx varied from 0.3 to 1.2 hares/d, with the highest one year after the peak. Maximum kill rates by both predators were greater than their energetic needs. The functional response of coyotes was equally well described by linear and type-2 curves, and that of lynx was well described by a type-2 curve. Kill rates by coyotes were higher during the increase in density of hares than during the cyclic decline, while the reverse was true for lynx. Coyotes killed more hares early in the winter, and cached many of these for later retrieval. Lower densities of hares were associated with longer reactive distances of both predators to hares, but with little apparent change in time spent searching or handling prey. In summary, our data show that the two similarly sized predators differed in their foraging behavior and relative abilities at capturing alternative prey, leading to different patterns in their functional responses to fluctuations in the density of their preferred prey.

Osborne, T., 1985. Fork-tailed storm-petrel records from inland Alaska. *Condor* 87 (3), 432-434. *POPULATION; birds; storm petrel; climate*

The Fork-tailed Storm-Petrel (*Oceanodroma furcata*) has been recorded from interior Alaska (Nelson 1887, Geist 1939), but Palmer (1962) and AOU (1983) rejected these unsubstantiated inland records. After seeing three of these birds in the interior of Alaska, the author investigated the rarity of their inland occurrence and where they had originated. From University of Alaska Museum records, he found that his inland sightings were not unique and possibly were associated with four other sightings. This note examines present distribution, historic records, weather patterns, and recent inland records of these storm-petrels in Alaska.

Osgood, W.H., 1909. Biological investigations in Alaska and Yukon Territory [microform] : i. East Central Alaska; II. Ogilvie Range, Yukon; III. Macmillan River, Yukon. U.S. G.P.O. (United States Government Printing Office), *INCOMPLETE (need abstract)*

Osterkamp, T., and Gosink, J., 1983. Frazil ice formation and ice cover development in interior Alaska streams. *Cold Regions Science and Technology* 8 (1), 43-56. *HYDROLOGY; surface water; river ice; snow*

A number of photographs are presented which illustrate selected aspects of frazil ice formation in turbulent streams in interior Alaska. These include the various forms of frazil ice found in turbulent streams and the processes involved in the development of an ice cover on the streams. All of the photographs depict frazil ice under field conditions. They include photographs of cooling conditions, frazil discs (both in situ and removed from the stream), anchor ice, edge ice, frazil floes, frazil pans, snow slush, and frazil floes. Photographs of hydrological conditions that lead to the production of large frazil ice floes and of different types of frazil ice jams are also included. These photographs provide visual documentation of the key role that frazil ice plays in ice cover development on turbulent streams in interior Alaska.

Osterkamp, T., Viereck, L., Shur, Y., Jorgenson, M., Racine, C., Doyle, A., and Boone, R., 2000. Observations of Thermokarst and Its Impact on Boreal Forests in Alaska, U.S.A. *Arctic, Antarctic, and Alpine Research* 32 (3), 303-315. *CLIMATE; hydrology; ground ice / permafrost; thermokarst*

Thermokarst is developing in the boreal forests of Alaska where ice-rich discontinuous permafrost is thawing. Thawing destroys the physical foundation (ice-rich soil) on which boreal forest ecosystems rest causing dramatic changes in the ecosystem. Impacts on the forest depend primarily on the type and amount of ice present in the permafrost and on drainage conditions. At sites generally underlain by ice-rich permafrost, forest ecosystems can be completely destroyed. In the Mentasta Pass area, wet sedge meadows, bogs, thermokarst ponds, and lakes are replacing forests. An upland thermokarst site on the University of Alaska Campus consists of polygonal patterns of troughs and pits caused by thawing ice-wedge polygons. Trees are destroyed in corresponding patterns. In the Tanana Flats, ice-rich permafrost supporting birch forests is thawing rapidly and the forests are being converted to minerotrophic floating mat fens. At this site, an estimated 83% of 2.6×10^5 [260,000] ha was underlain by permafrost a century or more ago. About 42% of this permafrost has been influenced by thermokarst development within the last 1 to 2 centuries. Thaw subsidence at the above sites is typically 1 to 2 m with some values up to 6 m. Much of the discontinuous permafrost in Alaska is extremely warm, usually within 1 or 2 degree C of thawing, and highly susceptible to thermal degradation. Additional warming will result in the formation of new thermokarst.

Oswood, M., 1997. Streams and rivers of Alaska: A high latitude perspective on running waters. In: Milner, A., and Oswood, M., eds., *Freshwaters of Alaska Ecological Synthesis*. Ecological

Studies. Springer, New York, NY, pp. 330-356. *WATER QUALITY; surface water; limnology; ecology; management; climate; modeling*

This chapter first discusses the special importance of high latitudes in general, and Alaska in particular, to the ecology and management of running waters. In the second part, I propose a model (framework of hypotheses), tracing the interacting effects of high latitude climate on running waters.

Oswood, M., Reynolds, J., Irons, J.I., and Milner, A., 2000. Distributions of freshwater fishes in ecoregions and hydroregions of Alaska. *Journal of the North American Benthological Society* 19 (3), 405-418. *POPULATION; fish; distribution; modeling; vegetation*

We examined the spatial distributions of Alaskan freshwater fishes using 2 frameworks, ecoregions and hydroregions (catchments). Ecoregions are defined by climate, terrain, vegetation, and soils; their utility in explaining distributions of aquatic organisms is based upon terrestrial-aquatic linkages. Analysis of the probable dispersal of aquatic organisms along past and current hydroregions provides an alternative and likely complementary path to understanding distributions of aquatic organisms. We use published distribution records for freshwater fishes of Alaska to construct a matrix of presence/absence records for each fish species in ecoregions and hydroregions of Alaska. We assessed faunal similarities among ecoregions and hydroregions using the Jaccard index. Classification analyses (two-way indicator species analysis [TWINSPAN] and unweighted pair-group method using arithmetic averages [UPGMA] cluster analysis) were used to group ecoregions and hydroregions. Similarities of fish faunas were highest in adjacent hydroregions, with declining similarity between latitudinally disjunct hydroregions; similarities were lower between hydroregions separated by high-elevation mountain chains than between hydroregions separated by lower-elevation mountains and lowlands. The Brooks Range Tundra, which is a high-elevation swath of the mountains separating the Arctic coastal plain from interior Alaska, showed the greatest dissimilarity in fish fauna from other (even adjacent) ecoregions. Classification analyses of hydroregions and ecoregions produced geographically similar patterns, tentatively considered ichthyoregions. From north to south, these ichthyoregions included Arctic and Brooks Range regions, a region consolidating most of the Yukon catchment of interior Alaska, a western Alaska region, a coastal southwestern region (Bristol Bay to Cook Inlet and adjacent Alaska Range), and a southern maritime region including Southeast Alaska. Fishes of the Beringian refuge (local survivors of Pleistocene glaciation) dominated northern regions, with increasing representation southward by fishes derived from the Pacific Coast (Cascadia) refuge, suggesting a Pleistocene imprint on distribution of Alaskan fishes. Thus, we hypothesize that the distribution of Alaskan freshwater fishes is complexly determined by ecophysiological requirements of fishes along the latitudinal gradient from northern rain forest to Arctic tundra, by current and past barriers to dispersal, and by the legacy of Pleistocene glaciation.

Ovenden, L., and Brassard, G., 1989. Wetland vegetation near Old Crow, northern Yukon. *Canadian Journal of Botany/Revue Canadienne de Botanique* 67 (4), 954-960. *VEGETATION; mosses; sedges; grasses; tussock tundra; soil; hydrology*

Wetland vegetation on lowlands of northern Yukon was related to gradients of pH, peat depth, and active-layer depth using detrended correspondence analysis. 7 vegetation types were distinguished by two-way indicator species analysis: *Arctophila* shoreline marsh, *Carex aquatilis* - *Sphagnum* - *Chamaedaphne* wet meadow, *Scorpidium* - sedge carpet, *Carex rotundata* - *Andromeda* - *Sphagnum orientale* lawn, *Sphagnum* - heath on firm peat, thickets and tussock tundra, and *Calamagrostis canadensis* meadow. The *Arctophila* marshes and tussocky shrublands resemble other sites in the subarctic and low arctic wetland region of North America, while *Sphagnum* - heath on firm peat is typical of high boreal and subarctic wetlands.

Paetkau, D., Shields, G., and Strobeck, C., 1998. Gene flow between insular, coastal and interior populations of brown bears in Alaska. *Molecular Ecology* 7 (10), 1283-1293.

POPULATION; reproduction; genetics; grizzly bear

The brown bears of coastal Alaska have been recently regarded as comprising from one to three distinct genetic groups. We sampled brown bears from each of the regions for which hypotheses of genetic uniqueness have been made, including the bears of the Kodiak Archipelago and the bears of Admiralty, Baranof and Chichagof (ABC) Islands in southeast Alaska. These samples were analysed with a suite of nuclear microsatellite markers. The 'big brown bears' of coastal Alaska were found to be part of the continuous continental distribution of brown bears, and not genetically isolated from the physically smaller 'grizzly bears' of the interior. By contrast, Kodiak brown bears appear to have experienced little or no genetic exchange with continental populations in recent generations. The bears of the ABC Islands, which have previously been shown to undergo little or no female-mediated gene flow with mainland populations, were found not to be genetically isolated from mainland bears. The data from the four insular populations indicate that female and male dispersal can be reduced or eliminated by water barriers of 2–4 km and 7km in width, respectively.

Palmer, M., 1999. Contaminants in Yukon moose and caribou - 1997. Synopsis of Research Conducted Under the 1996/97 Northern Contaminants Program (Environmental Studies - Canada 75), 189-191. *CONTAMINANTS; metals; cadmium; mercury; moose; caribou; bioaccumulation; traditional food; dietary advisory*

Objectives: 1. to develop baseline data on levels of inorganic contaminants in Yukon moose and caribou, 2. to identify potential health risks to First Nations and others using moose and caribou as a food source, 3. to identify potential health problems in wildlife populations as a result of contaminant loading, 4. to identify potential temporal and geographical trends in inorganic contaminants in Yukon moose and caribou. ... For the most part, element concentrations found in Yukon moose and caribou kidneys are at background levels and are not of concern to the animals themselves, or those who consume them. However, Health Canada has recommended limiting consumption of kidneys from Yukon moose and caribou because of high cadmium concentrations in kidneys from both moose and caribou, and high mercury levels in caribou. It is likely that these elements are accumulating from natural sources in the mineral-rich area, and are acquired by the animals, through the consumption of specific plants that are adept at absorbing these elements from the natural environment. Although cadmium levels tend to be higher in older animals, there has been no significant change in the levels found in moose or Porcupine caribou over the last two years. Similarly, there has been no significant change in mercury levels in the Porcupine caribou over the last two years.

1999. Sources, pathways and levels of contaminants in fish from Yukon waters. Synopsis of Research Conducted Under the 1997/98 Northern Contaminants Program (Environmental Studies - Canada 75), 193-195, 1 map. *CONTAMINANTS; POPs (persistent organic pollutants); fish; whitefish; trout; pike; grayling; salmon; burbot; bioaccumulation*

Objectives - Short-term: 1. to verify results from previous organochlorine analyses in order to address concerns raised by health advisories based on existing data, 2. to determine spatial variability in contaminant loadings, and to assess short term trends. Long-term: 1. to investigate the sources, processes and rates of contaminant deposition and transport into and within the waters of the Yukon, 2. to determine levels of contaminants for use in long term trend analysis, 3. to develop additional monitoring on levels of organic contaminants within the Yukon, and 4. to provide additional information for use in updating health advisories. ... Main findings of the multi-year program: - Organochlorine contaminants are present in lakes and rivers throughout the Yukon, as in other regions of the circumpolar North. - Yukon whitefish, Northern pike, Arctic grayling,

and salmon have consistently low levels of organochlorines. - Lake trout organochlorine contaminant levels vary a lot from lake to lake and within lakes, partly in relation to whether or not the trout eat fish or invertebrates. - Burbot (lingcod) all have very low levels of organochlorines in their muscle tissue, but contaminants build up in the large, fatty livers. Contaminant levels also vary a lot from lake to lake.

Panzica, G.C., Plumari, L., Garcia-Ojeda, E., and Deviche, P., 1999. Central vasotocin-immunoreactive system in a male passerine bird (*Junco hyemalis*). *Journal of Comparative Neurology* 409 (1), 105-17. *POPULATION; birds; junco; biochemistry; endocrinology*
Previous investigations have identified regions of the avian brain that contain immunoreactive vasotocinergic (VT-ir) cell bodies and fibers. These studies exclusively used domesticated species, and the relevance of the findings for free-living birds has not been established. The present study used immunocytochemistry to determine the neuroanatomical distribution of the VT-ir system in the brain of a well-studied male passerine bird (dark-eyed junco, *Junco hyemalis*) obtained from a natural population in interior Alaska (65 degrees N, 147 degrees W). VT-ir cell bodies were observed in several brain regions (paraventricular and supraoptic nuclei, nucleus of the stria terminalis), where they have been described in other oscine species. VT-ir fibers were widespread in many brain regions and were especially abundant in the medial preoptic nucleus, the basal region of the septum, and the hypothalamic-neurohypophyseal tract. Fibers were also present in brain regions that are involved in the control of vocal behavior including the ventromedial capsular region of the nucleus robustus archistriatalis and the dorsomedial portion of the mesencephalic nucleus intercollicularis. The widespread brain distribution of VT-ir cell bodies and fibers in juncos generally resembles that of domestic birds and suggests a role for this neuropeptide in the control of reproductive behavior and physiology.

Paragi, T., and Wholecheese, G., 1994. Marten, *Martes americana*, predation on a northern goshawk, *Accipiter gentilis*. *Canadian field-naturalist* 108 (1), 81-82. *POPULATION; predation; marten; goshawk; behavior (feeding)*

The site where a Marten *Martes americana* killed a Northern Goshawk *Accipiter gentilis* was found during snowtracking in the taiga of western interior Alaska. The Marten dragged the raptor >0.5 km before beginning to feed on it. Although Martens are known to prey on passerines and gallinaceous birds, this is apparently the first report of one attacking and consuming a raptor.

Park, L., Brainard, M., Dightman, D., and Winans, G., 1993. Low levels of intraspecific variation in the mitochondrial DNA of chum salmon (*Oncorhynchus keta*). *Molecular Marine Biology and Biotechnology* 2 (6), 362-370. *POPULATION; fish; salmon; chum; biochemistry; genetics; enzymology*

A total of 798 individuals from 42 different populations of chum salmon (*Oncorhynchus keta*) were examined for mtDNA variation. Populations were sampled across the geographic range of the species, from mainland Japan around the Pacific Rim to the state of Washington in the United States. The entire D-loop region (approximately 1 kb) was sequenced for 16 individuals from representative populations. Subregions (approximately 200 nucleotides each) of the D-loop reported to be rapidly evolving in salmon were sequenced for another 29 individuals. Only 4 nucleotide variants were detected, and they occurred in only 4 individuals. Four coding regions of the mtDNA genome were also examined using restriction fragment analysis of products amplified via the polymerase chain reaction. Only one, the region coding for NADH dehydrogenase subunits 5 and 6, showed any variation at this level. The restriction enzyme *Asel* revealed a polymorphism where the frequency of haplotypes was correlated geographically. We surveyed all individuals for this polymorphism and documented a cline in frequency of the haplotypes around the Pacific Rim. There was a significant frequency difference

between Japan and 3 other major geographic regions (Russia, Alaska/Yukon, and British Columbia/Washington) for the presence of the 2 haplotypes. This marker may prove useful in the identification of continent-of-origin for individual chum salmon caught in the open ocean.

Parker, J., 1991. Status of coho salmon in the Clearwater River delta of interior Alaska. 91-4. Alaska Department of Fish and Game, *POPULATION; fish; salmon; coho; INCOMPLETE (need abstract)*

Parker, C., 1999. Floristic inventory of selected sites in the Nulato Hills, Western Alaska 1997-1998. University of Alaska Museum Herbarium, Fairbanks; Bureau of Land Management, Anchorage Field Office, Anchorage, AK, <http://www.uaf.edu/museum/herb/nulato/cover.html> *VEGETATION; distribution; invasive species; endangered*

The Nulato Hills region in western Alaska, managed by the Bureau of Land Management-Anchorage Field Office, is very remote and was essentially unknown botanically prior to this survey. A botany field crew based at Unalakleet during a portion of the summers of 1997 and 1998 visited select sites in the area including a representative sampling of all upland and alpine habitats as well as sites which were thought likely to support rare plants. The resulting collections, which are now electronically databased and curated at the University of Alaska Museum Herbarium, Fairbanks, document 350 vascular and over 200 non-vascular plant species for the region.

Several floristically significant finds resulted from this survey which may influence management decisions in the future. Ranunculus auricomus, the Goldilocks buttercup, was found at two sites, thereby documenting the first known records for this northern Eurasian species in North America. Both buttercup populations were small and a critically imperiled (S1) rank is expected to be assigned to this plant by the Alaska Natural Heritage Program (AKNHP). Three large populations of Douglasia beringensis, the Bering Sea douglasia, were also located. This plant was previously known from only two small populations on the Seward Peninsula and is ranked S1. Based on these new findings, its ranking is likely to be changed to imperiled (S2). One collection of Papaver, a poppy, is currently being reviewed and may represent an undescribed species. A total of 12 taxa ranked as critically imperiled to rare (S1-S3) by the AKNHP were documented, and many of these records represent considerable extensions of their respective known ranges.

This survey has made an invaluable contribution to our knowledge of both the common and rare flora of central western Alaska. General collection information is available to all concerned agencies and researchers, and more detailed information on rare plants has been shared with AKNHP. Recommendations for future floristic work are offered, plant species lists are included, and the localities surveyed are described.

Parkerson, R., 1977. The effect of N, P and K fertilization on the lower stem xylem of quaking aspen in interior Alaska, University of Alaska, Fairbanks, Ph. D., 128 p *VEGETATION; NUTRIENT CYCLING; nitrogen; phosphorus; potassium; nutrition; trees; aspen; INCOMPLETE (need abstract)*

Parkinson, A.J., Davidson, M., Fitzgerald, M.A., Bulkow, L.R., and Parks, D.J., 1994. Serotype distribution and antimicrobial resistance patterns of invasive isolates of Streptococcus pneumoniae: Alaska 1986-1990. Journal of Infectious Disease 170 (2), 461-4. *PEOPLE; infants; children; health (comparative); respiratory infection; pneumonia; health care; biochemistry* **From January 1986 through December 1990, 672 cases of invasive pneumococcal disease were identified. From these, 574 pneumococcal isolates were recovered from**

normally sterile sites (blood, cerebrospinal and pleural fluid); 92% were serotypes represented in the 23-valent pneumococcal polysaccharide vaccine. The most common serotypes from children < 2 years old were 4, 6B, 9V, 14, 18C, 19F, and 23F, recovered from 83% of Alaska Native and 75.1% of nonnative children with invasive disease. Moderate penicillin resistance (MIC, 0.1-1.0 micrograms/mL) was found in 3.8% of isolates. All were sensitive to chloramphenicol, vancomycin, rifampin, ceftriaxone, cefotaxime, cephalothin, and cefaclor. However, in the Yukon-Kuskokwim Delta region, 16.9% of isolates were moderately resistant to penicillin, and 10.8% were resistant to erythromycin and 6.2% to trimethoprim-sulfamethoxazole; the number resistant to two or more antibiotics increased significantly during surveillance. All multiply resistant isolates were serotype 6B, and all were from Alaska Native patients < 2 years old.

Paton, P., and Pogson, T., 1996. Relative abundance, migration strategy, and habitat use of birds breeding in Denali National Park, Alaska. *Canadian field-naturalist* 110 (4), 599-606.

POPULATION; birds; sparrow; warbler; distribution; habitat selection; migration; monitoring
The breeding bird community in Denali National Park, Alaska, was studied over a three-year period (1993-1995). Birds were surveyed from nine off-road routes in spruce forests from 1993-1995 and from four on-road routes in 1994 and 1995. Thirty-nine species were detected during off-road routes, whereas 80 species were detected from on-road routes. The most abundant species were sparrows (White-crowned Sparrow [*Zonotrichia leucophrys*], American Tree Sparrow [*Spizella arborea*], and Savannah Sparrow [*Passerculus sandwichensis*]) and warblers (Wilson's Warbler [*Wilsonia pusilla*] and Orange-crowned Warbler [*Vermivora celata*]). The avian community in Denali National Park was similar to other areas in the region, although there were some distinctive differences. The majority of detected individuals (69%) presumably migrate to the tropics; residents accounted for only 9% of the individuals detected. Shrublands had the greatest relative abundance of any habitats surveyed, whereas species richness was greatest in tall shrub and spruce forest habitats. These findings generally concur with previous research in the region. Both habitats should be important components in any program that attempts to monitor avian populations in interior Alaska.

Pedersen, S., and Caulfield, R., 198-? Some elements of subsistence land and resource use within the range of the Porcupine herd in Alaska. Technical paper (Alaska. Dept. of Fish and Game. Division of Subsistence) ; no. 3. Alaska Dept. of Fish and Game, Division of Subsistence, Fairbanks. *INCOMPLETE (need abstract); PEOPLE; subsistence; caribou; land use; economics*

Pelletier, L., and Krebs, C.J., 1997. Line-transect sampling for estimating ptarmigan (*Lagopus* spp.) density. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 75 (8), 1185-1192.

POPULATION; birds; ptarmigan; distribution; monitoring

Current methods of estimating ptarmigan density require total counts, and hardly apply to areas exceeding 1 km super(2). We evaluated the applicability, accuracy, and efficiency of line-transect sampling as an alternative method for estimating breeding density of male ptarmigan. We compared Hayne's and generalized Hayne's estimators with line-transect estimators based on perpendicular distance. We surveyed 6 subalpine areas in Kluane, Yukon, with 231 km of transects in 1995 and 1996, in addition to a 77-ha grid where we also conducted total counts. Estimates of perpendicular distance were accurate (bias = -3 to -7%). Their efficiency resides mainly in detecting changes in density over 2-year periods in highly or moderately fluctuating populations. Performance of Hayne's estimator was close to that of perpendicular distance (coefficient of correlation, $r = 0.95$), even if in many cases the average sighting angle was not 32.7 degree . The generalized Hayne's estimator was not robust; biases were up to -90%. The results of this survey, with densities ranging between 0 and 65 males/km² for similar and

adjoining subalpine areas, dispute the principle that the "health" of a population can be assessed by censusing only a small area.

1998. Evaluation of aerial surveys of ptarmigan *Lagopus* species. *Journal of Applied Ecology* 35 (6), 941-947. *POPULATION; ptarmigan; distribution; monitoring*

1. We evaluated the reliability of aerial surveys to monitor trends in breeding population density of ptarmigan *Lagopus* spp. in south-western Yukon, Canada. 2. Aerial surveys provided repeatable indices of density. 3. Aerial indices of density were positively and linearly related to density between areas within the same year. 4. However, aerial indices of density were not positively related to density between years because the aerial index was lower in 1996 than in 1995, while in fact the density of ptarmigan increased. This could be explained by a reduction in the flushing response of ptarmigan in 1996. 5. We caution wildlife managers against a possible inter-year variation in the number of animals that can be seen from the air when conducting aerial surveys.

Pence, A.R., ed., 1992. Canadian National Child Care Study [microform]. Canadian child care in context: perspectives from the provinces and territories. Statistics Canada : Health and Welfare Canada, Ottawa. *PEOPLE; health care; children; infants*

Contents: v. 1. British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Yukon -- v. 2. Quebec, New Brunswick, Prince Edward Island, Nova Scotia, Newfoundland, Northwest Territories.

Pentz, S., and Kostaschuk, R., 1999. Effect of placer mining on suspended sediment in reaches of sensitive fish habitat. *Environmental Geology* 37 (1-2), 78-89. *MINING; sediment; hydrology; surface water; management; engineering; fish*

The McQuesten River system in central Yukon Territory, Canada, contains placer mines and reaches of sensitive fish habitat. Suspended sediment is supplied to the system by erosion of previously mined disturbed areas, bank erosion, resuspension of placer sediment deposited on bars, and active placer-mine discharges. Direct discharge from active placer mines did not have a large impact on suspended sediment in reaches of sensitive fish habitat in 1994-1995, although only two mines were active and concentrations did periodically exceed water quality objectives. Erosion of previously mined disturbed areas had a pronounced effect on suspended sediment during spring snowmelt and summer rainstorms in 1994-1995. Deposits in previously mined areas should be stabilized to reduce erosion and its downstream impact on fish habitat.

Person, S.J., 1975. Digestibility of indigenous plants utilized by rangifer tarandus, University of Alaska, Fairbanks, M.S., 96 p *POPULATION; mammals; caribou; reindeer; nutrition; metabolism; vegetation; lichen; INCOMPLETE (need abstract)*

Person, B., Babcock, C., and Ruess, R., 1998. Forage variation in brood-rearing areas used by Pacific black brant geese on the Yukon-Kuskokwim delta, Alaska. *Journal of Ecology* 86 (2), 243-259. *VEGETATION; sedges; waterfowl; goose; brant; growth/development; nutrition; distribution*

We investigated the effects of grazing by black brant geese on *Carex subspathacea* lawns on the Yukon-Kuskokwim delta, Alaska. We compared variation in growth and forage quality in both grazed and temporarily exclosed sites to determine responses of *C. subspathacea* to grazing at landscape scales within two nesting colonies that had experienced different population dynamics over recent decades. Landscapes differed in forage quality, grazing patterns, and in the effect grazing had on *C. subspathacea* forage characteristics. We found no effect of grazing on net above-ground primary productivity (NAPP) over a wide range of natural grazing intensities at the landscape scale. No differences in forage quality, NAPP, or response of *C. subspathacea* growth rates to grazing pressures could be detected between colonies. This suggests that goose grazing does not have deleterious effects on *C. subspathacea* in this ecosystem. It has been

suggested that gosling growth rates are sensitive to seasonal declines in forage availability and quality. Spatial variation in forage quality and availability per sampled area exceeded seasonal variation in these characteristics and is likely to have dramatic effects on gosling growth and recruitment rates.

Person, B.T., 2001. Herbivore-mediated effects on ecosystem processes in a near-Arctic salt marsh, University of Alaska Fairbanks, Ph. D., 184 p *POPULATION; birds; waterfowl; goose; nutrition; herbivory (avian); vegetation; sedges; reproduction; growth/development*

Ch. 1. Cackling Canada gosling growth: separating variation in food quality from availability -- Ch. 2. Forage variation in brood-rearing areas used by pacific black brant geese on the Yukon-Kuskokwim delta, Alaska -- Ch. 3. Feedback dynamics of grazing lawns: coupling vegetation change with animal growth -- Ch. 4. Stability of a near-arctic saltmarsh: community resistance to tidal disturbance -- Conclusions -- Literature cited.

Summary: "Herbivores influence, and often regulate energy flow. I investigated interactions between herbivory and the foods on which geese rely while nesting and rearing their broods on the Yukon-Kuskokwim Delta in southwestern Alaska. In a captive Cackling Canada gosling (*Branta Canadensis minima*) experiment I decoupled the effects of seasonal declines in forage quality and availability on gosling development. An 11% decline in forage quality translated to goslings that were structurally smaller and 100 g lighter at 31 days of age. Forage availability had similar effects on gosling size, and the combined magnitude of these effects are similar to those observed in wild populations. I manipulated within-season grazing history of '*Carex subspathacea*' swards within brood-rearing areas used by Black Brant geese (*Branta bernicla nigricans*). Spatial variation in forage quality and availability exceeded seasonal variation. Brant consumed over 95% of the annual aboveground production of these swards without any short- or apparent long-term effects on aboveground growth. Adding grazing pressure to '*C. ramenskii*,' or removing grazing pressure from '*C. bernicla nigricans*'. Spatial variation in forage quality and availability exceeded seasonal variation. Brant consumed over 95% of the annual aboveground production of these swards without any short- or apparent long-term effects on aboveground growth. Adding grazing pressure to '*C. ramenskii*,' or removing grazing pressure from '*C. subspathacea*,' resulted in a bi-directional shift in the morphology and nutritional characteristics of these sedges. The areal extent of '*C. subspathacea*' increased 2 to 8% of the Tutakoke landscape with a concomitant decrease in '*C. ramenskii*' meadows between 1991-1998. Brant have been increasing the carrying capacity of the Tutakoke River colony following a population decline in the early 1980's. The population has increased beginning in 1988, yet remains below historic numbers. Density-dependent effects on gosling growth accompanied the population increase initially. However, gosling mass has increased over the past decade due to herbivore-mediated increases in the areal extent of grazi[ng.??]

Petersen, M.R., 1976? Breeding biology of Arctic and red-throated loons, University of California, Davis, M.S., 55 p *POPULATION; birds; waterfowl; loon; behavior (reproductive/nesting); reproduction; habitat selection; ecology*

Petersen, M., 1989. Nesting biology of Pacific loons, *Gavia pacifica*, on the Yukon-Kuskokwim Delta, Alaska. *Canadian field-naturalist* 103 (2), 265-269. *POPULATION; birds; loon; reproduction; behavior (feeding); behavior (reproductive/nesting); behavior (territorial); nutrition*
The nesting biology of Pacific Loons, *Gavia pacifica*, was studied from 1973 to 1975 on the Yukon-Kuskokwim Delta, Alaska. Loons maintained territories on ponds throughout the pre-nesting period. Both adults incubated eggs and raised the young. Males incubated more than females during early incubation, and females more than males

during late incubation. The female assumes much of the early brood rearing, with the male assisting more when food demands of young increase later in brood rearing.

1995. Lead Poisoning of Spectacled Eiders (*Somateria fischeri*) and of Common Eider (*Somateria mollissima*) in Alaska. *Wildlife Disease* 31 (2), 268-271. *CONTAMINANTS; metals; lead; birds; waterfowl; eider*

Lead poisoning was diagnosed in four spectacled eiders (*Somateria fischeri*) and one common eider (*Somateria mollissima*) found dead or moribund at the Yukon Delta National Wildlife Refuge, Alaska (USA) in 1992, 1993, and 1994. Ingested lead shot was found in the lower esophagus of one spectacled eider. Lead concentrations in the livers of the spectacled eiders were 26 to 38 ppm wet weight, and 52 ppm wet weight in the liver of the common eider. A blood sample collected from one of the spectacled eiders before it was euthanized had a lead concentration of 8.5 ppm wet weight. This is the first known report of lead poisoning in the spectacled eider, recently listed as a threatened species by the US Fish and Wildlife Service.

Petersen, M., Douglas, D., and Mulcary, D., 1995. Use of implanted satellite transmitters to locate spectacled eiders at sea. *Condor* 97 (1), 276-278. *POPULATION; waterfowl; eider; habitat selection; imaging (remote sensing); monitoring; endangered*

Population estimates of Spectacled Eiders (*Somateria fischeri*) on the Yukon-Kuskokwim Delta (YKD), Alaska, suggest that by 1992 the number of birds nesting on this major nesting area had declined to 1,721 pairs, 4% of that estimated in the 1970s (Stehn et al. 1993). Consequently, Spectacled Eiders were listed as threatened under the Endangered Species Act. As nesting habitats for this species are believed to have changed little over the past 100 years, hypotheses concerning the cause of this decline include factors away from nesting areas. We initiated a study to determine if at-sea areas used by Spectacled Eiders could be identified using satellite telemetry.

Petersen, M., Larned, W., and Douglas, D., 1999. At-sea distribution of Spectacled Eiders: A 120-year-old mystery resolved. *Auk* 116 (4), 1009-1020. *POPULATION; birds; waterfowl; eider; distribution; monitoring*

The at-sea distribution of the threatened Spectacled Eider (*Somateria fischeri*) has remained largely undocumented. We identified migration corridors, staging and molting areas, and wintering areas of adult Spectacled Eiders using implanted satellite transmitters in birds from each of the three extant breeding grounds (North Slope and Yukon-Kuskokwim Delta in Alaska and arctic Russia). Based on transmitter locations, we conducted aerial surveys to provide visual confirmation of eider flocks and to estimate numbers of birds. We identified two principal molting and staging areas off coastal Alaska (Ledyard Bay and eastern Norton Sound) and two off coastal Russia (Mechigmenskiy Bay on the eastern Chukotka Peninsula, and the area between the Indigirka and Kolyma deltas in the Republic of Sakha). We estimated that >10,000 birds molt and stage in monospecific flocks at Mechigmenskiy and Ledyard bays, and several thousand molt and stage in eastern Norton Sound. We further identified eastern Norton Sound as the principal molting and staging area for females nesting on the Yukon-Kuskokwim Delta, and Ledyard Bay and Mechigmenskiy Bay as the principal molting and staging areas for females nesting on the North Slope. Males marked at all three breeding grounds molt and stage in Mechigmenskiy Bay, Ledyard Bay, and the Indigirka-Kolyma delta region. Males from the Yukon-Kuskokwim Delta molt and stage mainly at Mechigmenskiy Bay. Equal numbers of males from the North Slope molt and stage at all three areas, and most males from arctic Russia molt and stage at the Indigirka-Kolyma delta region. Postbreeding migration corridors were offshore in the Bering, Chukchi, and Beaufort seas. In winter, eiders were in the Bering Sea south of St. Lawrence Island. Our estimates from surveys in late winter and early spring suggest that at least 333,000 birds winter in single-species flocks in the pack ice in the Bering Sea.

Pham, H., 1999. Applications of digital spectral analysis and Monte Carlo simulations to the measurement of signal characteristics, University of Alaska Fairbanks, M.S., 100 p
POPULATION; fish; monitoring; modeling; imaging (remote sensing)

Contents: 1. Introduction -- 2. A demonstration and analysis of the Doppler effect -- 3. Effects of filter characteristics on the measurement of the parameters of a single sonar echo in the presence of noise -- 4. Conclusions -- 5. Appendix -- 6. References.

Summary: "This thesis describes applications of digital spectral analysis and Monte Carlo simulations to the measurement of signal characteristics. Specifically, it treats two applications of Digital Signal Processing: 1) analysis of a Doppler experiment, and 2) measurement of sonar echo parameters in the presence of noise. The first experiment is meant as a teaching tool and consists of analyzing an audio signal received from a rotating buzzer. Measurements of the rotation frequency and the speed of sound are made from the signal's static and dynamic spectra. Monte Carlo simulations are performed in the second application to find Butterworth filter order and bandwidth required for sufficiently accurate and precise measurements sonar echo parameters. These optimum filter settings are given as a function of the signal-to-noise ratio. Better measurements of these echo parameters are needed in fisheries acoustics to characterize, track and count fish"

Pienitz, R., Smol, J., and Birks, H., 1995. Assessment of freshwater diatoms as quantitative indicators of past climatic change in the Yukon and Northwest Territories, Canada. *Journal of Paleolimnology* 13 (1), 21-49. *LIMNOLOGY; microbes; diatom; CLIMATE; hydrology; modeling; surface water; nutrition; sediment*

We identified, enumerated, and interpreted the diatom assemblages preserved in the surface sediments of 59 lakes located between Whitehorse in the Yukon and Tuktoyaktuk in the Northwest Territories (Canada). The lakes are distributed along a latitudinal gradient that includes several ecoclimatic zones. It also spans large gradients in limnological variables. Thus, the study lakes are ideal for environmental calibration of modern diatom assemblages. Canonical correspondence analysis, with forward selection and Monte Carlo permutation tests, showed that maximum lake depth and summer surface-water temperature were the two environmental variables that accounted for most of the variance in the diatom data. The concentrations of sodium and calcium were also important explanatory variables. Using weighted-averaging regression and calibration techniques, we developed a predictive statistical model to infer lake surface-water temperature, and we evaluated the feasibility of using diatoms as paleoclimate proxies. This model may be used to derive paleotemperature inferences from fossil diatom assemblages at appropriate sites in the western Canadian Arctic.

Pienitz, R., Smol, J., and Lean, D., 1997. Physical and chemical limnology of 59 lakes located between the southern Yukon and the Tuktoyaktuk Peninsula, Northwest Territories (Canada). *Canadian Journal of Fisheries and Aquatic Sciences/Journal Canadien des Sciences Halieutiques et Aquatiques* Ottawa 54 (2), 330-346. *WATER QUALITY; contaminants; metals; nutrient cycling; calcium; sodium; chlorophyll; limnology; climate; acidification; vegetation; geology*

Water chemistry and other limnological data gathered for 59 lakes in the Yukon and the adjacent Northwest Territories (Canada) were interpreted using linear regression and principal components analysis. The study sites represent lakes from a wide range of ecoclimatic regions, spanning large latitudinal (60 degree 37'-- 69 degree 35'N) and altitudinal gradients (15-1387 m above sea level). Water samples collected from each lake were analysed for concentrations of major ions, trace metals, nutrients, and chlorophyll a. Most of the lakes were dilute and slightly acidic to alkaline. Their ionic composition varied from Ca-Cl-Na [calcium and sodium chloride (salt)] waters near the Arctic Ocean

to Ca-HCO_3 [calcium carbonate] waters further inland, reflecting differences in local drainage basins and proximity to the sea. Arctic and alpine sites generally showed many similarities, but considerable differences in water chemistry were observed among sites in the interior of the Yukon Territory. These can be related mainly to differences in bedrock geology and catchment vegetation.

Pier, M., Zeeb, B., and Reimerts, K., 2002. Patterns of contamination among vascular plants exposed to local sources of polychlorinated biphenyls in the Canadian Arctic and Subarctic. *Science of the Total Environment* 297, 215-227. *CONTAMINANTS; POPs (persistent organic pollutants); vegetation; bioaccumulation*

Polychlorinated biphenyl (PCB) concentrations were examined in 1043 Arctic vascular plant specimens comprising 31 genera and the soils they grew in. The samples were collected at 61 abandoned military and Coast Guard sites across the Canadian Arctic and Subarctic and in nine remote background locations. Genus-specific differences in PCB uptake, partitioning of PCBs among different plant tissues, and congener-specific uptake of PCBs were examined. Mean PCB concentrations and plant vs. soil regression relationships were significantly different among genera. The highest concentrations were found in *Poa* and *Luzula* and the lowest mean concentration was found in *Betula*. Among the genera examined, PCB concentrations in the genus *Luzula* exhibited the greatest increase relative to increasing soil PCB concentrations. Bioaccumulation factors were not fixed within a single genus or species, but decreased with increasing soil concentrations, suggesting that at higher levels of exposure accumulation of PCBs may be kinetically limited by redistribution processes within the plant. The accumulation of specific congeners was related to the primary mode of exposure and the octanol-air partition coefficient (K_{oa}) of the congener. In plants exposed mainly to atmospheric PCBs, uptake increased with increasing K_{oa} , as has been reported elsewhere. By contrast, there was a negative correlation between accumulation and K_{oa} in plants that were mainly exposed through direct contact with contaminated soil. Only congeners 132y153 were found at concentrations greater than predicted from their K_{oa} . The presence of these congeners in plants is proposed as the explanation for their predominance in terrestrial animal tissues. _ 2002 Elsevier Science B.V. All rights reserved.

Ping, C., Michaelson, G., and Kimble, J., 1997. Carbon storage along a latitudinal transect in Alaska. *Nutrient Cycling in Agroecosystems* 49 (1-3), 235-242. *CLIMATE; NUTRIENT CYCLING; carbon; vegetation; ground ice / permafrost*

Global warming is anticipated to have a significant impact on high-latitude ecosystems which store large amounts of C in their soils and have a predominance of permafrost. The purpose of this study was to estimate the total C storage of different ecosystems along a north-south transect in Alaska. Soil pedons from three Alaska climate zones were studied. These zones were the arctic slope with continuous permafrost and vegetation predominantly tussock tundra and coastal marsh, Interior Alaska with discontinuous permafrost and vegetation predominantly spruce forest on the upland and tundra or bog in the lowland, and Southern Alaska free of permafrost with the vegetation predominantly mixed hardwood and conifers with moss bogs.

Soil samples were taken from the representative ecosystems of these zones for carbon storage analysis. In the Arctic and Interior Alaska zones, many soils are cryoturbated and as a result the horizons are warped and often broken. These conditions made it impractical to use the common method for estimating C storage that is used for soils with roughly parallel horizons. For this study the linear proportion of each horizon in the cryoturbated [ice-disturbed] pedon was digitized by using a Geographic Information System (GIS) and the irregular horizons were collapsed to form a simulated profile with parallel horizons. The carbon content of each pedon was then calculated based on the

linear proportions. These carbon stores based on the whole soil (1 m deep) approach were compared to other available estimates from the literature.

Calculations for pedons from selected ecosystems in Alaska ranged from 169 MgC/ha to 1292 MgC/ha. The organic carbon storage of the arctic coastal marsh pedon amounted to 692 MgC/ha, and that of the arctic tundra pedon amounted to 314 and 599 MgC/ha. The carbon storage of interior forest pedons was 169 and 787 MgC/ha, and the associated organic soil stored nearly 1300 MgC/ha. The carbon storage in the mixed forest and coastal forest pedons was 240 and 437 MgC/ha, respectively. The bog associated with the mixed and coastal forest stored 1260 MgC/ha. Soils with the thickest organic layers were bogs associated with the tundra and boreal forest. These soils had the largest carbon storage. Carbon stores estimated from the whole pedon approach are 30 to 100% higher than those from the literature from the same zones. These data suggest that the global carbon storage estimates based in part on literature values from the N. latitudes, may be underestimated.

Pitts, R.S., 1972. The changing settlement patterns and housing types of the Upper Tanana Indians: College, Alaska, University of Alaska, M.A., 250 p *PEOPLE; land use; INFRASTRUCTURE; anthropology*

Platte, R.M., and Butler, W.I.J., 1993. Waterbird abundance and distribution on Yukon Delta National Wildlife Refuge, Alaska. U.S. Fish and Wildlife Service Migratory Bird Management Project, Anchorage. <http://biology.usgs.gov/s+t/SNT/noframe/ak177r.htm> *INCOMPLETE (need abstract); POPULATION; birds; waterfowl; distribution*

Platts, W., and Millard, M., 1995. New data on the North American distribution of the pond smelt, *Hypomesus olidus* (Osmeridae). *Journal of Ichthyology* 35 (5), 55-62. *POPULATION; fish; pond smelt; distribution*

According to most authors, the pond smelt (*Hypomesus olidus*) is thought to be absent from the Alaskan interior. In this article, we report on the occurrence of pond smelt within the upper Innoko River, a major tributary to the lower Yukon River. The implications of this discovery are discussed in relation to the biogeographic history of North American pond smelt.

Popovics, L.M., 1999. The effect of soil and stream water quality on primary and secondary productivity of Rock Creek, Denali National Park and Preserve, Alaska, University of Alaska Fairbanks, M.S., 98 p *LIMNOLOGY; WATER QUALITY; hydrology; ground water; surface water; soil; population; invertebrates; nutrition; phosphorus; nitrogen; vegetation*
Summary: "Aquatic productivity may be affected by physical and chemical properties of soil water and streamwater. This study related primary and secondary productivity to parameters in relation to four soil mapping units within Rock Creek watershed. Physical and chemical properties of soil were measured on these four sites. Stream characteristics were determined using measurements on hydrology, stream water chemistry, organic matter retention, limiting nutrients, primary production and secondary production. Geochemicals dominated the streamwater chemistry with concentrations typically greater than in soil water. Periphyton biomass and invertebrate densities were low in Rock Creek compared to other subarctic streams. Nutrient diffusing substrate studies indicated primary productivity increased in response to phosphorus- and some nitrogen-and-phosphorus treatments. This response is consistent with undetected streamwater levels of phosphorus. Physical factors affecting retention, stream discharge, and channel morphology were significant in limiting the primary and secondary productivity of Rock Creek"

Post, K., 1984. Wood borer (Cerambycidae and Buprestidae) infestation, development and impact on wood quality in recently felled white spruce trees in the interior of Alaska, University

of Alaska, Fairbanks, M.S., 68 p *VEGETATION; white spruce; parasitic infection; insects; wood borers; INCOMPLETE (need abstract)*

Postl, B.D., ed., 1991. Circumpolar health 90 : proceedings of the 8th International Congress on Circumpolar Health, Whitehorse, Yukon, May 20-25, 1990. University of Manitoba, for the Canadian Society for Circumpolar Health, Winnipeg. *REFERENCE; PEOPLE; health (condition); INCOMPLETE (need abstract)*

Price, K., 1994. Center-edge effect in red squirrels: Evidence from playback experiments. *Journal of Mammalogy* 75 (2), 545-548. *POPULATION; mammals; squirrel; behavior (territorial)*
Larder-hoarding red squirrels (*Tamiasciurus hudsonicus*), with a valuable resource (midden) within their territory, should respond more intensely to intrusion at the center than on the edges of their territory. In a playback experiment, squirrels gave more aggressive screech calls in response to simulated intrusion at their midden than at the territory edge, but moved more often in response to simulated intrusion at the edge. The frequency of territorial rattle calls and of alarm calls did not change as long as playback was from within the territory.

Provost, E., 1996. Cervical cancer screening on the Yukon-Kuskokwim Delta, Southwest Alaska. A population-based study. *Cancer* 78 (7 Suppl), 1598-1602. *PEOPLE; cancer; health (condition)*

BACKGROUND: Alaska Native women suffer excess morbidity and mortality due to cervical cancer. This population-based study analyzed data from a regional Pap smear registry to describe the 2-year prevalence of cervical cancer screening for the women who live in remotely located villages in the Yukon-Kuskokwim Delta region. **METHODS:** All women older than 18 years of age who lived in one of the villages of the Yukon-Kuskokwim Delta were included (n = 6916). A 2-year Pap prevalence rate for each village was estimated by counting the number of women who had at least one Pap smear between September 1, 1992, and August 31, 1994, using the computer-based Pap registry located at the regional medical center in Bethel, Alaska. Population estimates for each village were obtained from a database maintained by the local office of the State of Alaska's Public Health Nurses. **RESULTS:** The overall 2-year Pap prevalence rate for the population was 62%. By age group, 2-year prevalence rates were as follows: women 18 to 44 years, 64%; women 45 to 64 years, 58%; and women 65 years and older, 52%. **CONCLUSION:** This study demonstrated that there is a significant need to improve access to and use of cervical cancer screening in this region to achieve national and state objectives. Village-based clinic staff are underutilized for cancer prevention service delivery; with additional training and supervision, staff members may serve as a means to improve this preventive health care service.

Prussian, A., Royer, T., and Minshall, G., 1999. Impact of suction dredging on water quality, benthic habitat, and biota in the Fortymile River, Resurrection Creek, and Chatanika River, Alaska. US Environmental Protection Agency, Seattle, Washington.

<http://www.akmining.com/mine/1999epa.htm> *WATER QUALITY; MINING; sediment; contaminants; metals; arsenic; zinc; copper; mercury; molybdenum; nickel; population; invertebrates; microbes; insects; crustaceans; algae*

SUMMARY

This report describes the results of our research during 1997 and 1998 into the effects of commercial suction dredging on the water quality, habitat, and biota of the Fortymile River and recreational dredging on Resurrection Creek and the Chatanika River. On the Fortymile River, water chemistry, heavy metal concentrations, riverbed morphology, algal (periphyton) standing crop, and aquatic macroinvertebrate abundance and diversity were measured in relation to commercial suction dredging for both years. The focus of

our work on the Fortymile in 1997 was on an 8-inch suction dredge (Site 1), located on the mainstem and a 10 inch dredge located on the South Fork (Site 2a). Our research in 1998 included (1) resampling the 1997 sites on the mainstem and SF Fortymile to determine recovery after one year, (2) sampling a dredge site on the South Fork to examine for possible spatial variability in the effects of large-scale suction dredging on benthic communities (3) sampling a dredge site on the North Fork Fortymile to determine whether impact and recovery differ from conditions on the South Fork and the mainstem, and (4) again sampling unmined sites on the NF and SF to better document suspected background differences between the two forks in terms of macroinvertebrate communities. In all of the suction-mined sites studied, dredges were operated by experienced miners. Sampling was performed at fixed transects above and below the dredge locations. Additional sampling above the confluence of the North and South Forks revealed differences in background conditions in these two main tributaries.

At Site 1, dredge operation had no discernable effect on alkalinity, hardness, or specific conductance of water in the Fortymile. Of the factors we measured, the primary effects of suction dredging on water chemistry of the Fortymile River were increased turbidity, total filterable solids, and copper and zinc concentrations downstream of the dredge. These variables returned to upstream levels within 80-160 m downstream of the dredge. The results from this sampling revealed a relatively intense, but localized, decline in water clarity during the time the dredge was operating. The impact of suction dredging on water clarity and heavy metal concentrations may be greater or lesser than we measured, depending on the type of material the dredge is excavating.

The cross-sectional profiles indicate that the impact of the dredge piles relative to the width of the Fortymile River was small. After one year, dredge piles at Site 1 had largely disappeared following the scouring flows that accompany snow-melt in the Fortymile drainage. However, at Site 2, dredge piles were clearly discernable after one year. Macroinvertebrate abundance and diversity were greatly reduced in the first 10 m below the dredge at Site 1 during 1997, relative to the upstream reference site. For example, macroinvertebrate abundance was reduced by 97% and the number of taxa by 88% immediately below the dredge. The abundance and diversity of macroinvertebrates returned to values seen at the reference site by 80 to 160 m downstream of the dredge. A similar decline in macroinvertebrate abundance and diversity was observed at Site 2a. One year after dredging at both Site 1 and Site 2, recovery of macroinvertebrate diversity appeared to be substantial. The cumulative effect of suction dredging on the biota of the Fortymile is a function of the number of dredges operating concurrently, the size of the dredges, the strategy and effectiveness of their operators, and the rate and extent of re-colonization on the excavated dredge piles.

We compared conditions in the North Fork versus the South Fork of the Fortymile under the hypothesis that the greater background mining activity (of all types) on the SF would result in reduced macroinvertebrate abundance and diversity. We also expected that suction dredging would be relatively less harmful at already impacted sites than at sites that were less disturbed. An increase in macroinvertebrate density was found in the NF, relative to the SF, and this we attributed to the lower variability of benthic organic matter and greater amounts of periphyton standing crop that occurred in the NF. We could discern no natural reason for this difference and therefore attribute this result to the greater disturbance in the SF from all forms of mining, historic and current.

The second component of this project is to examine the effects of recreational suction dredging on smaller streams in Alaska. In 1997, sampling was conducted on a single site on Resurrection Creek, a designated recreational mining stream on the Kenai Peninsula. In 1998, sampling was conducted on the Chatanika River, known to be popular for recreational dredging. The Chatanika River was sampled at a location north of Fairbanks. The results from Resurrection Creek indicated that there was no difference in the macroinvertebrate community between the mining area and the locations downstream of the mining area, in terms of macroinvertebrate density, taxa richness, EPT richness, or food resources. Results from the Chatanika showed slight downstream decreases in macroinvertebrate density, but all other measures remained similar to those of the reference area. In general, our results are in agreement with other studies that have found only localized reductions in macroinvertebrate abundance in relation to small-scale suction dredging.

PSC, 1985. TREATY BETWEEN THE GOVERNMENT OF CANADA AND THE GOVERNMENT OF THE UNITED STATES OF AMERICA CONCERNING PACIFIC SALMON [text and related links]. Pacific Salmon Commission: <http://www.psc.org/Treaty/TREATY.HTM> *POPULATION; fish; salmon; chum; chinook; coho; management; monitoring*

"The Government of the United States of America and the Government of Canada,

Considering the interests of both Parties in the conservation and rational management of Pacific salmon stocks and in the promotion of optimum production of such stocks;

Recognizing that States in whose waters salmon stocks originate have the primary interest in and responsibility for such stocks;

Recognizing that salmon originating in the waters of each Party are intercepted in substantial numbers by the nationals and vessels of the other Party, and that the management of stocks subject to interception is a matter of common concern;

Desiring to cooperate in the management, research and enhancement of Pacific salmon stocks;

Have agreed as follows:..."

Pugh, R., Dick, D., and Fredeen, A., 2002. Heavy metal (Pb, Zn, Cd, Fe, and Cu) contents of plant foliage near the anvil range lead/zinc mine, Faro, Yukon Territory. *Ecotoxicology and Environmental Safety* 52 (3), 273-279. *MINING; VEGETATION; blueberry; labrador tea; willow; CONTAMINANTS; metals; lead; zinc; copper; iron; cadmium*

Mining and processing of lead (Pb)/zinc (Zn) ore at the Anvil Range mine occurred near the town of Faro in the Yukon Territory, Canada, for approximately 30 years, beginning in 1968. A study was undertaken to examine whether the mining activities had left a detectable "footprint" on the environment in the way of heavy metal phytoaccumulation. Foliage of three native plant species was sampled: bog blueberry (*Vaccinium uliginosum*), Labrador tea (*Ledum groenlandicum*), and willow (*Salix* sp.), at approximately 0.25, 2.5, 12, 30, and 200 (control) km distant from the mill (ore-processing facility at the mine). Foliage samples were oven-dried, wet- or dry-ashed, and analyzed for metal content using ICP-AES. In addition to Pb and Zn, the primary ore constituents, copper (Cu), iron (Fe), and cadmium (Cd), were also assayed. As expected, foliar Pb and Zn concentrations were elevated in plants at the sites closest to the mill, i.e., 0.25 and 2.5 km from the mine facility. Copper and Fe, both essential nutrients for plants, were also elevated in foliage at the sites closest to the mill, but not to a level that would be of concern. Foliar Cd levels were highest in *Salix* relative to the other species but were not

affected by proximity to the mill. Results suggest that *Ledum* may be the best indicator of high environmental concentrations of Ph, while *Salix* may be the best indicator of elevated Zn and Cd. (C) 2002 Elsevier Science (USA).

Rachlow, J., and Bowyer, R., 1998. Habitat selection by Dall's sheep (*Ovis dalli*): maternal trade-offs. *Journal of Zoology* 245 (4), 457-465. *POPULATION; mammals; sheep; behavior (reproductive/nesting); reproduction; nutrition; habitat selection; snow*

Habitat selection by female Dall's sheep (*Ovis dalli dalli*) during lambing was studied in interior Alaska, U.S.A., in 1988 and 1989. Selection of habitat changed with the chronology of lambing. During the prelambing period, maternal females selected sites with forage and avoided snow-covered areas. During peak lambing, food and steep slopes continued to be selected. Distance to escape terrain was a critical component of habitat selection by females throughout lambing. Maternal bands that ventured farther from escape terrain were in larger groups. Abundance of forage also increased in areas that were farther from this terrain. Habitat selection by females also differed between years. In 1989, a late spring storm resulted in deep snow and delayed phenology of plants; forage was of lower quality, and the growing season was much shorter in 1989 than in 1988. Births of lambs also occurred later and less synchronously in the second year. Females selected terrain characteristics that were related to avoiding predators in 1988 when forage was more plentiful, but selected sites with forage in 1989 when food was less abundant. Group size of maternal bands was larger in 1988 than in 1989, and females foraged most efficiently during 1988. Large groups may not have occurred in 1989 because lambs were born asynchronously, preventing cohesive movements of maternal bands with lambs of differing ages. Both the chronology of lambing and a variable environment affected habitat selection by females. Maternal females made trade-offs between the requirements for forage to meet the high energetic costs of lactation and the risk of predation.

Racine, C., and Walters, J., 1991. Groundwater-discharge wetlands in the Tanana Flats, interior Alaska. 91-14. Cold Regions Research and Engineering Lab, Hanover, NH. *VEGETATION; mosses; fen; buckbean; horsetail; sedges; marshfivefinger; hemlock; bladderwort; hydrology; surface water; disturbance; ground ice / permafrost*

In the northwest corner of the Tanana Flats, a lowland basin just south of Fairbanks in interior Alaska, there is a vast network of floating-mat wetlands or fens that appears to be unique in terms of their origin, large areal extent, and absence of sphagnum moss and associated peat. During the summers of 1989 and 1990 a study of the impacts of airboats on these wetlands included aerial and ground reconnaissance of 20 sites to characterize the vegetation, hydrology and subsurface conditions. These wetlands consist of a floating vegetation mat up to 1 m thick, forming an almost complete cover over deeper water bodies. The mats consist of a tall, dense and productive network of emergent vascular plants, including buckbean (*Menyanthes trifoliata*), swamp horsetail (*Equisetum fluviatile*), sedges (*Carex aquatilis*), marshfivefinger (*Potentilla palustris*), water hemlock (*Cicuta mackenzieana*) and bladderwort (*Utricularia* sp.). Evidence that these wetlands are formed by groundwater discharge includes (a) the apparent absence of permafrost under these wetlands but its presence on the adjacent forested uplands, (b) nearby winter icings resulting from artesian springs, (c) the relatively high pH, conductivity, calcium and magnesium concentrations of the water, (d) the vascular plant species composition and in particular the absence of Sphagnum moss, and (e) the flow of water and the geological history of the area. Expansion of these fens in several places is suggested by dead and dying white birch along the upland-fen margin, where permafrost thaw and subsidence (thermokarst) is taking place.

Racine, C., 1994. Long-term recovery of vegetation on two experimental crude oil spills in interior Alaska black spruce taiga. *Canadian Journal of Botany/Revue Canadienne de Botanique*

72 (8), 1171-1177. *CONTAMINANTS; POL (petroleum/oil/lubricants = hydrocarbons); remediation; microbes; bacteria; vegetation; recovery*

Vegetation was sampled on two black spruce taiga sites in interior Alaska, 15 and 20 years after crude oil was experimentally applied as low-volume sprays or high-volume point spills. Low volume spray spills that uniformly covered the ground caused initial damage to vegetation, but after 20 years recovery of the understory vegetation was almost complete, with dramatic recovery and expansion of fruticose lichens. High-volume point spills created small areas of surface oil saturation with dead vegetation and little sign of recovery but spread out mostly belowground with little or no apparent effect on the shallowly rooted vegetation above even after 15-20 years. Because winter point spills created a much greater area of surface oil, their effects were more damaging. After 15 years on the saturated surface oiled areas, only *Eriophorum vaginatum* tussocks survive and grow. At both sites with surface oil, black spruce mortality was high, with no evidence of long-term recovery and with continuing chronic effects after 15 years. However, from a long-term perspective the black spruce taiga ecosystem appears to be able to recover from low volume spray spills and to retain large amounts of crude oil from high-volume point spills belowground with minimal damage to the vegetation. Because of the permafrost, removal of crude oil from this ecosystem by soil excavation is undesirable. In situ acceleration of oil breakdown using fertilizers and bacteria is a possible option; seeding or planting of *E. vaginatum* on surface-oiled areas may also provide some cover and belowground biomass.

Racine, C., and Walters, J., 1994. Groundwater-discharge fens in the Tanana lowlands, Interior Alaska, U.S.A. *Arctic and Alpine Research* 26 (4), 418-426. *INCOMPLETE (need abstract); HYDROLOGY; fen; ground water*

Racine, C., Lichvar, R., Murray, B., Tande, G., and Lipkin, R., 1997. Floristic Inventory and Spatial Database for Fort Wainwright, Interior Alaska. CRREL Special Report SR-97-23. Cold Regions Research and Engineering Lab, Hanover, NH. *VEGETATION; distribution; military*
An inventory of the vascular and ground-inhabiting cryptogam flora of Fort Wainwright, in interior Alaska, was conducted during the summer of 1995 to support land management needs related to the impact of training. Primary plant collecting, identification and verification were conducted by the Alaska Natural Heritage Program and the University of Alaska Museum. The work was supervised and the data compiled into a geographic information system by the USA Cold Regions Research and Engineering Laboratory and the USA Waterways Experiment Station. Fort Wainwright covers 370,450 hectares (915,000 acres); it was divided into five areas: (1) the valleys of a cantonment area of base facilities, (2) the slopes and alpine areas of the Yukon-Tanana Uplands, (3) Tanana Flats and associated wetlands, (4) the upland buttes and Blair Lakes area in Tanana Flats, and (5) the floodplains of the Tanana and Chena Rivers. Over 100 sites were visited, with habitats ranging from very dry south-facing slopes to forest, floodplains, wetlands, and alpine tundra. Vascular collections represented 491 species (including subspecies and varieties), included about 26% of Alaska's vascular flora, and are considered to be relatively complete. The cryptogam collections included 219 species, representing 92 mosses, 117 lichens, and 10 liverworts. The flora is characteristic of the circumpolar boreal forest and wetlands of both North America and Eurasia, but it also contains alpine and dry-grassland and steppe species.

Racine, C., Jorgenson, M., and Walters, J., 1998. Thermokarst vegetation in lowland birch forests on the Tanana Flats, interior Alaska, U.S.A. *Proceedings 7th International Conference on Permafrost, Proceedings, Yellowknife, Northwest Territories, Sainte-Foy, Québec, Université Laval, Centre d'études nordiques, Canada, p. 927-933* *CLIMATE; ground ice / permafrost; thermokarst; vegetation; birch; mosses; invertebrates; microbes*

The thawing of ice-rich permafrost beneath birch forests in the Tanana Flats area of interior Alaska has produced thermokarst features colonized by a range of species and wetland vegetation types. As the forest drowns along its border with fens, an open-water moat is colonized by minerotrophic species and a floating mat develops. At the same time, thawing in the birch forest interior produces water-filled pits and collapse scar bogs in which ombrotrophic vegetation develops through several stages to Sphagnum bogs. As the thawing front moves into the birch forest from the fen, these latter features are incorporated into the floating mat, accelerating the expansion of fens.

Racine, C., Walters, J., and Jorgenson, M., 1998. Airboat Use and Disturbance of Floating Mat Fen Wetlands in Interior Alaska, U.S.A. *Arctic* 51 (4), 371-377. *VEGETATION; fen; recreation; hunting; disturbance; recovery*

The use of airboats is expanding in Alaska, particularly in the interior. This study describes the nature, magnitude, and distribution of disturbances caused by airboat trails over floating mat fen wetlands in the Tanana Flats near Fairbanks, Alaska. Airphoto interpretation showed over 300 km of airboat trails by 1995, with a 15% expansion of the trail system since 1989. Field sampling was done at 30 trail and adjacent control sites along this trail system to assess changes in hydrology, soils, and vegetation. Water velocities in the trails at two-thirds of the sites were at least an order of magnitude greater than velocities of less than 1.5 cm per sec in the control areas. On average, 30 cm of the 0.5-0.75 m thick floating mat has been removed or eroded by airboat traffic at the sampling locations. Nearly all emergent floating mat vegetation has been destroyed (5% cover remaining on average) so that the trails resemble a highly visible open water stream channel 2-3 m wide through the floating mats. Although the recovery and regrowth potential of floating mats in trails is high, recovery is unlikely in trails with continuing use.

Racine, C., Lichvar, R., and Duffy, M., 2001. An inventory of the vascular flora of Fort Greely, Interior Alaska. Technical report ERDC/CRREL TR-01-5. US Army Corps of Engineers, Engineer Research and Development Center, Hanover, N.H. *INCOMPLETE (need abstract); VEGETATION; distribution*

Ratner, P., Johnson, J., and Jeffery, B., 1998. Examining emotional, physical, social, and spiritual health as determinants of self-rated health status. *American Journal of Health Promotion* 12 (4), 275-282. *PEOPLE; health (condition)*

PURPOSE: To determine whether individuals' perceptions of their emotional, physical, social, and spiritual health constitute elements of their self-rated health status operationalized with a commonly employed single indicator. **DESIGN:** Secondary analysis of cross-sectional survey data. Structural equation modeling with LISREL was used. **SETTING:** The Yukon Health Promotion Survey, Yukon Territory, Canada, 1993. **SUBJECTS:** The population-based sample was made up of 742 women and 713 men between 15 and 90 years of age; 80.3% responded. **MEASURES:** Self-rated health status was operationalized with the "excellent, good, fair, poor" indicator derived from the question: "In general, compared to other people your age, would you say your health is...." Social, spiritual, emotional, and physical health status were also self-rated from excellent to poor. **RESULTS:** The model's fit of the data was acceptable. Only physical health status significantly contributed to the variance in self-rated health status (55.1% of the variance was explained). Emotional, social, and spiritual health were found to have no effect on individuals' ratings of their health status. **CONCLUSIONS:** Although recent conceptualizations have broadened in much of the theoretical and political discourse about health, especially in health promotion, the self-rated health status indicator measures only physical health status.

Raveling, D., 1989. Nest-predation rates in relation to colony size of black brant. *Journal of Wildlife Management* 53 (1), 87-90. *POPULATION; birds; waterfowl; goose; brant; reproduction; predation; fox; management*

The author compared data on nesting success of black brant (*Branta bernicla nigricans*) from 4 different sized colonies on the Yukon-Kuskokwim Delta, Alaska, to investigate how predation may affect reproductive success, numbers, and distribution of these geese. Black brant lost 55 and 85% of their nests, primarily to predators, in 2 small colonies (10-37 pairs/yr) compared to losses of 31-32% in each of 2 colonies containing thousands of individuals. Predators, especially arctic fox (*Alopex lagopus*), can limit numbers and distribution of nesting brant and prevent or slow increases in size of brant colonies diminished by other mortality factors such as exploitation by humans. Therefore, removal or management of arctic fox at and near small colonies of brant may assist re-establishment or expansion of depleted brant colonies.

Rawn, D., Lockhart, W., Wilkinson, P., Savoie, D., Rosenberg, G., and Muir, D., 2001. Historical contamination of Yukon Lake sediments by PCBs and organochlorine pesticides: influence of local sources and watershed characteristics. *Science of the Total Environment* 280 (1-3), 17-37. *CONTAMINANTS; WATER QUALITY; surface water; SEDIMENT; POPs (persistent organic pollutants); military; long range transport; glacial discharge*

PCBs and other persistent organochlorine (OC) pesticides were analyzed in sediment cores collected from six lakes in Yukon Territory and one in northern British Columbia, Canada, with the objective of establishing sources and historical trends of these contaminants. DDT was found to be the most prominent OC in the sediment profiles of most of the lakes. Maximum Σ [total] DDT levels (3.47-2680 ng/g dry weight (dw)) were observed in sediment slices dated to the 1950s from lakes near populated areas. In contrast, in more remote lakes (Hanson, Kusawa and Lindeman), the maximum Σ DDT concentrations were observed in the sediments dated to the 1970s. Highest Σ PCB and Σ DDT concentrations were measured in sediments from Watson Lake, near a suspected PCB waste disposal site and in a region where DDT was heavily applied in the 1950s and 1960s. Elevated Σ PCB concentrations [16.1-93.6 ng/g dw] were also observed in sediments from lakes situated near populated areas, relative to Kusawa and Lindeman (11.1 and 12.7 ng g⁻¹ dw, respectively). Recent Σ PCB fluxes ranged from 621 ng/m²y in Kusawa Lake to 16400 ng/m²y in Little Atlin Lake. The extremely high sedimentation rate (2050 g/m²y) in glacial fed Lindeman Lake gave rise to elevated fluxes of Σ PCB (2410 ng/m²y) and other OCs, despite much lower concentrations in the sediment. Levels of hexachlorocyclohexanes (Σ HCH), chlordane-related compounds (Σ CHL), and chlorobenzenes (Σ CBz) were in the low ng/g (dw) range in all lake sediments, similar to concentrations previously reported for Arctic lakes in Canada, indicating that their major source was long range atmospheric transport. Contamination of the lakes with PCBs and DDT near populated areas of the Yukon Territory appears to be a result of regional activities rather than long range transport and deposition. The results also point to glacial runoff as a significant source of OCs to small, high elevation lakes (Lindeman), but not to larger lakes within the Yukon River drainage basin that are also affected by glacial sources (Kusawa, Laberge).

Ray, S.R., 1988. Physical and chemical characteristics of headwater streams at Caribou-Poker Creeks research watershed, Alaska, University of Alaska Fairbanks, M.S., 172, ill., maps + disk p *WATER QUALITY; surface water; hydrology*

Ray, S., and Vohden, J., 1992. PRELIMINARY WATER-QUALITY SAMPLING FOR THE FAIRBANKS INTERNATIONAL AIRPORT BIOREMEDIATION PROJECT: NOVEMBER 1990 THROUGH OCTOBER 1991. Public-data File 92-1. Alaska Division of Geological and

Geophysical Surveys, Fairbanks. <http://dggs.dnr.state.ak.us/scan2/pdf92/text/PDF92-01.PDF>
CONTAMINANTS; POL (petroleum/oil/lubricants = hydrocarbons); remediation; engineering; infrastructure; airstrip

INTRODUCTION

The Fairbanks International Airport Bioremediation Project is a multi-agency effort to remediate a contaminated site at the airport using innovative engineering designs and enhanced biological remediation. The major agencies involved include the Alaska Department of Transportation and Public Facilities (ADOTPF), the US Army Corp of Engineers Cold Region Research Engineering Laboratory (CRREL), the US Geological Survey (USGS), the Alaska Division of Water (DOW), and the University of Alaska Fairbanks Water Research Center (WRC). This report will not discuss the details of the project, but will present the water chemistry data collected from November 1990 to September 1991. Eleven wells were sampled during the period, although not all wells were sampled each sampling event and not all parameters were measured for each well. Figure 1 shows the well locations and the bioremediation site. One well upgradient and off-site was used as a control (P-Tan). Three wells on site not directly associated with the infiltration gallery were monitored (B-1, B-2, and B-4). These wells were either up- or parallel-gradient of the infiltration gallery. The remaining wells are associated with the infiltration gallery (B-3, IG-1, IG-2, IG-3, IG-WW, DEC-1, DEC-2). At the start of the project, only wells P-Tan, B-1, B-2, and B-4 were monitored. Well B-3 was added during the spring 1991, with the remaining wells added late in the summer of 1991.

Raymond, C., Benedict, R., Harrison, W., Echelmeyer, K., and Sturm, M., 1995. Hydrological discharges and motion of Fels and Black Rapids Glaciers, Alaska, U.S.A.: implications for the structure of their drainage systems. *Journal of Glaciology* 41 (138), 290-304. *INCOMPLETE (need abstract); HYDROLOGY; surface water; glacial discharge; climate*

Raymond, R., 1999. Sharp-tailed grouse habitat study in eastern interior Alaska, 10 September 1998 - 30 June 1999. Alaska Dept. of Fish and Game, Division of Wildlife Conservation, Juneau, AK. *INCOMPLETE (need abstract); POPULATION; birds; grouse; habitat selection*

Raymond-Yakoubian, J.M., 2001. "They left their teacups full and their zeniths in the house" : Innoko River population movements and migrations, University of Alaska Fairbanks, M.A., 235 p *PEOPLE; subsistence; anthropology; land use; migration; health (effects); subsistence*
Summary: "This thesis discusses the history of population movements and migrations on the middle and upper Innoko River in west-central Alaska. The history of research and exploration into the region is synthesized. The bodies of work known as 'place attachment studies' and 'place studies' are presented as a framework with which to understand current perceptions of the movements and migrations. The move from Holikachuk village on the Innoko River to Grayling on the Yukon River in 1963 is examined in detail. The long-term consequences of these movements for the Holikachuk Athabascan people are analyzed"

Ream, B.A., 1986. Old Fish Camp : an ethnohistoric and archeological analysis of a lower Yukon Koyukon Athapaskan winter village, Khotol River, Alaska, Western Washington University, M. A., 632 p *PEOPLE; subsistence; anthropology; fish; INCOMPLETE (need abstract)*

Receveur, O., Kassi, N., Chan, H.M., Berti, P.R., and Kuhnlein, H.V., 1998. Yukon First Nations' Assessment Dietary Benefit/Risk. Centre for Indigenous Peoples' Nutrition and Environment, Quebec City. <http://www.contaminants.ca/done/index.html> "Dietary Risk/Benefit Study"
PEOPLE; subsistence; CONTAMINANTS; POPs (persistent organic pollutants); metals; traditional food; risk assessment; nutrition; obesity; dietary advisory

FINDINGS IN PERSPECTIVE

In summary, the diet of the people of Yukon First Nations is rich in traditional food. A large quantity and great variety of traditional food are consumed and bring about better diet quality, and increased physical activity, as well as economic and sociocultural benefits. Importantly, when traditional food is consumed, the diet quality appears to meet recommended levels for fat (<30% of calories) and saturated fat (<10% of calories); when market food only is consumed, the percentage of calories from fat in the diet rises to 40% and saturated fat to 14.3%, levels at which increased risk of chronic disease may occur. Furthermore, since overweight is common in Yukon First Nations women and the elderly, it is recommended that immediate attention be given to improving diet quality and increasing physical activity in these groups. Inadequate intakes of calcium and vitamin A were noted in all age groups and additional dietary sources of these important nutrients may also be promoted.

Traditional food is consumed less by those 20-40 years old than by the older age groups. Many individuals also reported eating less traditional food now than five years ago (Table 37). When asked what factors may be responsible for this decrease, respondents reported lack of time, lack of equipment and animal scarcity as principal causes (Table 38). Maintaining the current level of traditional food use by Yukon First Nations will therefore require proactive strategies.

In terms of risk, it appears that risks associated with the presence of contaminants in traditional food are low, especially for heavy metals and most organochlorines studied. The possibility exists, however, that high consumers of trout and salmon have usual intakes that exceed the TDIs for chlordane and toxaphene. Although the risks associated with these levels of exposure are low (a conservative safety factor of 1000 is used in the calculation of TDIs for chlordane and toxaphene), the importance of trout and salmon in the traditional and contemporary food systems of Yukon First Nations warrants further monitoring, not because contaminant concentrations are high, but because these traditional food species are consumed in large quantity.

This report does not evaluate variation in traditional food use between communities. Traditional food use varies in terms of variety (different communities consuming different traditional food species), and quantity, with percent of total dietary energy from traditional food ranging from 9% in the lowest community to 38% in the highest community. Additional consultation with community councils will consider whether comparisons of traditional food use between communities be pursued. Analyses to date suggest that estimates of benefits and risks presented in this report for all communities combined are unlikely to mask important community differences. In all communities, benefits of traditional food outweigh risks. However, it is important to stress that the quality of traditional food species needs to be constantly monitored. This is especially true for salmon and trout, because of their current levels of consumption, and for moose since it remains the dominant traditional food of Yukon First Nations.

Reidy, S.K., 1978. The occurrence of airborne polycyclic aromatic hydrocarbons in Fairbanks, Alaska, University of Alaska Fairbanks, M.S., 62 p *AIR QUALITY; CONTAMINANTS; POL (petroleum/oil/lubricants = hydrocarbons)*

Reynolds, J., 1997. Ecology of overwintering fishes in Alaskan freshwaters. In: Milner, A., and Oswood, M., eds., *Freshwaters of Alaska Ecological Synthesis*. Springer, New York, NY, pp. 281-302. *POPULATION; fish; salmon; pike; burbot; habitat selection; ecology; seasonality*

This chapter describes Alaskan freshwaters as winter habitat for fish, and summarizes the results of Alaskan studies of freshwater fish populations during winter. Scientific and common names of fishes referenced in this chapter are listed. Much of the work by government agencies is excellent, but the resulting reports remain part of the "gray" literature; these sources have been used only when no published source was available to support a particular point. Fortunately, a number of key studies have been published in the peer-reviewed literature; these serve as the primary source of information for this chapter. In addition, relevant studies in Canada, the continental United States, and elsewhere are cited, not as an exhaustive review, but as needed to support and complement the purpose of this review (i.e., to synthesize what is known about overwintering fishes in Alaskan freshwaters).

Rhoades, E.R., D'Angelo, A.J., and Hurlburt, W.B., 1987. The Indian Health Service record of achievement. *PEOPLE; health (condition); health (comparative); health care; mortality*
The Indian Health Service (IHS) was transferred from the Department of Interior to the Public Health Service in the Department of Health, Education, and Welfare in 1955. At that time, the general health of Indian people substantially lagged behind the rest of the U.S. population. This gap was reflected in mortality rates which were several-fold higher for Indians, or reflected in time; there were decades between the dates when the U.S. population achieved certain lower death rates compared with the dates when similar reductions were achieved by Indians. As a result of preventive health programs, improvements in sanitation, and the development of a number of medical advances, substantial progress has been achieved in improving the health of American Indians and Alaska Natives. Life expectancy of Indians has increased 20 years between 1940 and 1980. From 1955 through 1982, the death rate for Indian infants dropped by 82 percent. Also, the age-adjusted death rate for tuberculosis decreased from 57.9 per 100,000 population in 1955 to 3.3 in 1983. These and other improvements are summarized in this paper.

Richmond, S.A., 2001. Natural attenuation of chlorinated solvents in subarctic ground water, University of Alaska Fairbanks, Ph. D. *WATER QUALITY; CONTAMINANTS; POPs (persistent organic pollutants); chlorine; POL (petroleum/oil/lubricants = hydrocarbons); remediation; hydrology; ground water; surface water; sediment*

Summary: "Little is known about natural attenuation of chlorinated solvents in subarctic ground water. This study aimed to better understand the biogeochemistry and microbiology associated with naturally occurring processes of contaminant removal at two hydrologically diverse sites near Fairbanks, Alaska. Six Mile Village, located several km north of the Tanana River, is hydrologically stable, experiencing minor fluctuations in ground-water levels. Fort Wainwright is located adjacent to the Chena River and is hydrologically dynamic, experiencing seasonal flow reversals and substantial fluctuations in water-table elevations. By comparing data collected seasonally and with data collected at the two sites, I determined how ground-water/surface-water interactions affected in situ redox conditions and, hence, natural attenuation processes. A portion of the aquifer at Fort Wainwright was undergoing active treatment so I was also able to compare differences in chlorinated solvent transformations in treated and untreated ground water. Although ground water at Fort Wainwright was generally more oxidized than ground water at Six Mile Village, hydrogen concentrations at both sites were almost uniformly within ranges suggestive of iron or manganese reduction. However, aquifer sediments in the Tanana/Chena Alluvium are composed of mafic (containing reduced iron and manganese) minerals; suspended ferric iron appeared to result from oxidation of ferrous iron as ground water rose through the unsaturated zone. Sulfate concentrations were substantial and dissolved sulfide in manganese reduction. However, aquifer sediments in the Tanana/Chena Alluvium are composed of mafic (containing

reduced iron and manganese) minerals; suspended ferric iron appeared to result from oxidation of ferrous iron as ground water rose through the unsaturated zone. Sulfate concentrations were substantial and dissolved sulfide in most samples suggested that sulfate reduction might have been an important process. Calculated in situ Gibbs free energies for iron and sulfate reduction were energetically favorable at both sites; given other geochemical data, it seems that methanogenesis from H₂/CO₂ was generally not energetically feasible at either site. Methane likely diffused from underlying permafrost or peat. The presence of less chlorinated intermediates of solvent degradation suggested that biological reductive dechlorination occurred, providing further support that sulfate-reducing conditions existed. However, low rates of microbial activity, incomplete degradation and persistence of contaminants imply that biologically mediated mechanisms did not likely represent an important contribution to natural attenuation of contaminants at either site where dilution appeared to be a major attenuation mechanism"

Ricker, J.E., 2000. Benzene as an indoor air pollutant in Fairbanks, Alaska, University of Alaska Fairbanks, M.S., 65 p *AIR QUALITY (indoor); POL (petroleum/oil/lubricants = hydrocarbons)*
Summary: Benzene is a known carcinogen found in gasoline, automobile exhaust, cigarette smoke, and organic solvents. Previous studies suggest that sources of chemicals within the home are the major factors influencing personal exposure to benzene. Indoor air was sampled for benzene in order to determine the concentrations present in Fairbanks homes, and to identify what factors might be associated with higher concentrations. Sampling sites were limited to homes with attached garages and with no smokers in the household. A wide range of benzene concentrations was observed in the eight homes sampled. The highest concentration was about 70 ppbv, and the concentration in most homes was at or above 4 ppbv. The primary source of benzene appears to be gasoline, most likely from small engines (such as lawnmowers) stored in the attached garage. More sites, including homes with attached garages that contain various numbers of small engines, need to be sampled to confirm these conclusions"

Riggins, C.W., 2001. Phytochemistry and chemosystematics of *Artemisia arctica* in Alaska, University of Alaska Fairbanks, 69 p *VEGETATION; wormwood; traditional medicine; genetics*
Summary: "Artemisia L. (Asteraceae - Anthemideae) is a large and taxonomically complex genus occurring widely throughout the northern hemisphere. Chemical investigations in this genus have mainly been stimulated by the economic and/or medicinal importance of many of its members. This chemical knowledge has also provided useful criteria for resolving systematic uncertainties within the genus. Alaskan *Artemisia* species are little known chemically despite their historic and contemporary medicinal use. Therefore, an investigation of the chemistry of Alaskan *Artemisia arctica* was initiated with the dual purpose of searching for structurally novel and/or biologically active compounds and contributing additional criteria for systematic studies of this taxon. Collections of *A. arctica* from four different geographic locations in Alaska were analyzed for chemical characters and biological activity. The roots and leaves afforded one novel acetylenic isocoumarin, in addition to several known acetylenic and non-acetylenic compounds. The biological and systematic significance of these results are discussed"

Rignot, E., and Way, J., 1994. Monitoring freeze-thaw cycles along north-south Alaskan transects using ERS-1 SAR. *Remote Sensing of Environment* 49 (2), 131-137. *CLIMATE; soil; vegetation; freeze-thaw cycles; monitoring; imaging (remote sensing); heat flux*
Monitoring freeze-thaw cycles of high latitude terrestrial ecosystems is useful for estimating the length of the growing season and annual productivity in the tundra and in boreal forests, for estimating potential damage to living plants due to frost drought, and for evaluating major changes in heat fluxes between land and atmosphere. At microwave

frequencies, freezing results in a dramatic decrease of the dielectric constant of soil and vegetation, which significantly alters their radar scattering properties. In this article, we investigate the possibility of monitoring freeze-thaw cycles of terrestrial ecosystems using C-band frequency (5.3 GHz), vertical transmit and receive polarization, synthetic-aperture radar (SAR) data gathered by the European Space Agency's Earth Remote Sensing satellite (ERS-1). Repeat-pass SAR images are mosaicked together along a north-south transect across Alaska, coregistered, and analyzed using a change detection algorithm that determines when the landscape freezes based on a decrease in radar backscatter greater than 3 dB relative to a known thawed, wet state of the landscape. Air-temperature recordings from seven airport weather stations and in situ observations from three monitored forest stands in interior Alaska concur to indicate SAR accurately maps frozen areas across the entire state. The technique does not apply to open water because calm water and frozen water are confused. Elsewhere, ERS-1 SAR could monitor thaw/freeze transitions of terrestrial ecosystems at the regional scale, at a spatial resolution of several tens of meters and independent of cloud cover and vegetation type.

Rignot, E., Way, J., Williams, C., and Viereck, L., 1994. Radar estimates of aboveground biomass in boreal forests of interior Alaska. *IEEE Transactions on Geoscience and Remote Sensing* 32 (5), 1117-1124. *VEGETATION; imaging (remote sensing); modeling*

Airborne SAR data gathered by the NASA/JPL three-frequency, polarimetric, radar system in winter, spring, and summer over the Bonanza Creek Experimental Forest, near Fairbanks, AK, are compared to estimates of whole-tree aboveground dry biomass from 21 forest stands and two clear-cuts. While C-band radar backscatter shows little sensitivity to biomass, L- and P-band radar backscatter increase by more than 6 dB when biomass increases from 5 to 200 tons/ha. Using second-order polynomial regressions, biomass values are predicted from the radar at L- and P- band and compared to actual biomass values. At P-band HV-polarization, the error in predicted biomass is about 30% of the actual biomass. When HV-, HH-, and VV-polarization are used together in the regression, the error in predicted biomass is about 20%. Errors obtained using L-band data are a few percents larger. These errors are caused by uncertainties in actual stand biomass estimates, significant inner-stand spatial variations in biomass, unusual conditions of forest stands following natural disturbances, along with interactions of the radar signals with a complex three-dimensional structure of the canopy. Multiple incidence angle data reveal that the incidence angle [$\theta_{(i)}$] of the radar illumination is also a factor influencing the retrieval of biomass, even at HV-polarization, when $\theta_{(i)} > 50$ degree or $\theta_{(i)} < 25$ degree. Finally, the radar response of the forest - and thereby the regression curves for biomass retrieval - are dependent on the seasonal and environmental conditions.

Rignot, E., Williams, C., Way, J., and Viereck, L., 1994. Mapping of forest types in Alaskan boreal forests using SAR imagery. *IEEE Transactions on Geoscience and Remote Sensing* 32 (5), 1051-1058. *VEGETATION; mapping; succession; imaging (remote sensing); freeze-thaw cycles; hydrology; flooding*

Mapping of forest types in the Tanana river floodplain, interior Alaska, was performed using a maximum-a-posteriori Bayesian classifier applied on SAR data acquired by the NASA/JPL three-frequency polarimetric AIRSAR system on several dates. Five vegetation types were separated, dominated by white spruce, then by balsam poplar, black spruce, alder/willow shrubs, and bog/fen/nonforest vegetation. Open water of rivers and lakes was also separated. Accuracy of forest classification was investigated as a function of frequency and polarization of the radar, as well as the forest seasonal state, which included winter/frozen, winter/thawed, spring/flooded, spring/unflooded, and summer/dry conditions.

Ritchie, R., and Ambrose, S., 1996. Distribution and population status of bald eagles (*Haliaeetus leucocephalus*) in interior Alaska. *Arctic* 49 (2), 120-128. *POPULATION; birds; raptor; eagle; distribution; contaminants; POPs (persistent organic pollutants); metals; mercury; migration*

We summarize information available on natural history, numbers, distribution, and status of bald eagles (*Haliaeetus leucocephalus*) in six regions of interior Alaska: Upper Yukon, Lower Yukon, Tanana, Kuskokwim, Susitna, and Upper Copper. We identified 347 nesting territories using information from local researchers, a raptor nest atlas, unpublished raptor survey reports, and our own surveys. Nearly 85% of these territories were from the Copper, Susitna, and Tanana drainages. Extrapolating from the number of known nests and approximate survey coverage per drainage, we estimate that 525 to 725 pairs of bald eagles nest in interior Alaska. Observations also suggest that this population has increased substantially since the middle of this century and that numbers in some areas continue to increase. Reasons for these increases may include (1) improving health of individuals in this population; (2) reduced persecution in Alaska and in wintering areas outside the state; (3) immigration into interior Alaska from rebounding or expanding populations elsewhere; and (4) changing environmental conditions (e.g., warmer temperatures). Banding and migration data suggest that part of the population that nests north of the Alaska Range may winter in areas different from those used by populations that nest south of the Alaska Range. No environmental contaminants measured in eggs occurred at concentrations known to result in sublethal or lethal effects, and most organochlorine pesticide and mercury concentrations were an order of magnitude lower than concentrations in bald eagle eggs elsewhere in the United States.

Roach, P.D., Olson, M.E., Whitley, G., and Wallis, P.M., 1993. Waterborne *Giardia* cysts and *Cryptosporidium* oocysts in the Yukon, Canada. *Applied and Environmental Microbiology* 59 (1), 67-73. *WATER QUALITY; waste (human); PEOPLE; parasitic infection*

Several outbreaks of waterborne giardiasis have occurred in southern Canada, but nothing has been reported from the Canadian North. The objective of this study was to collect information relevant to waterborne giardiasis and cryptosporidiosis in the Yukon including epidemiological data and analyses of water, sewage, and animal fecal samples. Remote, pristine water samples were found to be contaminated with *Giardia* cysts (7 of 22 or 32%) but not with *Cryptosporidium* oocysts. *Giardia* cysts were found in 21% (13 of 61) of animal scats, but no *Cryptosporidium* oocysts were observed (small sample size). Whitehorse's drinking water was episodically contaminated with *Giardia* cysts (7 of 42 or 17%) and *Cryptosporidium* oocysts (2 of 42 or 5%). Neither were found in Dawson City's water supply. The only water treatment in the Yukon is chlorination, but contact times and free chlorine residuals are often too low to provide adequate protection by disinfection. Raw sewage samples from the five largest population centers in the Yukon contained 26 to 3,022 *Giardia* cysts and 0 to 74 *Cryptosporidium* oocysts per liter. Treated sewage from Whitehorse contained fewer *Giardia* cysts but more *Cryptosporidium* oocysts on average. Both were detected in Lake Laberge, downstream of Whitehorse, which has a history of fecal coliform contamination. Daily monitoring of raw sewage from the suburbs of Whitehorse showed a summertime peak of *Giardia* cysts and occasional *Cryptosporidium* oocysts after springtime contamination of drinking water. Despite this evidence, epidemiological data for the Yukon showed an endemic infection rate of only 0.1% for giardiasis (cryptosporidiosis is not notifiable). Stool analysis is slow in the North and most physicians treat diarrheal illness presumptively, often with metronidazole.

Robe, C.F., 1943. The penetration of an Alaskan frontier: the Tanana Valley and Fairbanks, Yale University, 224 p *INFRASTRUCTURE; history; anthropology*

Robert, M., 1984. Trapping Patterns in the Vicinity of the Kaiyuh Flats, West Central Alaska. Technical Paper No. 84. Alaska Department of Fish and Game, *PEOPLE; land use; trapping*

This study documents the use of the Innoko National Wildlife Refuge by residents of Nulato, Kaltag, Koyukuk, and Galena for trapping. It describes methods of harvest, areas that are used for trapping, fur animals harvested, access and trails, sociocultural and economic aspects of trapping, and uses made by trappers of the furbearing animals.

Rodgers, A., and Sinclair, A., 1997. Diet choice and nutrition of captive snowshoe hares (*Lepus americanus*): Interactions of energy, protein, and plant secondary compounds. *Ecoscience* 4 (2), 163-169. *POPULATION; mammals; snowshoe hare; herbivory (mammal); nutrition*

We examined consumption and digestibility of winter browse in captive snowshoe hares (*Lepus americanus* Erxl.) to determine how energy content, protein quality and plant secondary chemicals interact to affect their diet choice and nutrition. We found that preferred foods of snowshoe hares have higher apparent digestibilities of dry matter and energy than nonpreferred foods. Digested crude protein was unaffected by increased consumption of preferred foods, but declined when hares consumed nonpreferred foods. Rate of weight loss in hares increased with increasing consumption of nonpreferred twigs. Hares did not compensate for low protein or low energy content by eating more twigs. Weight changes were correlated with the energy content of the food and its digestibility, whereas consumption was correlated with phenol and protein content. If hares can increase consumption of preferred foods, they may simultaneously meet both their energy and protein requirements. If they are obliged to increase consumption of nonpreferred foods, then protein requirements may never be met due to the effects of secondary compounds. During periods of limited food availability, snowshoe hares should select a mixed diet that may include small quantities of poor-quality food items, regardless of preference, allowing them time to find good-quality foods.

Roessler, J.S., 1997. Disturbance history in the Tanana River Basin of Alaska: management implications, University of Alaska Fairbanks, M.S., 221 + plates p *VEGETATION; management; disturbance; wildfire; forestry; surface water; INCOMPLETE (need abstract)*

Rohner, C., Smith, J., Stroman, J., Joyce, M., Doyle, F., and Boonstra, R., 1995. Northern hawk-owls in the nearctic boreal forest: Prey selection and population consequences of multiple prey cycles. *Condor* 97 (1), 208-220. *POPULATION; birds; raptor; owl; behavior (feeding); nutrition; snowshoe hare; vole*

We studied hawk-owls in the southwestern Yukon, Canada, from 1987-1993. Most information on hawk-owls originates from studies in Europe, and very little is known about the subspecies *Surnia ulula caparoch* in North America. The boreal forest communities in the two continents differ remarkably in the composition of cyclic herbivore populations. Fennoscandia is dominated by 3-4 year microtine cycles, whereas northern Canada and Alaska experience a 10-year cycle in snowshoe hare numbers, with voles fluctuating at lower levels. We studied the diets of nine nesting pairs by pellet analysis, and we observed prey deliveries at five nests. The proportion of voles in the diets was lower than reported from Fennoscandia, and snowshoe hares made up 40-50% during the peak of the hare cycle. Estimates of prey densities by live-trapping revealed that hawk-owls strongly prefer voles over snowshoe hares and squirrels. Among voles, *Microtus* were preferred and *Clethrionomys* were avoided. Hawk-owls showed, however, a functional response not only to voles but also to juvenile hares, and they may be critically dependent on larger prey during certain nesting stages when vole abundance is moderate or low. Breeding densities and winter observations changed concurrently over years of different prey abundance. Prey selection translated into population consequences: hawk-owls did not respond numerically to *Clethrionomys* outbreaks, but to the combined densities of *Microtus* and snowshoe hares. We conclude that the

Northern Hawk-Owl is less of a vole specialist and more affected by the prey composition in specific systems than commonly assumed, and we discuss this pattern from an evolutionary perspective.

Rohner, C., 1996. The numerical response of great horned owls to the snowshoe hare cycle: Consequences of non-territorial 'floaters' on demography. *Journal of Animal Ecology* 65 (3), 359-370. *POPULATION; birds; raptor; owl; demographics; snowshoe hare; monitoring; predation*

The numerical response of great horned owls (*Bubo virginianus* Gmelin) to the 10-year population cycle of snowshoe hares (*Lepus americanus* Erxleben) in the boreal forest was examined during 1988-93 in the south-western Yukon, Canada. Demographic parameters were estimated based on censuses (territorial pairs), nest visits (productivity), and radio-telemetry (survival, emigration, and integration of young birds into the population). Hares rose to peak densities in 1990, and almost all resident owl pairs bred and raised large broods during years of increasing and highest prey abundance. In 1991, the first year of hare decline, all breeding parameters including post-fledging survival were reduced, and recruitment in autumn was very low. In 1992 and 1993, reproduction was completely suppressed. Survival of young owls in their first 2 years of life was high during the peak of the hare cycle, and a large number of non-territorial 'floaters' were present. These birds were silent, and moved more than territorial owls. Their ranges overlapped broadly with defended territories, and floaters were affected by the hare decline before territory holders. Most ecological studies on birds are based on the territorial fraction of a population. The results of this study show how a large proportion of secretive floaters can delay the detection of population declines in traditional censuses of territorial birds, and can lead to serious underestimates of the impacts of predation.

Rohner, C., and Hunter, D.B., 1996. First-year survival of great horned owls during a peak and decline of the snowshoe hare cycle. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 74 (6), 1092-1097. *POPULATION; birds; raptor; owl; behavior (reproductive/nesting); nutrition; parasitic infection; predation; snowshoe hare*

Most bird species have low survival rates in their first year of life, and the highest losses occur when juveniles become independent and disperse. Young great horned owls (*Bubo virginianus*), monitored by telemetry in the southwestern Yukon, Canada, survived well during the peak of the population cycle of snowshoe hares (*Lepus americanus*). Subsequently, juvenile survival collapsed parallel to the decline in hare densities. The proportion of starving owls did not increase, but there was a significant increase in mortalities involving parasitism and predation, probably as an interaction with food shortage. The mortality rates of juvenile great horned owls peaked before, not during, dispersal. We propose that extended parental care makes the postfledging stage safe during optimal conditions, but that the relatively slow development during this stage incurs the cost of increased susceptibility to disease and other mortality factors under environmental stress.

Rohner, C., and Smith, J., 1996. Brood size manipulations in great horned owls *Bubo virginianus*: Are predators food limited at the peak of prey cycles? *Ibis* 138 (2), 236-242. *POPULATION; birds; raptor; owl; reproduction; behavior (reproductive/nesting); nutrition; snowshoe hare*

The reproduction of raptors strongly depends on food resources. It is unclear whether predators experience superabundant food during cyclic peaks of prey populations. In order to test this hypothesis, four pairs of Great Horned Owls *Bubo virginianus* with two young were subjected to brood size manipulations during high densities of cyclic Snowshoe Hare *Lepus americanus* populations in southwestern Yukon, Canada. Broods older than 35 days were temporarily enlarged by one, and then by two, young. No effects

were observed when one owlet was added, but the addition of two young resulted in significant weight losses in manipulated broods. Females with enlarged broods moved farther from their nest sites at night, presumably reflecting increased hunting effort, and also spent less time near the nest during the day. Food additions to enlarged broods returned the parental behaviour to normal. We conclude that these large predators did not experience superabundant food at this stage of the breeding season during a peak in cyclic prey.

Rohner, C., 1997. Non-territorial 'floaters' in great horned owls: Space use during a cyclic peak of snowshoe hares. *Animal Behaviour* 53 (5), 901-912. *POPULATION; birds; raptor; owl; reproduction; behavior (territorial); behavior (reproductive/nesting)*

The ecology and behaviour of non-territorial owls are little known. During a population peak of snowshoe hares, *Lepus americanus*, the main prey of great horned owls, *Bubo virginianus*, in the boreal forest, fledglings were equipped with radiotransmitters, and 30 successful dispersers were monitored in 1988-1991. Of those, nine became resident floaters in the study area. Transient floaters were not recorded, although floaters shifted the centre of their home ranges more than territorial owls. Floater home ranges were about five times larger than defended territories, but the space use did not differ significantly. Floaters intruded regularly into territories and their locations overlapped broadly with those of territory owners and other floaters, but were concentrated on the periphery of defended territories. This is consistent with other evidence that territorial behaviour limits the breeding density of great horned owls even at extreme peaks of prey availability. None of the monitored floaters bred as secondary females, and the intrusion rates and movement patterns of floaters did not change during the fertile period of females, as predicted if male floaters were seeking extra-pair copulations.

Roininen, H., Price, P., and Bryant, J., 1997. Response of galling insects to natural browsing by mammals in Alaska. *Oikos* 80 (3), 481-486. *POPULATION; insects; galling insect; vegetation; poplar; willow; herbivory; snowshoe hare; moose*

Along the Tanana River, near Fairbanks, Alaska, natural browsing by the snowshoe hare, *Lepus americanus*, and moose, *Alces alces*, pruned back growth and resulted in resprouting of more juvenile growth in host plants. This resulted in longer leading shoots of stems in young trees of *Populus balsamifera* and ramets of the shrub, *Salix novae-angliae*, both species in the family Salicaceae. Total numbers of shoots were the same on uncaged and caged plots, the latter excluding moose and snowshoe hare, but the ramets of *Salix novae-angliae* were slightly younger on uncaged plots, indicating that dieback of older ramets accelerated under natural browsing. The most common herbivores in August 1993 were two leaf-folding sawfly species in the genus *Phyllocolpa* (Hymenoptera: Tenthredinidae). Densities of the two *Phyllocolpa* species, one on *Populus balsamifera* and one on *Salix novae-angliae*, were 83 and 85% higher on ramets or stems in uncaged plots. Also, the combined number of other rarer galling species were higher in browsed, uncaged plots. Mean length of leading shoots in ramets and stems accounted for 35 and 30% of variation in densities of *Phyllocolpa* species on *Populus balsamifera* and *Salix novae-angliae* in plots, respectively. Thus, the increased galling insect densities are accounted for as far as our studies permit by increased vigor of host plants indicated by shoot length. On *Salix novae-angliae* also faster dieback of older senescent ramets may have an important effect on the resource quality for gallers.

Roland, C.A., 1996. The floristics and community ecology of extrazonal steppe in the Yukon and Kolyma River drainages, University of Alaska Fairbanks, M.S., 205 p *VEGETATION; ecology*

Romanovsky, V.E., Osterkamp, T.E., Sazonova, T.S., Shender, N.I., and Balobaev, V.T., 2001. Permafrost Temperature Dynamics Along the East Siberian Transect and an Alaskan Transect.

Tohoku Geophysical Journal (Ser 5) 36 (2), 224-229. *INCOMPLETE (need abstract); CLIMATE; HYDROLOGY; ground ice / permafrost; thermokarst*

Romanovsky, V.E., Shender, N., Sazonova, T., Balobaev, V., Tipenko, G., and Rusakov, V., 2001. Permafrost Temperatures in Alaska and East Siberia: Past, Present and Future. *Proceedings Proceedings of the Second Russian Conference on Geocryology (Permafrost Science), Moscow, p. 301-314 INCOMPLETE (need abstract); CLIMATE; HYDROLOGY; ground ice / permafrost; thermokarst*

Rombach, C., 2000. Alaska Resource Data File; Kantishna River quadrangle. open file report 00-289. Alaska Division of Geological & Geophysical Surveys, Fairbanks.

<http://ardf.wr.usgs.gov>. *MINING; INFRASTRUCTURE*

Descriptions of the [8] mineral occurrences shown on the accompanying figure follow. See U.S. Geological Survey (1996) [?] for a description of the information content of each field in the records. The data presented here are maintained as part of a statewide database on mines, prospects and mineral occurrences throughout Alaska... This and related reports are accessible through the USGS World Wide Web site <http://ardf.wr.usgs.gov>. Comments or information regarding corrections or missing data, or requests for digital retrievals should be directed to: Frederic Wilson, USGS, 4200 University Dr., Anchorage, AK 99508-4667, e-mail fwilson@usgs.gov, telephone (907) 786-7448.

Rood, K., and Church, M., 1994. Modified freeze-core technique for sampling the permanently wetted streambed. *North American Journal of Fisheries Management* 14 (4), 852-861.

SEDIMENT; monitoring; hydrology; river ice

The substrates of streams are often sampled as part of scientific studies or environmental impact assessments or for monitoring project operations; however, there are no generally accepted standards for a well-designed program. We propose the use of a hybrid McNeil-freeze-core apparatus to collect samples that are unbiased with respect to the grain-size distribution in alluvial gravels. Consideration of sample-size standards demonstrates that multiple 13-kg cores are necessary to describe the full distribution if material greater than 32 mm is present. Alternatively, the observed grain-size distribution may be truncated to ensure representative samples. The sampling strategy depends upon the information requirements of the program. The number of substrate samples required for various levels of precision of the estimated mean percent fines at a site is calculated from sampling programs in British Columbia and the Yukon Territory. Based on these studies, costs are estimated for our recommended program.

Rosenmann, M., 1974. A comparative study of the metabolic response of small mammals to selected environmental factors: hypoxia, cold and visual disturbance, University of Alaska (College), Ph.D., 131 p *POPULATION; mammals; rodents; metabolism; seasonality; climate*

Rossow, L., Bryant, J., and Kielland, K., 1997. Effects of above-ground browsing by mammals on mycorrhizal infection in an early successional taiga ecosystem. *Oecologia* 110 (1), 94-98.

VEGETATION; distribution; willow; poplar; herbivory (mammal); invertebrates; mycorrhizal infection; health (condition)

Using an enclosure experiment in the willow stage of primary succession on the floodplain of the Tanana River, we tested the hypothesis that browsing can reduce mycorrhizal infection. We measured the effects winter browsing by moose (*Alces alces*) and snowshoe hare (*Lepus americanus*) had on mycorrhizal infection and fine root biomass of willow (*Salix* spp.) and balsam poplar (*Populus balsamifera*). We found that protection from winter browsing increased ectomycorrhizal infection by 10% in the top 5 cm of the soil profile, by 23% at 5-10 cm, and by 42% at the 10-15 cm depth. Mammal

browsing in taiga forests is now recognized as a major cause of the shift from palatable deciduous species such as willow and balsam poplar to less palatable species such as alder and spruce. We suggest that browsing-induced reduction in ectomycorrhizal infection of salicaceous species plays a central role in this shift in plant community composition.

Rubin, C., Lanier, A., and Harpster, A., 1998. Environmental Chemicals and Health. Report of Pilot Study of Breast Cancer and Organochlorines in Alaska Native Women. Alaska Native Health Board, *INCOMPLETE (need abstract); CONTAMINANTS; POPs (persistent organic pollutants); health (effects); health (condition); cancer; infants; children*

Ruess, R., Uliassi, D., Mulder, C., and Person, B., 1997. Growth responses of *Carex ramenskii* to defoliation, salinity, and nitrogen availability: Implications for geese-ecosystem dynamics in western Alaska. *Ecoscience* 4 (2), 170-178. *VEGETATION; sedges; herbivory (avian); growth/development; nutrient cycling; soil; population; birds; waterfowl; goose*

The Yukon-Kuskokwim River delta in western Alaska is the principal nesting area for several species of geese, including Pacific black brant, *Branta bernicla*. Grazing by geese on *Carex ramenskii*, one of the most abundant plant species throughout much of this region, appears to have increased in recent years. The purpose of this study was 1) to evaluate the effects of early-season defoliation and fertilization on plant growth and nutrient cycling processes within field plots of *C. ramenskii* over a 3-year period, and 2) to study the interactive effects of defoliation, N availability, and salinity stress on growth, and biomass and N allocation in *C. ramenskii* under controlled greenhouse conditions. Both field and laboratory experiments found that rapid regrowth following defoliation was dependent on soil nutrient availability. Fertilization increased soil respiration rates each year but tended to decrease rates of net N mineralization, indicating that the soil microbial biomass is a strong nutrient sink in this ecosystem. In addition to the direct positive effects that goose feces have on plant growth, nitrogen recycled through feces may be an important source of nitrogen contributing to salinity tolerance in *C. ramenskii*. Results suggest that the observed increase in grazing pressure on patches of *C. ramenskii* early in the growing season may increase forage quality and quantity within these swards, and have important implications for geese-ecosystem interactions at a time of rapid goose population increase.

Ruess, R., Hendrick, R., and Bryant, J., 1998. Regulation of fine root dynamics by mammalian browsers in early successional Alaskan taiga forests. *Ecology* (Washington, D C) 79 (8), 2706-2720. *VEGETATION; growth/development; herbivory (mammal); nutrient cycling; carbon; nitrogen; climate; flooding*

The effects of browsing by moose and snowshoe hares on fine root production, mortality, and decomposition in early successional forest ecosystems along the Tanana River floodplain in interior Alaska were studied over a 3-yr period using minirhizotrons placed inside and outside large permanent exclosures. Fine root production and mortality varied seasonally, with greatest rates of production occurring during June each year, and greatest rates of mortality occurring in fall and over winter. Annual production and mortality during 1993, a year of unusually low precipitation, were significantly higher than during either 1992 or 1994. Aboveground herbivory significantly reduced monthly rates of fine root production, and on an annual basis, fine root production of browsed plots (311.4 plus or minus 31.7 mm per tube per yr) was significantly less than that of unbrowsed plots (453.8 plus or minus 49.8 mm per tube per yr) when averaged over 3 yr. Because herbivory had less of an effect on monthly or annual rates of fine root mortality, fine root turnover was higher for browsed stands. Browsed plants had a higher percentage of annual production in surface soil layers. Production on all plots shifted to deeper soil layers as the growing season progressed; this shift occurred deeper in the

profile for unbrowsed plants than for browsed plants. We used a parameter estimation program (Program MARK) to generate fine root survival and decomposition estimates from models testing the direct and interactive effects of time period, cohort (i.e., when the root first appeared) age of the root, browsing, and site on fine root longevity and decomposability. Cohort effects showed that survival of fine roots was greatest for roots that first appeared in May, and that survival progressively declined for roots first appearing during subsequent time periods, while age-based estimates showed a rapid decline in survival over the interval following first appearance. Survival and decomposition estimates were inversely correlated within a growing season, with the lowest survival but highest decomposition occurring over winter. Two-factor models indicated that time-dependent survival and decomposition rates of fine roots differed significantly between browsed and unbrowsed stands, among the 10 fine root age groups, and among the three study sites. Browsing significantly reduced fine root survival, but this effect varied among sites. Fine root decomposition rates were consistently lower (-21%) in browsed stands. Two important features distinguish fine root dynamics in our stands from temperate and more southerly boreal ecosystems: (1) low overwinter survival of fine roots, and (2) a substantial time lag between leaf-out and maximum fine root growth, suggesting greater reliance on aboveground stores for spring regrowth. Herbivores appear to play an important role in linking these two events, first by exacerbating overwinter mortality, and second by consuming a substantial amount of aboveground stores. Thus, not only do herbivores have pronounced direct effects on carbon and nutrient cycling processes, but climatically driven effects on fine root processes may be linked with herbivory in complex ways that define fundamental latitudinal patterns in plant growth and allocation to defense against herbivory.

Rupp, T., Starfield, A., and Chapin, F.I., 1999. Modeling transient vegetation dynamics in a warming climate: Implications for Denali National Park and preserve. *Proceedings 50th Arctic Science Conference: Science in the North - 50 Years of Change, Denali Park, AK (USA)*; (World Meeting Number 993 5068) *CLIMATE; VEGETATION; distribution; modeling*

Rupp, T., Starfield, A., and Chapin III, F., 2000. A frame-based spatially explicit model of subarctic vegetation response to climatic change: Comparison with a point model. *Landscape Ecology* 15 (4), 383-400. *CLIMATE; vegetation; modeling; wildfire; recovery*

An important challenge in global-change research is to simulate short-term transient changes in climate, disturbance regime, and recruitment that drive long-term vegetation distributions. Spatial features (e.g., topographic barriers) and processes, including disturbance propagation and seed dispersal, largely control these short-term transient changes. Here we present a frame-based spatially explicit model (ALFRESCO) that simulates landscape-level response of vegetation to transient changes in climate and explicitly represents the spatial processes of disturbance propagation and seed dispersal. The spatial model and the point model from which it was developed showed similar results in some cases, but diverged in situations where interactions among neighboring cells (fire spread and seed dispersal) were crucial. Topographic barriers had little influence on fire size in low-flammability vegetation types, but reduced the average fire size and increased the number of fires in highly flammable vegetation (dry grassland). Large fires were more common in landscapes with large contiguous patches of two vegetation types while a more heterogeneous vegetation distribution increased fires in the less flammable vegetation type. When climate was held constant for thousands of years on a hypothetical landscape with the same initial vegetation, the spatial and point models produced identical results for some climates (cold, warm, and hot mesic), but produced markedly different results at current climate and when much drier conditions were imposed under a hot climate. Spruce migration into upland tundra

was slowed or prevented by topographic barriers, depending on the size of the corridor. We suggest that frame-based, spatially explicit models of vegetation response to climate change are a useful tool to investigate both short- and long-term transients in vegetation at the regional scale. We also suggest that it is difficult to anticipate when non-spatial models will be reliable and when spatially explicit models are essential. ALFRESCO provides an important link between models of landscape-level vegetation dynamics and larger spatio-temporal models of global climate change.

Rupp, T., Chapin III, F., and Starfield, A., 2001. Modeling the influence of topographic barriers on treeline advance at the forest-tundra ecotone in northwestern Alaska. *Climatic Change* 48 (2-3), 399-416. *REFERENCE; CLIMATE; vegetation; distribution*

The response of terrestrial ecosystems to climate warming has important implications to potential feedbacks to climate. The interactions between topography, climate, and disturbance could alter recruitment patterns to reduce or offset current predicted positive feedbacks to warming at high latitudes. In northern Alaska the Brooks Range poses a complex environmental and ecological barrier to species migration. We use a spatially explicit model (ALFRESCO) to simulate the transient response of subarctic vegetation to climatic warming in the Kobuk/Noatak River Valley (200 x 400 km) in northwest Alaska. The model simulations showed that a significantly warmer (+6 degrees C) summer climate would cause expansion of forest through the Brooks Range onto the currently treeless North Slope only after a period of 3000-4000 yr. Substantial forest establishment on the North Slope did not occur until temperatures warmed 9 degrees C, and only following a 2000 yr time lag. The long time lags between change in climate and change in vegetation indicate current global change predictions greatly over-estimate the response of vegetation to a warming climate in Alaska. In all the simulations warming caused a steady increase in the proportion of early successional deciduous forest. This would reduce the magnitude of the predicted decrease in regional albedo and the positive feedback to climate warming. Simulation of spruce forest refugia on the North Slope showed forest could survive with only a 4 degrees C warming and would greatly reduce the time lag of forest expansion under warmer climates. Planting of spruce on the North Slope by humans could increase the likelihood of large-scale colonization of currently treeless tundra. Together, the long time lag and deciduous forest dominance would delay the predicted positive regional feedback of vegetation change to climatic warming. These simulated changes indicate the Brooks Range would significantly constrain regional forest expansion under a warming climate, with similar implications for other regions possessing major east-west oriented mountain ranges.

Rupp, T., Starfield, A., Chapin III, F., and Duffy, P., 2002. Modeling the Impact of Black Spruce on the Fire Regime of Alaskan Boreal Forest. *Climatic Change* 55 (1-2), 213-233.

VEGETATION; black spruce; CLIMATE; succession; modeling; wildfire

In the boreal biome, fire is the major disturbance agent affecting ecosystem change, and fire dynamics will likely change in response to climatic warming. We modified a spatially explicit model of Alaskan subarctic treeline dynamics (ALFRESCO) to simulate boreal vegetation dynamics in interior Alaska. The model is used to investigate the role of black spruce ecosystems in the fire regime of interior Alaska boreal forest. Model simulations revealed that vegetation shifts caused substantial changes to the fire regime. The number of fires and the total area burned increased as black spruce forest became an increasingly dominant component of the landscape. The most significant impact of adding black spruce to the model was an increase in the frequency and magnitude of large-scale burning events (i.e., time steps in which total area burned far exceeded the normal distribution of area burned). Early successional deciduous forest vegetation burned more frequently when black spruce was added to the model, considerably decreasing the fire return interval of deciduous vegetation. Ecosystem flammability

accounted for the majority of the differences in the distribution of the average area burned. These simulated vegetation effects and fire regime dynamics have important implications for global models of vegetation dynamics and potential biotic feedbacks to regional climate.

Saltus, R., Riggle, F., Clark, B., and Hill, P., 1999. Merged Aeroradiometric Data for Alaska; A Web Site for Distribution of Gridded Data and Plot Files. US Geological Survey, <http://greenwood.cr.usgs.gov/pub/open-file-reports/ofr-99-0016/alaskarad.html> *MINING; imaging (remote sensing); mapping; radiometry*

Aeroradiometric Map Background Information

Samis, S., Liu, S., Wernick, B., and Nassichuk, M., 1999. Mitigation of fisheries impacts from the use and disposal of wood residue in British Columbia and the Yukon. Canadian technical report of fisheries and aquatic sciences/Rapport technique canadien des sciences halieutiques et aquatiques 2296. Department of Fisheries and Oceans, Vancouver, BC (Canada) Habitat and Enhancement Branch; Environment Canada, North Vancouver, BC Environmental Protection Branch, Vancouver, BC. *WATER QUALITY; fish; waste (hazardous); CONTAMINANTS; wood residue*

This document, a companion to Guidelines on Storage, Use and Disposal of Wood Residue for the Protection of Fish and Fish Habitat in British Columbia, examines in detail the potential impacts on fish and fish habitat, including water quality, arising from operations involving the use, storage or disposal of wood residue in British Columbia and the Yukon. The chemical components of wood residue storage and disposal sites are presented. Application of this information is intended to promote a consistent approach toward environmentally-sound use and disposal of wood residue so that detrimental effects on fish and fish habitat are prevented. Alternative technology is encouraged to divert wood residue from landfills to secondary uses such as energy generation or the manufacture of value-added products.

Samuel, W.M., 1989. Locations of moose in northwestern Canada with hair loss probably caused by the winter tick, *Dermacentor albipictus* (Acari: Ixodidae). *Wildlife Disease* 25 (3), 436-9. *POPULATION; mammals; moose; health (condition); ticks*

Five hundred two trappers representing 389 registered traplines in northern Alberta, northern British Columbia, Northwest Territories and Yukon Territory (Canada) responded to a questionnaire on the occurrence of hair loss and the winter tick (*Dermacentor albipictus*) on moose (*Alces alces*). Results suggested that winter ticks may occur as far as 62 degrees N. Several sightings of moose with presumed tick-induced hair loss near Kluane Lake, Yukon Territory, suggest the possibility of introduction of this serious pest into the moose population in Alaska.

Sawada, M., and Johnson, P., 2000. Hydrometeorology, Suspended Sediment, and Conductivity in a Large Glacierized Basin, Slims River, Yukon Territory, Canada (1993-94). *Arctic* 53 (2), 101-117. *HYDROLOGY; sediment; climate; glacial discharge; water quality*

The Slims River was monitored for global solar radiation, air temperature, discharge, suspended sediment, and dissolved load in 1993 and 1994. Peak seasonal discharge occurred late in the summer and reflects a typical glacierized basin hydrograph, with increased bare ice surfaces contributing strongly to discharge in July and August. Air temperature, rather than global solar radiation, was most strongly correlated with discharge in both years, but during sustained ablation, air temperature becomes a poor index of meltwater production. Precipitation was infrequent and of low magnitude. The variance in suspended sediment concentration could be explained only in part by discharge; frequent clockwise hysteresis and seasonal sediment concentration peaks unrelated to discharge variations also contributed to this variance. High concentrations of Ca^{2+} and Mg^{2+} in meltwaters reflect the lithological influence of carboniferous sedimentary rocks in the basin. Conductivity and individual cation concentrations

decreased during both seasons and were inversely related to discharge. Diurnal conductivity amplitude was greatest during glacier melt, and frequent clockwise hysteresis was observed in both years.

Scannell, P.W., and Robus, M.H., 1987. Water quality and aquatic habitat assessments of Goldstream Creek drainage. Dept. of Fish and Game, Division of Habitat, Technical report ; no. 87-3. Tanana Chiefs Conference, Juneau. *INCOMPLETE (need abstract); WATER QUALITY; surface water; limnology; MINING; gold*

Schallock, E., 1966. Grayling life history related to a hydroelectric development on the Chatanika River in interior Alaska, University of Alaska Fairbanks, M.S., 113 p *POPULATION; fish; grayling; dams; health (effects)*

Schechter, M.T., Ballem, P.J., Buskard, N.A., Le, T.N., Thompson, M., Marion, S.A., and O'Shaughnessy, M.V., 1990. An anonymous seroprevalence survey of HIV infection among pregnant women in British Columbia and the Yukon Territory. Canadian Medical Association Journal 143 (11), 1187-92. *PEOPLE; health (comparative); HIV/AIDs*

We performed an anonymous seroprevalence survey of human immunodeficiency virus (HIV) type 1 infection through HIV antibody testing of blood samples from 22,512 women aged 15 to 44 years receiving prenatal care in British Columbia and the Yukon Territory from Mar. 15 to Sept. 30, 1989. Of the samples six were confirmed to be HIV positive; this yielded a crude overall seroprevalence rate of 2.7 per 10,000 pregnant women (95% confidence interval [CI] 1.0 to 5.8). All of the positive samples were from women 20 to 29 years of age; four were from Vancouver, one was from Victoria, and one was from elsewhere. The highest seroprevalence rates were among women aged 15 to 29 years in Vancouver and Victoria (7.2 and 9.4 per 10,000 pregnant women respectively). Thus, 1 in 1300 pregnant women in that age group in the metropolitan areas of British Columbia was HIV positive. Application of seroprevalence rates to the total female population in British Columbia and the Yukon Territory revealed that as many as 401 women had HIV infection in 1989. Our estimates likely represent the minimum. As a subset of women of childbearing age pregnant women are likely at lowest risk of HIV infection, and so the true number of women 15 to 44 years of age with HIV infection is probably several times higher. Our study has provided a baseline assessment and will be repeated annually to analyse trends in HIV seroprevalence among pregnant women in British Columbia and the Yukon Territory.

Schempf, P.F., 1989. Raptors in Alaska. *Proceedings Western raptor management symposium and workshop, National Wildlife Federation**INCOMPLETE (need abstract); POPULATION; birds; raptor; management*

Schimmel, J., Cates, R., and Ruess, R., 1998. The Role of Balsam Poplar Secondary Chemicals in Controlling Soil Nutrient Dynamics through Succession in the Alaskan Taiga.

Biogeochemistry 42 (1), 221-234. NUTRIENT CYCLING; SOIL; nitrogen; VEGETATION; succession; alder; poplar; flooding

The vegetation mosaic of the Alaskan taiga is produced by patterns of disturbance coupled to well-defined successional patterns. In primary succession on river floodplains, one of the critical transitions in succession is that from thinleaf alder (*Alnus tenuifolia*) to balsam poplar (*Populus balsamifera*). This is the shift from a N₂-fixing shrub to a deciduous tree. Through this transition there are major changes in N cycling including a decrease in N₂-fixation, mineralization, and nitrification. Most models of plant effects on soil processes assume that these changes are caused by shifts in litter quality and C/N ratio. This paper reviews several studies examining the effects of balsam poplar secondary chemicals on soil nutrient cycling. Balsam poplar tannins inhibited both N₂-

fixation in alder, and decomposition and N-mineralization in alder soils. Other poplar compounds, including low-molecular-weight phenolics, were microbial substrates and increased microbial growth and immobilization, thereby reducing net soil N availability. Thus, substantial changes in soil N cycling through succession appear to have been mediated by balsam poplar secondary chemicals.

Schimel, J., and Gullledge, J., 1998. Microbial community structure and global trace gases. *Global Change Biology* 4 (7), 745-758. *REFERENCE; CLIMATE; NUTRIENT CYCLING; POPULATION; microbes*

Global change can affect soil processes by either altering the functioning of existing organisms or by restructuring the community, modifying the fundamental physiologies that drive biogeochemical processes. Thus, not only might process rates change, but the controls over them might also change. Moreover, previously insignificant processes could become important. These possibilities raise the question 'Will changes in climate and land use restructure microbial communities in a way that will alter trace gas fluxes from an ecosystem?' Process studies indicate that microbial community structure can influence trace gas dynamics at a large scale. For example, soil respiration and CH₄ production both show ranges of temperature response among ecosystems, indicating differences in the microbial communities responsible. There are three patterns of NH₄⁺ inhibition of CH₄ oxidation at the ecosystem scale: no inhibition, immediate inhibition, and delayed inhibition; these are associated with different CH₄ oxidizer communities. Thus, it is possible that changes in climate, land-use, and disturbance regimes could alter microbial communities in ways that would substantially alter trace gas fluxes; we discuss the data supporting this conclusion. We also discuss approaches to developing research linking microbial community structure and activity to the structure and functioning of the whole ecosystem. Modern techniques allow us to identify active organisms even if they have not been cultivated; in combination with traditional experimental approaches we should be able to identify the linkages between these active populations and the processes they carry out at the ecosystem level. Finally, we describe scenarios of how global change could alter trace gas fluxes by altering microbial communities and how understanding the microbial community dynamics could improve our ability to predict future trace gas fluxes.

Schimel, J., Gullledge, J., Clein-Curley, J., Lindstrom, J., and Braddock, J., 1999. Moisture effects on microbial activity and community structure in decomposing birch litter in the Alaskan taiga. *Soil Biology and Biochemistry* 31 (6), 831-838. *SOIL; NUTRIENT CYCLING; carbon; nitrogen; vegetation; birch; invertebrates; microbes; bacteria*

We carried out a field experiment to evaluate the effect of moisture regime on microbial biomass and activity in birch litter in the Alaskan taiga. Litter bags were placed in one of three treatments: continuously moist (0.5 cm water per day), cycling (0.5 cm water weekly), and 'natural', which experienced two natural dry-wet cycles of 2 weeks dry followed by rain. The experiment lasted for 1 month. Each week we collected litter bags and analyzed microbial respiration and biomass C and N. In the last two cycles we analyzed bacterial substrate use on Biolog GN plates. There were strong overall correlations between biomass, respiration and litter moisture content. However, the different treatments had significantly different rates of respiration, biomass and respiratory quotient (qCO₂) that could not be explained by moisture content directly. The natural treatment had lower respiration rates and biomass than the wet or cycling samples, indicating that the 2-week droughts in the natural treatment reduced microbial populations and activity to a greater degree than did shorter droughts. Episodic drying and rewetting considerably decreased the number of Biolog substrates used. This experiment showed that the size and functioning of the litter microbial community was strongly affected by its stress history.

Schmutz, J., Cantor, S., and Peterson, M.R., 1994. Seasonal and annual survival of emperor geese. *Journal of Wildlife Management* 58 (3), 525-535. *POPULATION; birds; waterfowl; goose; mortality; modeling; management*

Population levels of emperor geese (*Chen canagica*) in Alaska in 1993 were about half that estimated in the 1960s. Survival information is necessary for managers to decide how to best enhance recovery of this species to former levels. We calculated seasonal and annual estimates of emperor goose survival from resightings of neck-collared birds. Geese were neck collared in 1988-90 on their breeding grounds in the Yukon-Kuskokwim Delta, Alaska, and resighted each spring and fall, 1988-92, at staging areas on the Alaska Peninsula. Adult monthly survival rates during overwinter periods (1 Oct-30 Apr) were not different ($P = 0.281$) among years ($S' = 0.940$, $SE = 0.009$), whereas monthly rates of oversummer (1 May-30 Sep) survival showed annual variation ($P = 0.048$). However, we constrained oversummer survival to a single estimate of 0.980 (0.010). Monthly survival estimates for juveniles during their first overwinter period did not vary among years ($P = 0.999$) and was 0.710 (0.018). Subsequent monthly survival for juveniles was 0.943 (0.010), similar to that for adults. We developed an adjustment procedure to account for philopatric behavior of geese and this enabled us to use data for postbanding (1 Aug-30 Sep) periods. Survival estimates were low compared with those for other goose species, particularly for juveniles. We addressed collar loss and heterogeneity in resighting probabilities and felt their contribution to potential model bias was insignificant. Annual survival among adults ($S' = 0.631$, $SE = 0.023$) was not different ($P = 0.709$) from that observed during 1982-85 (Petersen 1992). The similarity in survival rates in these studies suggests that harvest regimes did not differ between the 2 periods. This suggests that continued subsistence harvest has contributed to persistent low population levels in emperor geese.

Schmutz, J., and Kondratyev, A., 1995. Evidence of emperor geese breeding in Russia and staging in Alaska. *Auk* 112 (4), 1037-1041. *POPULATION; birds; waterfowl; goose; migration; distribution*

Emperor Geese (*Chen canagica*) breed primarily on the Yukon-Kuskokwim Delta, Alaska, but a small, poorly quantified proportion of the world's population is known to breed in the Russia Far East. Here we report observations of two geese banded as juveniles in Russia and observed on the Alaska Peninsula during their first fall migration.

Schmutz, J., and Hobson, K., 1998. Geographic, temporal, and age-specific variation in diets of Glaucous Gulls in western Alaska. *Condor* 100 (1), 119-130. *POPULATION; birds; glaucous gull; nutrition; behavior (reproductive/nesting); behavior (feeding); predation; monitoring*

We observed both geographic and temporal variation in diet; gulls consumed proportionately more terrestrial prey after peak hatch in late June, and gulls near the coast consumed proportionately more marine prey than gulls at two inland areas. Goslings occurred in > 60% of all samples from these inland areas. We compared these data to those from a previous study in western Alaska and found no marked differences. Evidence for similar patterns of geographic and temporal variation in diet was found using measurements of stable-carbon and nitrogen isotopes in gull and prey tissues. Stable isotope analysis further revealed that adult gulls consumed proportionately more marine prey (saffron cod, *Eleginus gracilis*) than they fed to their young. Using isotopic models, we estimated that 7-22% and 10-23% of the diet of adult and juvenile Glaucous Gulls, respectively, was comprised of terrestrial species. In addition to significant age-related variation, dietary estimates varied among geographic areas and between pre- and post-hatch periods. Overall, our isotopic estimates of the contribution of terrestrial prey to the diet of Glaucous Gulls was less than what may be inferred from conventional methods of diet analysis. Our study emphasizes the benefit of combining stable-isotope

and conventional analyses to infer temporal and geographic changes in diet of wild birds and other organisms.

Schmutz, J., 2000. Age-specific breeding in Emperor Geese. *Wilson Bulletin* 112 (2), 261-263. *POPULATION; birds; waterfowl; goose; reproduction*

I studied the frequency with which Emperor Geese (*Chen canagica*) of known age were observed breeding on the Yukon-Kuskokwim Delta, Alaska. No one- or two-year old geese were observed on nests. Three-year old geese bred at a lower rate than four-year old geese. These data suggest that patterns of age-specific breeding in Emperor Geese are similar to other sympatrically nesting, large bodied geese [Greater White-fronted Geese (*Anser albifrons*)] but delayed relative to smaller bodied geese [Cackling Canada Geese (*Branta canadensis minima*) and Pacific Black Brant (*B. bernicla nigricans*)].

Schmutz, J.A., 2000. Survival and brood rearing ecology of emperor geese, University of Alaska Fairbanks, Ph. D., 138 p *POPULATION; distribution; birds; waterfowl; goose; reproduction; behavior (reproductive/nesting); behavior (feeding); mortality; habitat selection; vegetation; sedges; nutrition*

Summary: "Emperor Geese (*Chen canagica*) breed on the Yukon-Kuskokwim Delta in an area inhabited by three other goose species. Whereas populations of other geese increased since the mid 1980s, Emperor Goose numbers remained low. Because survival and habitat selection by broods of Emperor Geese had not been studied previously and numbers of predatory Glaucous Gulls (*Larus hyperboreus*) had recently increased, I studied brood rearing ecology of Emperor Geese during 1993-1996 to assess whether this seasonal period could be limiting population growth. Survival of goslings to 30 days varied among years from 0.32 to 0.70 and was primarily influenced by mortality during the first five days after hatch. Other goose species with similar rates of gosling survival are increasing rapidly. Survival of Emperor Goose goslings was lowest in 1994, when unusually heavy rainfall occurred during early brood rearing. Using a long-term data set from Izembek National Wildlife Refuge, sizes of families in fall (n=23 years) were related to rainfall during early brood rearing. Gosling survival was lower and gull disturbance of broods greater in 1993-1994 than in 1995-1996. Although goslings were commonly consumed by Glaucous Gulls, gull diets during 1993 were similar to those observed in the 1970s. Across a broad scale, broods of Emperor Geese (n=56) strongly selected habitats dominated by *Carex subspathaceae*, *Carex ramenskii*, and unvegetated areas interspersed among these forage species, as determined from telemetry. These selected habitats comprised one-third of all available habitat. Habitat selection by the composite goose community (dominated by Cackling Canada Geese [*Branta canadensis minima*]) was assessed by feces collections and differed substantially from that of Emperor Geese. Broods of Emperor Geese spent more time feeding during 1993-1996 than during a [?!] 1994-1996, feeding rates of gosling and adult females was related more to total goose density than to Emperor Goose density. Although Cackling Canada Geese exhibited strongest selection of other habitats, their greater overall abundance resulted in numerical equivalence to Emperor Geese in habitats preferred by Emperor Geese. Interspecific competition for food has impacted behavior in Emperor Geese, which may impact growth and survival of juvenile geese."

Schmutz, J., 2001. Selection of Habitats by Emperor Geese during Brood Rearing. *Waterbirds* 24 (3), 394-401. *POPULATION; waterfowl; goose; habitat selection; growth/development*

Although forage quality strongly affects gosling growth and consequently juvenile survival, the relative use of different plant communities by brood rearing geese has been poorly studied. On the Yukon-Kuskokwim Delta, Alaska, population growth and juvenile recruitment of Emperor Geese (*Chen canagica*) are comparatively low, and it is unknown whether their selection of habitats during brood rearing differs from other goose species. Radio-telemetry was used to document the use of habitats by 56 families of Emperor

Geese in a 70 km² portion of the Yukon-Kuskokwim Delta during brood rearing in 1994-1996. When contrasted with available habitats (a set of six habitat classes), as estimated from 398 random sampling locations, Emperor Geese strongly selected Saline Ponds, Mudflat, and Ramenskii Meadow habitats and avoided Levee Meadow, Bog Meadow, and Sedge Meadow. These selected habitats were the most saline, comprised one-third of the study area, and 43% of all locations were in Ramenskii Meadow. I contrasted these Emperor Goose locations with habitats used by the composite goose community, as inferred from the presence of goose feces at random locations. The marked difference between groups in this comparison implied that Cackling Canada Geese (*Branta canadensis minima*) and Greater White-fronted Geese (*Anser albifrons*) collectively selected much different brood rearing habitats than Emperor Geese.

Schmutz, J., Manly, B., and Dau, C., 2001. Effects of gull predation and weather on survival of emperor goose goslings. *Journal of Wildlife Management* 65 (2), 248-257. *POPULATION; waterfowl; goose; mortality; predation; nutrition; climate*

Numbers of emperor geese (*Chen canagica*) have remained depressed since the mid-1980s. Despite increases in glaucous gulls (*Larus hyperboreus*), a primary predator of goslings, little information existed to assess whether recent patterns of gosling survival have been a major factor affecting population dynamics. We used observations of known families of emperor geese to estimate rates of gosling survival during 1993-96 on the Yukon-Kuskokwim Delta, Alaska. Survival of goslings to 30 days of age varied among years from 0.332 during 1994 to 0.708 during 1995. Survival was lowest during 1993-94, which corresponded with the years of highest frequency of disturbance of goose broods by glaucous gulls. Rainfall during early brood rearing was much higher in 1994 than other years, and this corresponded to low survival among goslings less than or equal to 5 days of age. Numbers of juveniles in families during fall staging were negatively related to rainfall during early brood rearing (n = 23 yr). Although there are no data to assess whether gosling survival in emperor geese has declined from some previous level, current survival rates of emperor goose goslings are as high as or higher than those observed in other goose species that are rapidly increasing. A proposed reduction of glaucous gull numbers by managers may not be the most effective means for increasing population growth in emperor geese.

Schraer, C., Lanier, A., and Boyko, E., 1988. Prevalence of Diabetes Mellitus in Alaska Eskimos, Indians and Aleuts. *Diabetes Care* 11, 693-700. *INCOMPLETE (need abstract); PEOPLE; health (condition); health (comparative); diabetes*

Schwan, M., 1974. Temperature regulation in the Common Raven (*Corvus corax principalis* Ridgway) from interior Alaska, University of Alaska, Fairbanks *POPULATION; birds; raven; metabolism; endocrinology*

Schwartz, M., Mills, L., McKelvey, K., Ruggiero, L., and Allendorf, F., 2002. DNA reveals high dispersal synchronizing the population dynamics of Canada lynx. *Nature* 415, 520-522. *POPULATION; mammals; lynx; distribution; genetics*

Population dynamics of Canada lynx (*Lynx canadensis*) have been of interest to ecologists for nearly sixty years. Two competing hypotheses concerning lynx population dynamics and large-scale spatial synchrony are currently debated. The first suggests that dispersal is substantial among lynx populations, and the second proposes that lynx at the periphery of their range exist in small, isolated patches that maintain cycle synchrony via correlation with extrinsic environmental factors. Resolving the nature of lynx population dynamics and dispersal is important both to ecological theory and to the conservation of threatened lynx populations: the lack of knowledge about connectivity between populations at the southern periphery of the lynx's geographic range delayed

their legal listing in the United States. We test these competing hypotheses using microsatellite DNA markers and lynx samples from 17 collection sites in the core and periphery of the lynx's geographic range. Here we show high gene flow despite separation by distances greater than 3,100 km, supporting the dispersal hypothesis. We therefore suggest that management actions in the contiguous United States should focus on maintaining connectivity with the core of the lynx's geographic range.

Schweiger, S., and Boutin, S., 1995. The effects of winter food addition on the population dynamics of *Clethrionomys rutilus* [red-backed vole]. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 73 (3), 419-426. *POPULATION; mammals; vole; nutrition*

Peaks in red-backed vole (*Clethrionomys rutilus*) populations are associated with high survival in the previous winter and we tested the hypothesis that winter persistence is determined by food supply. We supplied sunflower seeds to voles in a replicated design during winter in two consecutive years. The study began when voles were at peak density and the pattern of change was one of decline to low density over the first winter followed by constant low densities. Food addition increased persistence of individuals slightly in the first winter and significantly in the second winter. Despite higher numbers in spring and greater production of young on food grids, densities did not increase to a peak in autumn. We conclude that the food additions created local patches of high density, but these were too small to have widespread effects on vole dynamics in the area.

Scott, E., 1979. Genetic diversity of Athabaskan Indians. *Annals of Human Biology* 6 (3), 241-247. *PEOPLE; genetics*

If Athabaskan Indians are subdivided by linguistic group, a wide diversity in gene frequencies is disclosed. This diversity approximately that found when linguistically unrelated groups were compared. It was greater than that found for Eskimo-Aleus, even though the latter are more heterogeneous linguistically and subject to a wider variety of environmental conditions. Contiguity, geographic distance, and linguistic similarity were not reflected in similarity of gene frequencies. The gene found for Athabaskans appear to be the result of random process-survivor effects and genetic drift of small isolated groups. They appear to be of no value in detecting ethnic relationships.

Scott, E., and Wright, R., 1980. Genetic polymorphism of rhodanese from human erythrocytes. *American Journal of Human Genetics* 32 (1), 112-114. *PEOPLE; biochemistry; enzymology; genetics*

Rhodanese of human erythrocytes was monomorphic in most populations tested, but was polymorphic in Ahtna and Upper Tanana Indians. This enzyme is under the control of a single autosomal locus.

Scott, E., R., 1983. Health history of the Upper Yukon. Eagle City, Alaska. *PEOPLE; health (condition); health (comparative); INCOMPLETE (need abstract)*

Scribner, K., Gust, J., and Fields, R., 1996. Isolation and characterization of novel salmon microsatellite loci: Cross-species amplification and population genetic applications. *Canadian Journal of Fisheries and Aquatic Sciences/Journal Canadien des Sciences Halieutiques et Aquatiques* Ottawa 53 (4), 833-841. *POPULATION; fish; sockeye; chinook; salmon; genetics*

Twenty-two variable number of tandem repeat microsatellite dinucleotide repeat loci [minor genetic variation] were cloned from sockeye salmon (*Oncorhynchus nerka*) partial genomic libraries. Characteristics and optimal polymerase chain reaction (PCR) conditions were defined for each locus. The degree of conservation of sequences flanking microsatellite repeat motifs and the utility of heterologous PCR primers for analyses in closely related taxa was tested using 10 salmonid species from four genera. Nearly all microsatellite primers produce amplification products in multiple species, suggesting broad application in salmonid research. The utility of these loci for

population genetic studies was tested using individuals from 3 spawning populations of chinook salmon (*O. tshawytscha*) from the Yukon River, Yukon Territories. Twelve of 16 loci screened were polymorphic. Genetic distance estimates between populations were concordant with results from a previous allozyme survey of these same populations.

Scribner, K., and Bowman, T., 1998. Microsatellites identify depredated waterfowl remains from glaucous gull stomachs. *Molecular Ecology* 7 (10), 1401-1405. *POPULATION; birds; waterfowl; duck; goose; eider; glaucous gull*

Prey remains can provide valuable sources of information regarding causes of predation and the species composition of a predator's diet. Unfortunately, the highly degraded state of many prey samples from gastrointestinal tracts often precludes unambiguous identification. We describe a procedure by which PCR amplification of taxonomically informative microsatellite loci [minor genetic variations] were used to identify species of waterfowl predated by glaucous gulls (*Larus hyperboreus*). We found that one microsatellite locus unambiguously distinguished between species of the subfamily Anserinae (whistling ducks, geese and swans) and those of the subfamily Anatidae (all other ducks). An additional locus distinguished the remains of all geese and swan species known to nest on the Yukon-Kuskokwim delta in western Alaska. The study focused on two waterfowl species which have experienced precipitous declines in population numbers: emperor geese (*Chen canagica*) and spectacled eiders (*Somateria fischeri*). No evidence of predation on spectacled eiders was observed. Twenty-six percent of all glaucous gull stomachs examined contained the remains of juvenile emperor geese.

Scribner, K., Crane, P., Spearman, W., and Seeb, L., 1998. DNA and allozyme markers provide concordant estimates of population differentiation: Analyses of U.S. and Canadian populations of Yukon River fall-run chum salmon (*Oncorhynchus keta*). *Canadian Journal of Fisheries and Aquatic Sciences/Journal Canadien des Sciences Halieutiques et Aquatiques* Ottawa 55 (7), 1748-1758. *POPULATION; fish; salmon; genetics; distribution; modeling*

Although the number of genetic markers available for fisheries research has steadily increased in recent years, there is limited information on their relative utility. This study compared the performance of different 'classes' of genetic markers (mitochondrial DNA (mtDNA), nuclear DNA (nDNA)), and allozymes, in terms of estimating levels and partitioning of genetic variation and of the relative accuracy and precision in estimating population allocations to mixed-stock fisheries. Individuals from eight populations of fall-run chum salmon (*Oncorhynchus keta*) from the Yukon River in Alaska and Canada were assayed at 25 loci. Significant differences in mitochondrial haplotype and nuclear allele frequencies were observed among five drainages. Populations from the U.S.-Canada border region were not clearly distinguishable based on multilocus allele frequencies. Although estimates of total genetic diversities were higher for the DNA loci compared with protein allozymes, estimates of the extent of population differentiation were highly concordant across marker classes. Simulations of mixed-stock fisheries composed of varying contributions of U.S. and Canadian populations revealed a consistent bias for overallocation of Canadian stocks when expected Canadian contributions varied from 0 to 40%, due primarily to misallocations among genetically similar border populations. No single marker class is superior for differentiating populations of this species at the spatial scale examined.

Scribner, K., Petersen, M., Fields, R., Talbot, S., Pearce, J., and Chesser, R., 2001. Sex-biased gene flow in spectacled eiders (*Anatidae*): Inferences from molecular markers with contrasting modes of inheritance. *Evolution* 55 (10), 2105-2115. *POPULATION; birds; waterfowl; eider; genetics; migration*

Genetic markers that differ in mode of inheritance and rate of evolution (a sex-linked Z-specific microsatellite locus, five biparentally inherited microsatellite loci, and maternally

inherited mitochondrial [mtDNA] sequences) were used to evaluate the degree of spatial genetic structuring at macro- and microgeographic scales, among breeding regions and local nesting populations within each region, respectively, for a migratory sea duck species, the spectacled eider (*Somateria fisheri*). Disjunct and declining breeding populations coupled with sex-specific differences in seasonal migratory patterns and life history provide a series of hypotheses regarding rates and directionality of gene flow among breeding populations from the Indigirka River Delta, Russia, and the North Slope and Yukon-Kuskokwim Delta, Alaska. The degree of differentiation in mtDNA haplotype frequency among breeding regions and populations within regions was high $\Phi_{ST} = 0.189$, $P < 0.01$; $\Phi_{SC} = 0.059$, $P < 0.01$, respectively). Eleven of 17 mtDNA haplotypes were restricted to a single breeding region. Genetic differences among regions were considerably lower for nuclear DNA loci (sex-linked: $\Phi_{ST} = 0.001$, $P > 0.05$; biparentally inherited microsatellites: mean $\Phi = 0.001$, $P > 0.05$) than was observed for mtDNA. Using models explicitly designed for uniparental and biparentally inherited genes, estimates of spatial divergence based on nuclear and mtDNA data together with elements of the species' breeding ecology were used to estimate effective population size and degree of male and female gene flow. Differences in the magnitude and spatial patterns of gene correlations for maternally inherited and nuclear genes revealed that females exhibit greater natal philopatry than do males. Estimates of generational female and male rates of gene flow among breeding regions differed markedly (3.67×10^{-4} and 1.28×10^{-2} , respectively). Effective population size for mtDNA was estimated to be at least three times lower than that for biparental genes (30,671 and 101,528, respectively). Large disparities in population sizes among breeding areas greatly reduces the proportion of total genetic variance captured by dispersal, which may accelerate rates of inbreeding (i.e., promote higher coancestries) within populations due to nonrandom pairing of males with females from the same breeding population.

Searing, G., 1975. Aggressive behavior and population regulation of red squirrels (*Tamiasciurus hudsonicus*) in interior Alaska, University of Alaska, Fairbanks, M.S. *POPULATION; mammals; squirrel; distribution; behavior (territorial?)*

Sedinger, J., and Raveling, D., 1988. Foraging behavior of cackling Canada goose goslings: Implications for the roles of food availability and processing rate. *Oecologia* 75 (1), 119-124.

POPULATION; birds; waterfowl; goose; nutrition; behavior (feeding)

Time spent foraging (and in other activities), rate of pecking at food items and length of foraging and nonforaging periods were studied in cackling Canada goose (*Branta canadensis minima*) goslings during brood-rearing on the Yukon-Kuskokwim Delta, Alaska in 1978 and 1979. Variation in diet suggests that preferred foods were less available at higher brood densities, resulting in annual variation in foraging behavior. Alternating patterns of foraging and nonforaging periods suggests that rate of processing limits rate of food intake because a relatively constant period of time was regularly required to empty the esophagus before foraging could be resumed. The restriction of food intake by digestive processes increased the importance of dietary nutrient concentrations because low nutrient concentrations could not be compensated for by higher rates of food intake.

Sedinger, J., 1990. Effects of visiting black brant nests on egg and nest survival. *Journal of Wildlife Management* 54 (6), 437-443. *POPULATION; birds; waterfowl; goose; researcher impact; reproduction; monitoring*

I used 2 methods to evaluate the effect of visiting black brant (*Branta bernicla nigricans*) nests on survival of whole nests and eggs in a single colony on the Yukon-Kuskokwim Delta, Alaska. The first technique regressed survival of nests or eggs during a time

interval against interval length. Departure of the y-intercept from 1.0 estimated the short-term effect of the visit at the beginning of the interval. The y-intercepts (plus or minus 95% CI) for whole nests and eggs during the egg laying period were 1.11 plus or minus 0.31 and 1.06 plus or minus 0.31, respectively. During incubation the same 2 parameters were 0.66 plus or minus 0.31 and 0.66 plus or minus 0.33. The regression method was, thus, imprecise and failed to discriminate among widely varying potential impacts of visitors. The second method involved visiting nests and then immediately revisiting them after pairs had returned to their territories. This method estimated loss of eggs as a result of displacement of territorial pairs during the first visit. Only 1 of 50 eggs was lost (n = 27 nests) as a result of visits during egg laying, whereas no eggs were lost (n = 225 eggs and 55 nests) owing to visits during the incubation period.

1997. Waterfowl and wetland ecology in Alaska. In: Milner, A., and Oswood, M., eds., *Freshwaters of Alaska Ecological Synthesis*. Ecological Studies. Springer, New York, NY, pp. 155-178. *POPULATION; birds; waterfowl; reproduction; migration; flooding; limnology; habitat selection*

In this review, I examine factors affecting the distribution of waterfowl in Alaska and their use of inland freshwater wetlands and coastal wetlands that are infrequently (less than monthly) tidally influenced. Wetlands are generally defined as areas that are at least periodically flooded but do not regularly contain standing water > 2m deep. I will first briefly review basic requirements of waterfowl during the breeding, molting, and migration periods (few waterfowl winter in Alaskan freshwaters) and how meeting these requirements is influenced by wetland processes. I then consider wetland processes themselves and conclude with a review of waterfowl distribution in Alaska and a discussion of linkages among the various temporal and spatial scales of consideration necessary to understand waterfowl ecology in Alaska.

Sedinger, J., Herzog, M., Person, B., Kirk, M., Obritchkewitch, T., Martin, P., and Stickney, A., 2001. Large-scale variation in growth of Black Brant goslings related to food availability. *Auk* 118 (4), 1088-1095. *POPULATION; birds; waterfowl; goose; brant; distribution; reproduction; growth/development; nutrition*

We examined variation in growth of Black Brant (*Branta bernicla nigricans*) goslings among two colonies on the Yukon-Kuskokwim Delta in southwestern Alaska and the Colville River Delta on Alaska's Arctic coast. We simultaneously measured abundance and quality of a key food plant, *Carex subspathacea*, and grazing pressure on that plant at the three colonies. Our goal was to measure variation in gosling growth in relation to variation in grazing pressure and food abundance because growth of goslings is directly linked to first-year survival, and consequently is the principal mechanism for density-dependent population regulation. Goslings grew substantially faster on the arctic coast and were nearly 30% larger than those on the Yukon-Kuskokwim Delta at four to five weeks old. Faster growth on the arctic coast was associated with 2X greater standing crop of *C. subspathacea* during brood rearing than on the Yukon-Kuskokwim Delta. Dispersal rates are high enough (Lindberg et al. 1998) to rule out local adaptation and genetic variation as explanations for observed variation in growth. Our results are consistent with lower survival of goslings from the Yukon-Kuskokwim Delta during their first fall migration and stronger density-dependent regulation on the Yukon-Kuskokwim Delta than on the Arctic coast.

Sedinger, J., Chelgren, N., Lindberg, M., Obritchkewitch, T., Kirk, M., Martin, P., Anderson, B., and Ward, D., 2002. Life-history Implications Of Large-scale Spatial Variation In Adult Survival Of Black Brant (*Branta bernicla nigricans*). *Auk* 119 (2), 510-515. *POPULATION; birds; waterfowl; brant; mortality; modeling*

We used capture-recapture methods to estimate adult survival rates for adult female Black Brant (*Branta bernicla nigricans*; hereafter 'brant') from three colonies in Alaska,

two on the Yukon-Kuskokwim Delta, and one on Alaska's Arctic coast. Costs of migration and reproductive effort varied among those colonies, enabling us to examine variation in survival in relation to variation in these other variables. We used the Barker model in program MARK to estimate true annual survival for brant from the three colonies. Models allowing for spatial variation in survival were among the most parsimonious models but were indistinguishable from a model with no spatial variation. Point estimates of annual survival were slightly higher for brant from the Arctic (0.90 c 0.036) than for brant from either Tutakoke River (0.85 c 0.004) or Kokechik Bay (0.86 c 0.011). Thus, our survival estimates do not support a hypothesis that the cost of longer migrations or harvest experienced by brant from the Arctic reduced their annual survival relative to brant from the Yukon-Kuskokwim Delta. Spatial variation in survival provides weak support for life-history theory because brant from the region with lower reproductive investment had slightly higher survival.

Seeb, L., and Crane, P., 1998. High Genetic Heterogeneity in Chum Salmon in Western Alaska, the Contact Zone between Northern and Southern Lineages. *Transactions of the American Fisheries Society* 128 (1), 58-87. *POPULATION; genetics; fish; salmon; chum*

Genetic relationships among 64 spawning populations of chum salmon *Oncorhynchus keta* in western Alaska were studied using allele frequency data from 40 protein-encoding loci. Two major lineages of chum salmon inhabiting Alaska were detected using clustering and multidimensional scaling analyses of Cavalli-Sforza and Edwards' chord distances. Populations of the northwest Alaska lineage occur in the largely unglaciated areas of Alaska north of the Alaska Peninsula (Beringia, the Beringian Refugium), and the Alaska Peninsula–Gulf of Alaska lineage occurs in the glaciated and unglaciated areas of the Alaska Peninsula, Kodiak Island, and southcentral Alaska. The two lineages come into contact in the 150-km area separating Herendeen Bay and Port Heiden on the northern Alaska Peninsula; this area may represent a major zoogeographic contact zone. Genetic data also suggest the lineages come in contact in upper Cook Inlet; the population representing the Susitna River drainage, which drains into Cook Inlet and the Gulf of Alaska, shows affinity to the northwest Alaska lineage. Genetic variability was higher in the Alaska Peninsula–Gulf of Alaska lineage than in the northwest Alaska lineage. A comparison of allele frequency data collected in this study with data available for Pacific Rim populations suggests that populations of the Alaska Peninsula–Gulf of Alaska lineage were derived from Cascadia (the Pacific Refugium) and belong to a larger southern lineage, which includes populations from southeast Alaska, British Columbia, and the Pacific Northwest. In contrast, populations from northwest Alaska appear to be derived from a northern lineage with affinities to Asian populations.

Selkregg, L.L., 1974-1976. Alaska regional profiles. Arctic Information and Data Center, Anchorage, Alaska. v. 6 *INCOMPLETE (need abstract); ECOLOGY*

Sharp, D., and Bernard, D., 1988. Precision of estimated ages of lake trout from five calcified structures. *North American Journal of Fisheries Management* 8 (3), 367-372. *POPULATION; fish; trout; demographics*

Precisions of estimated ages from vertebrae, cleithra, opercular bones, otoliths, and scales were measured in replicated trials on samples from lake trout *Salvelinus namaycush* from interior Alaska. Ages from all structures were similar for sexually immature lake trout. For mature lake trout, estimated ages from otoliths and from opercular bones were the most precise, although ages from opercular bones were significantly younger by a year than ages from otoliths. On this basis, otoliths and opercular bones can be used in age validation studies and scales can be used to estimate the age of immature lake trout.

Sharratt, B., 1994. Freeze-thaw and winter temperature of agricultural soils in interior Alaska. *Cold Regions Science and Technology* 22 (2), 105-111. *SOIL; freeze-thaw cycles; agriculture; ground ice / permafrost; snow*

Freeze-thaw and winter temperature of soil influences the viability of perennial plants, yet the thermal regime of agricultural soils is virtually unknown in interior Alaska. The frequency of daily freeze-thaw events in the spring and fall, winter temperature minima, and the duration of critically-low winter temperatures in the plant root zone (0.05 to 0.40 m depth) were ascertained from daily air and soil temperature data collected from September 1987 through May 1992 at Fairbanks (64 degree 51'N) and Delta Junction (63 degree 55'N). Soil freeze-thaw events at both stations occurred more frequently in spring than in fall and were influenced in part by snow cover. At Delta Junction, where persistent winds result in thin snowpacks, the lowest soil temperature observed during this study was -29.1 degree C. Temperatures at 0.05 m were lower than 0 degree and -15 degree C (lethal temperature of winter grains and legumes) for 169 and 14 consecutive days, respectively. At Fairbanks, the lowest soil temperature was -12.3 degree C. This study suggested that snow management on agricultural fields in interior Alaska can influence the frequency of soil freeze-thaw and the occurrence of lethal winter temperatures.

Shelton, P., Hartmann, A., and Allen, J., 2002. Seasonal photoperiod, gender, and P300. *Biological psychology* 60 (2-3), 151-171. *PEOPLE; health (condition); seasonality; physiology; biochemistry*

The photoperiod model of seasonal affective disorder (SAD) suggests that SAD is caused by abnormal responses to seasonal changes in day length. Clarifying the utility of event-related brain potentials (ERPs) as diagnostic aids or measures of therapeutic efficacy in SAD requires understanding the range of naturally occurring seasonal patterns of variation in human responses. This investigation studied ERPs from non-patients (402 from men, 415 from women) during the pronounced photoperiod variation of the Alaskan subarctic where light availability ranges from 3.20 h in winter to 21.98 h in summer. ANOVA showed significant (P=0.03) main effect of photoperiod in the amplitude and latency of P300 responses, as well as a main effect of sensory modality (P=0.002). There was neither a main effect of gender, nor any significant gender-interactive effect in ERP responses. In clients with SAD, the ERP variability attributed to seasonal photoperiod remains to be clarified.

Shinkwin, A., and Case, M., 1984. Modern Foragers: Wild Resource Use in Nenana Village, Alaska. Technical Paper No. 91. Alaska Department of Fish and Game, *PEOPLE; subsistence; traditional food; land use*

This study examines the relationship between Athabaskan band organization in the past and contemporary organization of society and economy of Nenana Village. The study describes and analyzes the organization of wild resource use today, participation in harvests, harvest levels, and geographic areas used for harvesting fish and wildlife.

Shults, B.S., 2001. Abundance and ecology of martens (*Martes americana*) in Interior Alaska, University of Alaska Fairbanks, M.S., 79 p *POPULATION; mammals; marten; distribution; nutrition; climate; snow; reproduction; trapping*

Summary: "I studied marten (*Martes americana*) abundance and ecology in the Yukon-Charley Rivers National Preserve during 1991-1993. Using a multiple sample, mark-recapture estimator, I estimated marten densities to be 0.69, 0.41, and 0.45 martens/km² during each August for 1991-1993, respectively. Density estimates were derived with the boundary-strip method to address the edge effect inherent in live-trapping studies. During the study, marten density declined 43% between 1991 and 1992 and remained low during 1993. I hypothesize that a decline in primary prey (i.e., microtine rodents) and increased environmental stress (i.e., cold temperatures and snow cover) contributed

significantly to the decline in marten abundance. Using carcasses provided by trappers, I documented that female martens had lower ovulation rates and overall fecundity during winter 1991-1992, and as a result of low recruitment during summer 1992, the number of martens harvested by trappers decreased 85% during the 1992-93 trapping season"

Siddall, W.R., 1955. I. Seattle and the hierarchy of central places in Alaska. II. Wholesale - retail trade ratios as indices of urban centrality. III. An historical study of the Yukon waterway in the development of interior Alaska [microform], University of Washington, M.A. *INFRASTRUCTURE; transportation; economics; history*

Simmons, R., 1984. Effects of placer mining sedimentation on Arctic grayling of interior Alaska, University of Alaska, Fairbanks, M.S., 75 p *INCOMPLETE (need abstract); POPULATION; fish; grayling; mining; sediment; limnology*

Simonetti, J., Berner, J., and Williams, K., 2001. Effects of p,p'-DDE on immature cells in culture at concentrations relevant to the [Arctic] Alaskan environment. *Toxicology in Vitro* 15 (2), 169-179. *REFERENCE; CONTAMINANTS; POPs (persistent organic pollutants); health (effects); reproduction*

Arctic Alaskan Natives who maintain a traditional lifestyle have a disease profile that is significantly different from the general US population. There is concern that food sources containing environmental pollutants may contribute to this profile. In a preliminary study, umbilical cord blood was examined for the presence of several environmental contaminants. All cord blood samples analyzed thus far contain p,p'-DDE (1,1-dichloro-2,2-bis(p-chlorophenyl)ethylene) with an average concentration of 0.33 microg/l. This study was undertaken to ascertain if this concentration of p,p'-DDE had detectable effects on immature cells in culture. NIH 3T3 (embryonic mouse fibroblast) and WS1 (human fetal fibroblast) cultures were exposed to media containing either 1 or 10 times the average cord blood concentration of p,p'-DDE. Initial experiments indicated that exposure to p,p'-DDE resulted in a decrease in the cell number of both cell types. Subsequent analysis revealed that the decrease in cell number was due to cell death in NIH 3T3 cells and to cell-cycle arrest in WS1 cells. Furthermore, p,p'-DDE decreased the long-term survival of NIH 3T3 but not WS1 cells. This study has demonstrated that p,p'-DDE, at relevant environmental concentrations, has significant effects on two immature mammalian cell types in culture. In addition, these results highlight the necessity for further studies to address the specific effects of p,p'-DDE on developing fetal systems.

Simpson, M., and Boutin, S., 1989. Muskrat, *Ondatra zibethicus*, population responses to harvest on the Old Crow Flats, Yukon Territory. *Canadian field-naturalist* 103 (3), 420-422. *POPULATION; mammals; muskrat; trapping; recovery*

Population responses to harvest were investigated in muskrats (*Ondatra zibethicus*) on the Old Crow Flats. The hypotheses of compensatory reproduction, presocial breeding and increased survival as mechanisms of recovering from high mortality in northern muskrat populations were not supported. However, more immigrants were captured on trapped than untrapped areas, supporting the hypothesis that dispersal into trapped areas is a mechanism by which muskrat populations may recover from high mortality induced by trapping. Time constraints on reproduction in northern environments may limit the number of mechanisms by which populations are able to recover from trapping.

Simpson, T., 1998. Lake productivity indices as estimators of carrying capacity for burbot and northern pike in interior Alaska, University of Alaska Fairbanks, M.S., 115 p *POPULATION; LIMNOLOGY; fish; burbot; pike; nutrition; INCOMPLETE (need abstract)*

Singleton, R.J., Davidson, N.M., Desmet, I.J., Berner, J.E., Wainwright, R.B., Bulkow, L.R., Lilly, C.M., and Siber, G.R., 1994. Decline of *Haemophilus influenzae* type b disease in a region of

high risk: impact of passive and active immunization. *Pediatric Infectious Disease Journal* 13 (5), 362-7. *PEOPLE; infants; children; respiratory infection; influenza; bacteria; health care*

Haemophilus influenzae type b (Hib) is a major cause of serious childhood bacterial infections. Before 1989 Alaska Native infants in the Yukon Kuskokwim Delta (YKD) had the highest recorded Hib disease rate, 2960:100,000 in children less than 1 year of age with 6 to 35 (mean, 13) cases/year between 1980 and 1988. In July, 1989, Alaska Area Native Health Service initiated a passive immunization project in the YKD using bacterial polysaccharide immunoglobulin (BPIG) administered at 3-month intervals to prevent Hib infections in infants less than 13 months of age. On January 1, 1991, after licensure of Hib conjugate vaccines for infants, the program was modified to a passive-active strategy using BPIG at birth and PedvaxHIB at 2, 4 and 12 months of age. Between July 1, 1989, and December 31, 1990, 80% of YKD children less than 1 year of age received at least 1 dose of BPIG. During this period there were 7 Hib cases in this age group, but only 1 of the cases had received any BPIG. Between January 1, 1991, and December 31, 1992, 4 Hib cases occurred in 2 YKD children. During the combined period, July 1, 1989, to December 31, 1992, the incidence of Hib disease for infants less than 1 year of age was 302:100,000. A dramatic decrease in Hib disease was observed in this high incidence region concurrent with implementation of passive and passive-active immunization strategies.

Singleton, G.R., Petersen, K., Berner, J., Schulte, E., Chiu, K., Lilly, C., Hughes, E., Bulkow, L., and Nix, T., 1995. Hospitalizations for respiratory syncytial virus infection in Alaska Native children. *Pediatric Infectious Disease Journal* 14 (1), 26-30. *PEOPLE; infants; children; respiratory infection; health (comparative)*

To characterize the epidemiology of Alaska Native children hospitalized for respiratory syncytial virus infections, we reviewed records of hospitalizations during the winter seasons of 1991 to 1992 and 1992 to 1993 at a hospital in Anchorage and a rural hospital in the Yukon Kuskokwim Delta (YKD) region of southwestern Alaska. The median age of hospitalization for respiratory syncytial virus infection was 2 months of age for YKD residents and 4.5 months for Anchorage residents. Sixteen percent of the hospitalized YKD children were less than 1 month of age, whereas the same was true for only 3% of the Anchorage children. Eight percent of the YKD patients required mechanical ventilation, whereas none of the Anchorage patients required ventilation. The median hospital stay was 4.8 days for YKD patients and 3.2 days for Anchorage patients. Hospitalization rates for infants less than 1 year of age were 33/1000 for Alaska Natives in Anchorage and 100/1000 for those in the YKD region. The extremely high hospitalization rate, especially among very young infants in the rural YKD region, points to a need for early preventive efforts.

Singleton, R., Karron, R., Kruse, D., Harrison, L., DeSmet, I., Davidson, N., and Petersen, K., 1998. RSV [respiratory syncytial virus] -associated hospitalizations in Alaska Native infants. *International Journal of Circumpolar Health* 57 (Supplement 1), 255-259. *PEOPLE; infants; children; health (comparative); health (condition); respiratory infection*

PURPOSE: Retrospective reviews for 1986-1992 suggested that Alaska Native children experience high rates of respiratory syncytial virus (RSV)-associated hospitalization; however, the epidemiology of RSV infections has been poorly characterized. METHODS: A prospective hospital-based surveillance study was undertaken to determine rates of RSV-associated hospitalization in Alaska Native children < 36 months from the Yukon-Kuskokwim Delta. RESULTS: During the first study year, October 1993 to September 1994, there were 40 RSV cases (hospitalization rate, 53/1,000 infants < 1 year of age); however, during the second year, October 1994 to September 1995, there were 251 RSV cases (hospitalization rate, 294/1,000 infants). An unusually high proportion, 12%, of RSV cases were < 1 month of age. Disease severity was higher for children with a history of

prematurity, heart, or lung disease ($p = .001$, X^2 analysis). Of 255 cell cultures during 1994-1995, 190 were RSV-positive, 11 were positive for influenza, 4 for adenovirus, and 1 for parainfluenza. This study demonstrates wide seasonal variation in a population with an extremely high RSV hospitalization rate; increased disease severity associated with young age and pre-existing medical conditions; and co-circulation of RSV with other viruses.

Singleton, R., Morris, A., Redding, G., Poll, J., Holck, P., Martinez, P., Kruse, D., Bulkow, L., Petersen, K., and Lewis, C., 2000. Bronchiectasis in Alaska Native children: causes and clinical courses. *Pediatric Pulmonology* 29 (3), 182-187. *PEOPLE; infants; children; health (comparative); health (condition); respiratory infection*

Although bronchiectasis has become a rare condition in U.S. children, it is still commonly diagnosed in Alaska Native children in the Yukon Kuskokwim Delta. The prevalence of bronchiectasis has not decreased in persons born during the 1980s as compared with those born in the 1940s. We reviewed case histories of 46 children with bronchiectasis. We observed that recurrent pneumonia was the major preceding medical condition in 85% of patients. There was an association between the lobes affected by pneumonia and the lobes affected by bronchiectasis. Eight (17%) patients had surgical resection of involved lobes. We conclude that the continued high prevalence of bronchiectasis appears to be related to extremely high rates of infant and childhood pneumonia.

Skaugstad, C., 2001. Management report for the Stocked Waters Program, Region III, 1999-2000. Fishery management report (Anchorage, Alaska) ; no. 01-12. Alaska Dept. of Fish and Game, Division of Sport Fish, Research and Technical Services, Anchorage.

<http://www.sf.adfg.state.ak.us/FedAidPDFs/fmr01-12.pdf> *POPULATION; fish; management; fishing*

Slaughter, C., Glotov, V., Viereck, L., and Mikhailov, V., 1995. Boreal forest catchments: Research sites for global change at high latitudes. *Water, Air, & Soil Pollution* 82 (1-2; BOREAL FORESTS AND GLOBAL CHANGE), 351-361. *CLIMATE; hydrology; ground ice / permafrost; vegetation; NUTRIENT CYCLING; carbon*

Circumpolar subarctic boreal forest ecosystems are subject to change from a variety of agents and processes. Climate warming predicted by many GCMs indicates that regions north of 60 degree N may be subjected to major warming in coming decades, producing increased permafrost thaw, altered vegetation distribution and biological productivity, and perhaps release of large quantities of stored organic carbon into the global carbon cycle. Research into change in ecosystems can entail use of ecosystem "samples," i.e., sectors of landscape such as catchments (watersheds) which are representative of the larger ecoregion and available repeated, long-term measurement and analysis. Boreal forest research and monitoring programs have been established in hydrologically-defined catchments in discontinuous-permafrost regions at 65 degree N, 148 degree W in the Yukon-Tanana Uplands of central Alaska, and at 62 degree N, 158 degree W in the Kolyma River headwaters of Magadan Oblast, northeastern Russia. These sites are available for sustained research into global change.

Slough, B., and Mowat, G., 1996. Lynx population dynamics in an untrapped refugium. *Journal of Wildlife Management* 60 (4), 946-961. *POPULATION; mammals; lynx; snowshoe hare; trapping*

Refugia from trapping are believed to be important to support a long-term sustainable harvest of Canada lynx (*Lynx lynx*), but long-term studies in unharvested areas are lacking. We studied lynx population characteristics in relation to snowshoe hare (*Lepus americanus*) densities in a 301 km² refugium in the Yukon Territory between 1986 and 1994. Lynx carcasses were collected from adjacent trapping concessions for analysis of

attributes of the harvested population. Hare density peaked in summer 1990 and began to decline in the winter of 1990-91. Lynx density in March varied with hare density from 2.7/100 km² in 1987 to 44.9/100 km² in 1991-92. The lynx population doubled annually for 4 years when reproduction and kit and adult survival were high, and immigration balanced or exceeded emigration. High mortality and emigration characterized the lynx decline. Proportions of breeding adults were 100% most years, including the first year of declining hare densities, but zero in the following 2 years. Yearling females reproduced only in the 2 years of highest hare numbers. Kit survival, which was 0% in 1986-87, peaked at 75% for kits of adult females and 26% for kits of yearlings in 1990-91. Emigration peaked annually from March-June, was lowest Sept.-Oct., and was not sex-biased. At least 16% (n = 22) of emigrants were trapped or shot. Seventeen lynx (14M, 3F) emigrated 100-1100 km. Annual natural mortality rates were under 11% for the first 6 years of study, including 2 years of hare decline, 60% in 1992-93 and 25% in 1993-94. The carcass sample contained 36% fewer kits, 40% more yearlings, and 4% fewer adults than were present on the study area, reflecting the lower birth and survival rates of kits of yearling females and trapping bias. Mean annual lynx home range size did not vary with hare density, until 1992-93 when male ranges increased markedly, and 1993-94 when female ranges increased. We recommend a network of permanently assigned untrapped areas to facilitate normal lynx population responses to changing snowshoe hare densities, to prevent local extinctions, and to maximize lynx harvests over a complete population cycle.

Slough, B., 1999. Characteristics of Canada Lynx, *Lynx canadensis*, Maternal Dens and Denning Habitat. *Canadian field-naturalist* 113 (4), 605-608. *POPULATION; mammals; lynx; behavior (reproductive/nesting); reproduction*

Female Canada Lynx (*Lynx canadensis*) use maternal dens from birth until the kits are weaned and foraging with their mothers. I inspected 39 den sites during a long-term study of lynx population dynamics in southwestern Yukon. Most dens were under deadfall debris in burns, which predominated in the study area. Blowdown debris, mature and shrub subalpine fir trees, and willow shrub thickets were also used for denning in burned or unburned areas. Dens were generally located mid-slope and faced south or southwest. Dens were not re-used in subsequent years. Den sites of neighbouring females, and sites used by females in different years, were as close as 300 m. Females occasionally relocated dens even when not disturbed by the investigators. Den sites are an important habitat feature which, along with foraging habitat, cover and travel corridors, may enhance lynx recruitment. Den site availability should be taken into consideration when managing or assessing changes to lynx habitats.

Smidt, S., and Oswood, M., 2002. Landscape patterns and stream reaches in the Alaskan taiga forest: potential roles of permafrost in differentiating macroinvertebrate communities.

HYDROBIOLOGIA -THE HAGUE 468 (1/3), 95-105. *CLIMATE; ground ice / permafrost; HYDROLOGY; POPULATION; invertebrates; vegetation*

We investigated spatial variability in the community structure of stream macroinvertebrates at six reaches within Caribou-Poker Creeks Research Watershed in the Alaskan taiga forest. Stream reaches differed most notably in river continuum position (stream orders 1-4) and influence of permafrost. Permafrost may underly much of an entire watershed or may be only locally present in valley bottoms. Permafrost distribution influences hydrology, water temperature, and riparian vegetation. We sampled benthic macroinvertebrates six times during the ice-free season between June 1995 and June 1996. Mean invertebrate abundance (range: 1160-14494 individuals/ m²) was significantly different among sites, the lower values occurring in stream reaches affected by the local presence of permafrost and the highest value in a headwater stream unaffected by permafrost. Taxonomic composition of the macroinvertebrate community

also differed among reaches, with the quantity of watershed-level permafrost and stream size providing the strongest influences. This research highlights the importance of permafrost at two spatial scales (watershed and reach) for macroinvertebrate communities of headwater streams at high latitudes.

Smith, D., Sandor, G., MacLeod, P., Tredwell, S., Wood, B., and Newman, D., 1981. Intrinsic defects in the fetal alcohol syndrome: studies on 76 cases from British Columbia and the Yukon Territory. *Neurobehavioral toxicology and teratology* 3 (3), 145-152. *PEOPLE; children; infants; alcohol; health (effects); growth/development; deformity*

Children diagnosed as FAS using standard criteria of maternal alcoholism, poor growth, delayed development and characteristic facial appearance underwent an investigative protocol involving skeletal x-ray surveys, cardiac assessments and intravenous pyelograms (IVP). Significant skeletal findings included cervical spine fusion in 20 of 46 children (43%), x-ray confirmation of microcephaly in 26/49 (53%) and abnormal thoracic cage development in 13/48 (27%). Thirty-nine of 54 children (72%) demonstrated a characteristic tapering of the shaft and occasional associated prominence of the tuft of the distal phalanges Bone age was delayed 2 standard deviations or greater in 14 of 51 children (27%). Cardiac lesions were found in 31 of 76 (41%) and a further 12 (16%) had functional murmurs. Lesions were ventricular septal defect 20 (26%), Tetralogy of Fallot 4 (5.1%), plus a variety of less frequent abnormalities. IVP's were limited to 19 random cases with 5 (26%) showing alterations from the normal. Cervical spine abnormalities of FAS as compared to the Klippel-Feil Syndrome are dissimilar and probably represent a different entity. Hand and lateral cervical spine x-ray studies are felt to be a useful adjunct to the diagnosis and management of the fetal alcohol syndrome.

Smith, S.L., 1996. Effects of MTBE, ethanol, and sub-arctic winter temperatures on Alaskan gasoline odor thresholds, University of Alaska Fairbanks, M.S., 248 p *AIR QUALITY; contaminants; POL (petroleum/oil/lubricants = hydrocarbons)*

Sniffen, M., and Carrington, T., 1914. The Indians of the Yukon and Tanana Valleys, Alaska. Indian Rights Association, Philadelphia. *PEOPLE; subsistence; land use; population; health (condition)*

Sovell, J.R., and Holmes, J.C., 1996. Efficacy of ivermectin against nematodes infecting field populations of snowshoe hares (*Lepus americanus*) in Yukon, Canada. *Wildlife Disease* 32 (1), 23-30. *POPULATION; mammals; snowshoe hare; health (comparative); parasitic infection; health care*

From July 1990 to February 1991, nematode [flatworms] numbers in free-ranging snowshoe hares (*Lepus americanus*) at Kluane Lake, southwestern Yukon, Canada, were manipulated by subcutaneous injection (0.4 mg/kg) of ivermectin. Three field experiments were conducted to determine the degree of helminth loss associated with a single administration of ivermectin; the length of time that ivermectin was effective in reducing worm numbers; and the effect of repeated ivermectin administration in reducing worm numbers. Numbers of the nematodes, *Protostrongylus boughtoni* and *Nematodirus triangularis* were reduced by approximately 80% 2 wk after treatment with a single dose of ivermectin, and were still significantly lower than controls at 4 wk. However, beyond 2 wk, ivermectin did not affect the rate of acquisition of new worms of either species. All treated groups contained one or more hares in which numbers of *P. boughtoni* and *N. triangularis* were not reduced. In addition, ivermectin had no effect on numbers of *Trichuris leporis* or *Passalurus* sp. Overall, ivermectin was not as effective against the nematodes of free-ranging hares as has been reported for nematodes of domestic and laboratory animals.

Spence, C.E., Kenyon, J.E., Smith, D.R., Hayes, R.D., and Baer, A.M., 1999. Surgical sterilization of free-ranging wolves. *Canadian Veterinary Journal* 40 (2), 118-21. *POPULATION; mammals; wolf; reproduction; management*

The objective of the study was to determine whether surgical sterilization of both males and females in wolf pairs alters basic wolf social and territorial behaviors. Wolves were located from the air by snow-tracking methods and were tranquilizer-darted from a helicopter. Surgeries were performed either in a tent at the capture site or in a heated building in a nearby village. Six vasectomies and seven uterine horn ligations were performed in January and February of 1996 and 1997. Two females died: one likely related to the capture procedure, the other of a peritonitis unrelated to the surgery. One wolf had a litter. None of the wolves have shown changes in behavioral patterns. Surgical sterilization can be effective, but other, less invasive, fertility control techniques should be investigated.

Spindler, M., and Martin, P., 2001. Summer movements of white-fronted geese that nest in the taiga of Northwest and Interior Alaska. *Proceedings 10th North American Arctic Goose Conference (World Meeting Number 000 5496)*, Quebec (Canada) *INCOMPLETE (need abstract); POPULATION; migration; goose*

Springer, A., Walker, W., Rosebrough, W., Benfield, D., Ellis, D., Mattox, W., Mindell, D., and Roseneau, D., 1984. Origins of organochlorines accumulated by peregrine falcons, *Falco peregrinus*, breeding in Alaska and Greenland. *Canadian field-naturalist* 98 (2), 159-166.

CONTAMINANTS; POPs (persistent organic pollutants); birds; raptor; peregrine falcon
Differential productivity among populations of Peregrine Falcons breeding in Greenland and in Arctic and interior Alaska was found to be closely associated with DDE levels in unhatched eggs and in the lipids of eggshell membranes. Relatively higher levels of dieldrin in Arctic Alaska and of mirex in interior Alaska, compared to DDE, indicated regional differences in exposure, either in South America, or through the consumption on the breeding grounds of migrant prey species. The general features of the "fingerprint" profile of organochlorine contaminants throughout Alaska and Greenland, however, were markedly different from the profile of the same synthetic organochlorines measured in unhatched eggs of Peregrine Falcons breeding in California, where several of the organochlorine insecticides are no longer used.

Stefan, C., and Krebs, C., 2001. Reproductive changes in a cyclic population of snowshoe hares. *Canadian Journal of Zoology/Revue Canadien de Zoologie* 79 (11), 2101-2108.

POPULATION; mammals; snowshoe hare; reproduction; growth/development

Reproductive output was estimated for a cyclic population of snowshoe hares (*Lepus americanus*) in the Kluane Lake region of the southwest Yukon Territory. Data collected by five researchers were collated over 8 years (1989-1996). Pregnant hares were captured and held in cages until they gave birth so that reproductive characteristics could be measured. Pregnancy rate, litter size, and neonate size fluctuated significantly throughout the cycle, changes occurring about 2 years before corresponding changes in density. Pregnancy rates were nearly 100% early in the breeding season, but declined up to 20% in the last gestation periods of the year. The number of litters produced in a breeding season varied between two (decline phase) and four (low, early increase phase). Litter size varied among years as well as among litters within a year, larger litters being born later in the breeding season. The body mass and size of newborn hares varied by 5-33% among years. The combined changes in pregnancy rate and litter size resulted in a cyclic change in total reproductive output ranging from a low of 6.9 young per female during the decline phase to a maximum of 18.9 during the second year of the low and early increase phases.

Stehn, R.A., Dau, C.P., Conant, B., and Butler, W.I., Jr, 1993. Decline of spectacled eiders nesting in western Alaska. *Arctic* 46, 264-277. *INCOMPLETE (need abstract); POPULATION; birds; waterfowl; eider*

Stewart, P., and Steckle, J., 1987. Breastfeeding among Canadian Indians on-reserve and women in the Yukon and N.W.T. *Canadian Journal of Public Health* 78 (4), 255-261. *INCOMPLETE (need abstract); PEOPLE; infants; nutrition*

Stickney, A., 1984. Coastal Ecology and Wild Resource Use in the Central Bering Sea Area: Hooper Bay and Kwigillingok. Technical Paper No. 85. Alaska Department of Fish and Game, *PEOPLE; subsistence; traditional food; land use*

This study provides subsistence information for two coastal communities in the Yukon-Kuskokwim Delta: Hooper Bay and Kwigillingok. Information about the range and extent of subsistence activities, knowledge of the local environment, limitations posed by that environment, and ecological adaptations are presented. Demographic and socioeconomic descriptions of each community are provided.

Still, P.J., 1980. Index of streamflow and water-quality records to September 30, 1978, Yukon Basin, Alaska. Open-file report ; 80-552. U.S. Geological Survey, Anchorage. *WATER QUALITY; surface water; HYDROLOGY; monitoring*

Stone, D., and Clarke, G., 1996. In situ measurements of basal water quality and pressure as an indicator of the character of subglacial drainage systems. *Hydrological Processes* 10 (4), 615-628. *WATER QUALITY; surface water; glacial discharge*

Continuous subglacial measurements of turbidity and electrical conductivity - two indicators of basal water quality - can be used to help characterize subglacial drainage systems. These indicators of water quality yield information that complements that provided by water pressure measurements. Quantitative attributes of subglacial drainage systems, such as water velocity and subglacial residence time, as well as qualitative behaviour - for example, spatial and temporal variations in system morphology - can be deduced using water quality measurements. Interpretation is complicated by the many potential influences on turbidity and electrical conductivity, but when these complications are appreciated a richer interpretation results. To demonstrate the utility of basal water quality measurements, observations from Trapridge Glacier, Yukon Territory, Canada were examined. The data reveal complex behaviour of the drainage system, but constraints imposed by basal water quality measurements help to clarify the nature of the subglacial flow system. The measurement and interpretation methods described and demonstrated are applicable to other glaciers. As such, they should prove useful for characterizing different subglacial drainage configurations and behaviours, thereby improving our general understanding of the hydrology and dynamics of wet-based glaciers.

Stone, K., Flynn, R., and Cook, J., 2002. Post-glacial colonization of northwestern North America by the forest-associated American marten (*Martes americana*, Mammalia: Carnivora: Mustelidae). *Molecular Ecology* 11 (10), 2049-2063. *POPULATION; mammals; marten; genetics; distribution; vegetation*

Phylogeographic patterns were used to assess intraspecific diversification of American martens (*Martes americana*). Within martens, two morphological groups (*americana* and *caurina*) have been recognized, though the level of distinction between them has been debated. We examined mitochondrial cytochrome b gene haplotypes from 680 martens to explore the colonization history of the Pacific Northwest and found two clades that correspond to the morphological groups. The widespread *americana* clade extends from interior Alaska south to Montana and eastward to Newfoundland and New England (i.e.

northwestern, north-central and northeastern North America). The caurina clade occurs in western North America, minimally extending from Admiralty Island (southeastern Alaska) south to Oregon and Wyoming. Our data indicated two colonization events for the Pacific Northwest (one by members of each clade) and were consistent with the persistence of populations throughout past glacial periods in eastern and western refugia. Due to vegetational and geological history following the past deglaciation, we hypothesize that martens of the caurina clade spread along the North Pacific Coast, and into southeastern Alaska, earlier than martens of the americana clade. Mismatch distributions for the americana clade were indicative of populations that recently experienced demographic expansion, while mismatch distributions for the caurina clade suggested that populations were at equilibrium. These clades are reciprocally monophyletic and distinctive (interclade divergence ranged from 2.5 to 3.0% (uncorrected p), whereas, intraclade divergence was < 0.7%), and two regions of sympatry have been identified. Genetic signatures of past admixture in hybrid zones may have been extinguished during subsequent glacial periods when ranges contracted. This recurrent pattern of relatively restricted western, or Pacific coastal, lineages and more widespread eastern, or interior continental, lineages exists across broad taxonomic groups and suggests a shared biogeographical history.

Storvold, R., 2001. Experimental and theoretical investigation of stratospheric ozone depletion in the northern hemisphere caused by heterogeneous chemistry, University of Alaska Fairbanks, Ph. D., 136 p *AIR QUALITY; monitoring; modeling; ozone; acidification; sulfur; nitrogen*

"Stratospheric ozone is of crucial importance for life on Earth. This thin layer protects us from the ultraviolet solar radiation and also works as a greenhouse gas that helps maintain our climate. Large changes in thickness and vertical distribution of the ozone abundance may have detrimental effects on life on Earth. But even small changes could have considerable impact on UV irradiance, bio-production and cancer rates. During the last decade record low spring time vertical column amounts of stratospheric ozone have been observed over Northern Europe. However, this decrease is not as severe as the depletion observed over Antarctica and at mid-latitudes in the Southern Hemisphere. The discovery of the spring time stratospheric ozone depletion first in Antarctica and later in the Arctic has triggered international research efforts on stratospheric ozone chemistry and the possible effects of human activities on the ozone layer. Ground-based differential optical absorption spectroscopy measurements of NO₂ and ozone have been performed over Fairbanks (65°N) and Ny-Alesund (79°N) during the 1994-95 season. In this work we present improvements to ground based differential optical spectroscopy measurements by improving dark current corrections and spectral fitting of spectrographic photo diode array detector measurements. We have also improved the retrieval of vertical column amounts from diffuse light measurements by improving the corrections for seasonal changes in absorber air mass. This is particularly important at high latitudes. We used these data with local weather and ozone sounding data, and with trace gas and aerosol data measured by other ground based instruments and by instruments deployed on satellites. This comprehensive dataset was used to investigate the performance of two currently used models of heterogeneous chemistry. These are the University of Cambridge SLIM-CAT model and the University of Oslo SCTM-1 model. They were selected because the SLIMCAT is designed for process studies and comparison with measured data while the SCTM-1 is designed for prognostic and sensitivity studies aimed at predicting future development of the stratospheric ozone layer. We have used the models to study the sensitivity of the heterogeneous chemistry to stratospheric meteorological conditions and the effect of sulfuric acid aerosols and

polar stratospheric clouds on the stratospheric ozone abundance and ozone chemistry at high- and mid-latitudes in the Northern Hemisphere"

Streletski, A., 1995. Bioeconomics and the management of a sequential fishery: The commercial and subsistence fisheries for chum salmon on the Yukon River: Fairbanks, AK (USA), University of Alaska Fairbanks, M.S., 111 pages p *POPULATION; fish; chum; salmon; modeling; management*

Management of the Yukon River chum salmon *Oncorhynchus keta* fishery is complicated by the mixing of stocks from numerous spawning areas, limited understanding of stock dynamics, inexact measures of run strength, and the sequential exposure of the returning fish to different user groups in Alaska and Canada. A stochastic simulation model is used to examine the consequences of alternative strategies for the management of commercial catches. The eight strategies are evaluated using three criteria: probability of satisfying escapement objectives; probability of jointly satisfying escapement and subsistence harvest objectives; and probability of simultaneously reaching escapement, subsistence and commercial harvest objectives while satisfying treaty obligations with Canada. The results indicate that the Upper Yukon harvest goals cannot be consistently achieved unless catches in the lower Yukon River are restricted below their 1980-1993 average. In addition, the simulation model was used to explore the effects of increasing average run strength.

Strong, W., 2002. Lodgepole pine/Labrador tea type communities of western Canada. Canadian Journal of Botany/Revue Canadien de Botanique 80 (2), 151-165. *VEGETATION; ecology; hydrology; distribution*

Lodgepole pine/Labrador tea (*Pinus contorta* Dougl. ex Loud. var. *latifolia*/Ledum groenlandicum Oeder) relevés were classified and characterized based on data from archival sources (n = 428). Eleven forest communities were recognized and were distinguished by the relative dominance of Sphagnum, Cladina and Cladonia, Lycopodium, Vaccinium species, or feathermosses. *Picea mariana* (Mill.) BSP was the common secondary successional species. Most paired-community comparisons were nonoverlapping in ordination space, although intermingling sometimes occurred along interfaces. Lodgepole pine/Labrador tea stands occurred on upland sites within the boreal-cordilleran ecoclimatic transition zone along the eastern slopes of the Rocky Mountains from southwestern Alberta to the southern Yukon Territory. Nine communities had mesic to subhygric moisture and submesotrophic to mesotrophic nutrient regimes. The exceptions were a *Pinus contorta*/Ledum groenlandicum/Sphagnum (wetter sites) and a *Pinus contorta*/Ledum groenlandicum/Cladina mitis (drier sites) community. An inverse correlation occurred between latitudinal location and elevation of occurrence ($r = -0.56$, $P < 0.001$, $n = 403$) with a northward decline of 65 m/100 km. The concept of a "type community" is proposed for formally documenting the composition of plant communities and optimizing the comparability of different types. Eight of the recognized communities fulfilled the proposed criteria for a type community and two were considered provisional types.

Stuart-Smith, A., and Boutin, S., 1995. Predation on red squirrels during a snowshoe hare decline. Canadian Journal of Zoology/Revue Canadien de Zoologie 73 (4), 713-722.

POPULATION; mammals; predation; squirrel; snowshoe hare

We examined the extent and impact of predation on red squirrels (*Tamiasciurus hudsonicus*) during a cyclic decline of snowshoe hares in the southwestern Yukon, Canada. We monitored survival of squirrels on three control grids and a predator exclosure from March 1991 through August 1993. On controls, adult survival during the breeding season decreased from 1991, when snowshoe hare populations were high, to 1992, when hare populations declined rapidly. Survival increased slightly in 1993, when hare and predator populations were very low. Similarly, adult survival during winter was

lower in 1992-1993 than in 1991-1992. Adult survival on the enclosure remained similar in each breeding season but declined during winter 1992-1993. Adult survival was similar on the controls and the enclosure in each year except during winter 1991-1992 and the 1992 breeding season, when it was lower on the controls. There was no difference in juvenile survival between the controls and the enclosure. Despite the decrease in adult survival due to predation, there was no population decline on any of the control grids. We conclude that predation did not have a measurable impact on red squirrel densities at Kluane and that it is unlikely red squirrels show 10-year population cycles in conjunction with snowshoe hares.

Stuby, L.A., and Evenson, M.J., 1999. Burbot Research in Rivers of the Tanana River Drainage, 1998. Fishery data series ; no. 99-36. Alaska Dept. of Fish and Game, Division of Sport Fish, Anchorage. *INCOMPLETE (need abstract); POPULATION; fish; burbot; distribution; management*

Stuby, L., 2001. Salmon studies in interior Alaska, 2000. Fishery data series 01-24. Alaska Dept. of Fish and Game, Division of Sport Fish, Policy and Technical Services, Anchorage. Abstract at <http://www.sf.adfg.state.ak.us/statewide/divreports/html/details.cfm?id=1703>, full text at <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds01-24.pdf> *POPULATION; fish; salmon; chinook; chum; coho; management; distribution; morphology*

Attempts were made to acquire estimates of escapement for chinook salmon

Oncorhynchus tshawytscha for the Chena and Chatanika rivers near Fairbanks, Alaska, using tower-count methodology. The counts were conducted from 29 June to 12 August for the Chena River and 4 July to 4 August for the Chatanika River. High water and subsequent poor visibility precluded acquisition of complete tower estimates for both rivers. The incomplete tower estimates for chinook salmon were 1,903 (SE = 165) for the Chena River and 398 (SE = 83) for the Chatanika River. A mark-recapture estimate was subsequently conducted on the Chena River in order to acquire a total estimate of abundance, which was 4,694 (SE = 1,184) chinook salmon. An aerial-survey count of chinook salmon during the period of maximum escapement was 934 for the Chena River, which was 0.21 of the mark-recapture estimate. For the Chena River, age, sex, and length compositions were examined by means of carcass and electroshock surveys, with the latter used to estimate compositions because it showed less bias with respect to gender. Males composed 0.66 (SE = 0.04) of the carcass samples and 0.80 (SE = 0.02) of the electroshocked samples. The majority of males examined were age 1.3 (0.36) and the rest comprised ages 1.1 (0.01), 1.2 (0.30), 1.4 (0.12), and 1.5 (0.01). The majority of females were age 1.4 (0.17) and the rest comprised 1.3 (0.03) and 1.5 (0.02). A carcass survey was conducted on the Chatanika River to estimate age, sex, and length compositions. The majority of males were age 1.3 (0.67) and the rest comprised 1.2 (0.25) and 1.4 (0.08). The majority of females were age 1.4 (0.64) and the rest 1.3 (0.36). A portion of the escapement of chum salmon *Oncorhynchus keta* for the Chena and Chatanika rivers were also estimated during the tower-counts. The incomplete estimate of escapement for chum salmon was 3,515 (SE = 300) for the Chena River and 944 (SE = 138) for the Chatanika River. The Bering Sea Fishermen's Association conducted tower counts of salmon on the Salcha River from 30 June to 12 August along with a carcass survey to estimate age, sex, and length compositions. High water also precluded acquisition of complete estimates of escapement for the Salcha River. The incomplete estimates of escapement were 3,140 (SE = 165) chinook salmon and 20,516 (SE = 403) chum salmon. A total estimate of 4,595 (SE = 802) chinook salmon was calculated by expanding missed counts based on historic run timing patterns. The majority of males were age 1.3 (0.57) and the rest comprised ages 1.2 (0.30) and 1.4 (0.13). The majority of females were age 1.3 (0.39) and 1.4 (0.39) and the rest comprised ages 1.2 (0.11) and 1.5 (0.11). Escapement

of coho salmon *Oncorhynchus kisutch* was enumerated for the Delta Clearwater River by means of a boat survey. A count of coho salmon in the mainstem river was 9,225 on 24 October. An expansion of 2,364, which was based on five years of aerial survey data of river tributaries that were not boat accessible, was added to the boat survey for a total escapement of 11,589 coho salmon. An aerial survey count of coho salmon on 26 October was 2,175 for the Richardson Clearwater River.

Sugai, S., and Schimel, J., 1993. Decomposition and biomass incorporation of super(¹⁴C)-labeled glucose and phenolics in taiga forest floor: Effect of substrate quality, successional state, and season. *Soil Biology and Biochemistry* 25 (10), *POPULATION; microbes; NUTRIENT CYCLING; vegetation; soil; biochemistry; metabolism; enzymology; flooding*

Forest floor samples from early, intermediate and mature successional sites in the taiga of interior Alaska were exposed to ¹⁴C-labeled glucose and two phenolic acids. Our results indicate that microbes present in the taiga forest floor metabolized phenolics. At all sites, biomass incorporation of glucose as measured by the fumigation-extraction technique was approximately twice that for the phenolics, while respiration of ¹⁴CO₂ was significantly higher for the phenolic compounds. Major differences in ¹⁴C allocation were seen even between phenolic compounds with similar structures. Despite large differences in litter and forest floor composition, the metabolism of our model compounds varied only slightly between successional stages. Seasonal and successional effects were considerably less than those arising from the substrate quality with variation greater in the uplands (where succession is fire-dominated) than in the floodplains (where river erosion and deposition are the controlling factors). Any physiological variation in microbial communities through succession must therefore be in organisms which produce exoenzymes that break down primary polymers, rather than in organisms and pathways that use the monomer breakdown products.

Sullivan, M., Samis, S., Servizi, J., and Gordon, R., 1985. Survey of selected British Columbia and Yukon salmon streams for sensitivity to acidification from precipitation. # 1388. Department of Fisheries and Oceans, Vancouver, B.C. (Canada). *WATER QUALITY; snow; acidification; metals*

Surface water samples from 174 Pacific salmon streams on the British Columbia North Coast, Queen Charlotte Islands, Vancouver Island, Sunshine Coast and Lower Mainland of British Columbia and near Whitehorse in the Yukon were collected between 1982 and 1983 and analyzed for pH, alkalinity and metals. Snow samples were collected in 1983 from 26 of the watersheds drained by these streams and analyzed for pH, alkalinity and metals.

Sumida, V., and Alexander, C., 1985. Moose Hunting by Residents of Beaver Birch Creek, Fort Yukon, and Stevens Village in the Western GMU 25D Permit Moose Hunt Area, 1984-85. Technical Paper No. 121. Alaska Department of Fish and Game, *PEOPLE; traditional food; land use; management*

This report describes the general moose hunting patterns of residents of four communities in the Yukon Flats, in northeastern interior Alaska. Information is presented on socioeconomic characteristics of the communities, harvest methods and hunting strategies, geographic use areas, the regulatory history of the area, and harvests during the 1984-85 season.

Sumida, V., 1986. Land and Resource Use Patterns in the Yukon Flats: Stevens Village. Technical Paper No. 129. Alaska Department of Fish and Game, *PEOPLE; subsistence; traditional food; land use*

This report describes the contemporary harvest and use of fish and wildlife resources in the community of Stevens Village. An overview of the history of the area, the local environment, and socioeconomic characteristics of the community is presented. The

harvesting, processing, and distribution of resources is described, including contemporary information on geographic areas used by Stevens Village residents.

Sumida, V., and Alexander, C., 1986. Patterns of Land and Resource Use in Beaver, Alaska. Technical Paper No. 140. Alaska Department of Fish and Game, *PEOPLE; traditional food; distribution; land use*

This study documents the patterns of fish and wildlife harvest by residents of Beaver, a community along the upper Yukon River in Alaska. All 31 households in this small community were interviewed and all harvested some type of local fish, mammal, bird, or plant resources during the study year, 1985-86. Per capita harvests were 730 pounds with salmon comprising 56.8 percent of total edible weight of all fish and wildlife species harvested. The study found that households with high production levels were larger, had more members over 16 years of age, owned more equipment, and had more dogs than households with medium and low production levels. Research findings demonstrate that subsistence production and distribution of wild resources remained an integral component of life in this remote community, integrated with participation in the cash sector of the local economy.

Sumida, V., and Andersen, D., 1990. Patterns of Fish and Wildlife Use for Subsistence in Fort Yukon, Alaska. Technical Paper No. 179. Alaska Department of Fish and Game, *PEOPLE; subsistence; traditional food; distribution; land use*

This study examines subsistence harvest activities and the mixed economy of Fort Yukon, Alaska. Data collection took place from August 1987 through October 1988. While Fort Yukon is relatively large (population 584) and functions as a regional supply and administrative center for the Yukon Flats region, its harvest patterns indicate a substantial reliance on subsistence foods more typical of smaller communities. The estimated total edible weight of resources harvested by Fort Yukon residents during the survey year was 625,725 pounds. This provided an average household harvest of 2,951 pounds and an average per capita harvest of 1,071 pounds. Almost two-thirds of the total harvest consisted of salmon. Other major food resources included moose, whitefish, sheefish, northern pike, snowshoe hare, and caribou.

Sumner, P., 1964. Ecology of *Ledum groenlandicum* oeder in Interior Alaska, University of Alaska Fairbanks, M.S., 174 p *VEGETATION; labrador tea; ecology*

Suter, S.M., 1992. The morphology and chemistry of two willow species in relation to moose winter browsing, University of Alaska Fairbanks, M.S., 87 p *VEGETATION; willow; herbivory (mammal); chemical defense; growth/development*

Svete, P.A., 1999. Secondary reproductive strategies in Pacific black brant (*Branta bernicla nigricans*), University of Alaska Fairbanks, M.S., 39 p *POPULATION; birds; waterfowl; goose; reproduction; behavior (reproductive/nesting); genetics*

Summary: "Waterfowl are known to use secondary reproductive strategies, both extra-pair copulations and intraspecific brood parasitism, to increase fitness. We used five polymorphic microsatellite loci to determine extra-pair paternity and nest parasitism in 30 nests of Pacific Black Brant geese (*Branta bernicla nigricans*) containing 108 offspring. Fourteen of the 30 nests contained offspring that were not genetically related to one or both of the attending adults: 6.5% (7/108) of the offspring resulted from extra-pair copulations (EPC); 13.9% (15/108) of the offspring resulted from intraspecific brood parasitism (IBP). All offspring resulting from EPCs were produced during the peak period of nest initiation. Adult females hosting parasitic eggs were significantly older than non-hosts. After accounting for eggs resulting from IBPs in the calculated clutch size, clutches containing IBPs were significantly smaller than unparasitized clutches. Our data

indicate that secondary strategies represent an important component of reproductive effort in Black Brant"

Swadling, K., Pienitz, R., and Nogrady, T., 2000. Zooplankton community composition of lakes in the Yukon and Northwest Territories (Canada): relationship to physical and chemical limnology. *Hydrobiologia* 431 (2-3), 211-224. *POPULATION; invertebrates; microbes; LIMNOLOGY; water quality; vegetation*

We analysed associations between zooplankton species composition and local abiotic factors in 30 lakes located along a 900 km south-north transect from Whitehorse (Yukon Territory) to Inuvik (Northwest Territories). The lakes were situated in three broadly defined vegetation zones: (i) Boreal forest (between Whitehorse and Dawson City), (ii) alpine tundra (Ogilvie mountains north of Dawson City) and (iii) subarctic forest-tundra (near Inuvik). Lakes in the alpine tundra were characterised by lower conductivity, temperature, chlorophyll a and nutrients than those in the other two zones. Those in the forest-tundra were generally small and shallow, and had higher chlorophyll a concentrations than lakes further south. Lakes in forested catchments spanned a larger latitudinal range and exhibited a greater variety of physical and chemical characteristics. However, they were generally deeper, with higher conductivity, temperature and ionic concentrations. Forty-one zooplankton taxa were identified from the 30 lakes, of which the most frequently occurring were the rotifers *Conochilus unicornis*, *Kellicottia longispina*, *Keratella cochlearis* and *Polyarthra vulgaris*, the cladocerans *Daphnia middendorffiana* and *Bosmina longirostris*, and the copepods *Leptodiatomus pribilofensis*, *Heterocope septentrionalis* and *Cyclops* spp. The lakes contained between two and fifteen species (mean = 6.9). Alpine tundra lakes contained slightly less species (mean = 5.8) than those at lower elevations; in particular the cladoceran fauna was depauperate or absent. Relationships among the lakes, species and environmental factors were examined using canonical correspondence analysis, with forward selection and associated Monte Carlo permutation tests. Chloride, silica and temperature showed statistically significant relationships with species distribution, and together these abiotic factors explained 25% of the variation in zooplankton communities within Yukon and Northwest Territories lakes.

Swanson, D., 1996. Susceptibility of permafrost soils to deep thaw after forest fires in interior Alaska, U.S.A., and some ecologic implications. *Arctic and Alpine Research* 28 (2), 217-227. *SOIL; ground ice / permafrost; wildfire; vegetation*

Some soils with permafrost thaw deeply and become drier after forest fires in interior Alaska, while others change little. Soils with permafrost on the coldest and wettest landscape positions (concave to plane, lower slope positions, and north-facing midslopes) usually failed to thaw deeply after fires in the study area. Soils with permafrost on warmer and drier positions (convexities, crests and shoulders, and east-, west-, or south-facing midslopes) thawed deeply in some instances and not in others, presumably as a function of fire severity or frequency. The driest soils (those on convex, upper slope positions, usually with sand and gravel at shallow depth) lack permafrost regardless of time since fire. Postfire vegetation changes on soils that fail to thaw are weaker than on soils that thaw deeply after fire or were dry and originally free of permafrost. Soils with permafrost that fail to thaw show little postfire increase in cover of the plants browsed by moose. More cover and forage for voles are present on soils with permafrost and soils that thaw deeply after fires than on those that are always dry and permafrost free.

Szepanski, M., Ben-David, M., and Van Ballenberghe, V., 1999. Assessment of anadromous salmon resources in the diet of the Alexander Archipelago wolf using stable isotope analysis. *Oecologia* 120 (3), 327-335. *POPULATION; mammals; wolf; nutrition; modeling*

The Alexander Archipelago wolf (*Canis lupus ligoni*) is unique to southeast Alaska, occurring on islands south of Frederick Sound and along the mainland between Dixon Entrance and Yakutat Bay. Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) are an important prey species for wolves across the southern part of the region. Spawning salmon (*Onchorynchus* sp.) are seasonally available but their presence in wolf diets has not previously been quantified. We examined the range of bone collagen delta ¹³C and delta ¹⁵N values for wolves throughout southeast (n = 163) and interior (n = 50) Alaska and used a dual-isotope mixing model to determine the relative contribution of salmon-derived marine protein in the diet. Southeast Alaska wolves consumed significantly more salmon (mean + SE: 18.3 + 1.2%) than did wolves from interior Alaska (9.1 + 0.6%, P0.001). Wolves on the southeast Alaska mainland appeared to have higher marine isotopic signatures than island wolves, although this difference was not significant. Variation among individual wolf diets was higher for southeast than for interior Alaska wolves, and variation was highest in coastal mainland wolf diets (P0.001). Marine resources may augment the diet of southeast Alaska wolves during seasonal or annual fluctuations in the availability of deer, particularly in those areas on the mainland where densities of terrestrial ungulates are relatively low.

Tack, S., 1980. Migrations and distribution of arctic grayling in interior and arctic Alaska. Alaska Department of Fish and Game, *POPULATION; migration; fish; grayling; INCOMPLETE (need abstract)*

Taylor, E., Beacham, T., and Kaeriyama, M., 1994. Population structure and identification of North Pacific Ocean chum salmon (*Oncorhynchus keta*) revealed by an analysis of minisatellite DNA variation. Canadian Journal of Fisheries and Aquatic Sciences/Journal Canadien des Sciences Halieutiques et Aquatiques Ottawa 51 (6), 1430-1442. *POPULATION; fish; chum; salmon; genetics*

We examined geographic variability in minisatellite DNA in chum salmon (*Oncorhynchus keta*) from 42 populations from the North Pacific Ocean to (1) determine the extent of regional population structure at minisatellite loci and (2) assess the ability of minisatellite variability to determine the geographic origin in individual chum salmon. Restriction fragments from 1.6 to 13.6 kilobase pairs in molecular weight were resolved with a minisatellite probe. The fragments were inherited from parent to offspring and appeared to represent segregation at two linked loci. Minisatellite DNA variability was negligible between annual samples from the same rivers, and chum salmon fell into three regional population groupings: (i) Japanese, (ii) Russian/Yukon River, and (iii) southeastern Alaska/British Columbia salmon. These regional groupings probably reflect historical patterns of postglacial dispersal of chum salmon from three distinct refugia in the North Pacific. We used restriction fragment counts as input to linear discriminant and neural network classification of independent test samples of salmon. Accuracies of 90-95, 81-86, and 72-80% were achieved when classifying fish as of either Japan/Russia/Yukon River versus southeastern Alaska/British Columbia origin, Japan versus Russia/Yukon River origin, or Russia versus Yukon River origin, respectively.

Taylor, B., Wade, P., Stehn, R., and Cochrane, J., 1996. A Bayesian approach to classification criteria for spectacled eiders. Ecological Applications 6 (4), 1077-1089. *POPULATION; birds; waterfowl; duck; eider; modeling*

To facilitate decisions to classify species according to risk of extinction, we used Bayesian methods to analyze trend data for the Spectacled Eider (*Somateria fischeri*) an arctic sea duck. Trend data from three independent surveys of the Yukon-Kuskokwim Delta were analyzed individually and in combination to yield posterior distributions for population growth rates. We used classification criteria developed by the recovery team for Spectacled Eiders that seek to equalize errors of under- or overprotecting the

species. We conducted both a Bayesian decision analysis and a frequentist (classical statistical inference) decision analysis. Bayesian decision analyses are computationally easier, yield basically the same results, and yield results that are easier to explain to nonscientists. With the exception of the aerial survey analysis of the 10 most recent years, both Bayesian and frequentist methods indicated that an endangered classification is warranted. The discrepancy between surveys warrants further research. Although the trend data are abundance indices, we used a preliminary estimate of absolute abundance to demonstrate how to calculate extinction distributions using the joint probability distributions for population growth rate and variance in growth rate generated by the Bayesian analysis. Recent apparent increases in abundance highlight the need for models that apply to declining and then recovering species.

Taylor, B., Pollard, S., and Louie, D., 1999. Mitochondrial DNA variation in bull trout (*Salvelinus confluentus*) from northwestern North America: implications for zoogeography and conservation. *Molecular Ecology* 8 (7), 1155-1170. *POPULATION; fish; trout; distribution; biochemistry; genetics; enzymology*

Bull trout, *Salvelinus confluentus* (Salmonidae), are distributed in northwestern North America from Nevada to Yukon Territory, largely in interior drainages. The species is of conservation concern owing to declines in abundance, particularly in southern portions of its range. To investigate phylogenetic structure within bull trout that might form the basis for the delineation of major conservation units, we conducted a mitochondrial DNA (mtDNA) survey in bull trout from throughout its range. Restriction fragment length polymorphism (RFLP) analysis of four segments of the mtDNA genome with 11 restriction enzymes resolved 21 composite haplotypes that differed by an average of 0.5% in sequence. One group of haplotypes predominated in 'coastal' areas (west of the coastal mountain ranges) while another predominated in 'interior' regions (east of the coastal mountains). The two putative lineages differed by 0.8% in sequence and were also resolved by sequencing a portion of the ND1 gene in a representative of each RFLP haplotype. Significant variation existed within individual sample sites (12% of total variation) and among sites within major geographical regions (33%), but most variation (55%) was associated with differences between coastal and interior regions. We concluded that: (i) bull trout are subdivided into coastal and interior lineages; (ii) this subdivision reflects recent historical isolation in two refugia south of the Cordilleran ice sheet during the Pleistocene: the Chehalis and Columbia refugia; and (iii) most of the molecular variation resides at the interpopulation and inter-region levels. Conservation efforts, therefore, should focus on maintaining as many populations as possible across as many geographical regions as possible within both coastal and interior lineages.

TCC, 2001. Tanana Chiefs Conference's Tribal Environmental Restoration Program's (TERP) 1999 Final Report on Military Impacts to Tribes in Interior Alaska. Tanana Chiefs Conference, Fairbanks. www.tananachiefs.org (not available on line, but by request) *MILITARY; CONTAMINANTS; POPs (persistent organic pollutants); POL (petroleum/oil/lubricants = hydrocarbons); metals; management; remediation; reclamation; native perspective*

Excerpt from the Introduction: "This report characterizes the achievements of the Tanana Chiefs Conference, Inc.'s Tribal Environmental Restoration Program (TERP) during the 1999 calendar year. The report first introduces the reader to the history behind the development of TERP. Secondly, the report discusses the organization and intent of the TERP program. The remainder of the report reviews the various services performed by TERP program staff and the activities conducted by participating Tribal Liaison Officers to assess military impacts to TCC Tribes. For example, the regional report reviews the historical context of military impacts in Interior Alaska. Similarly, the report reviews the various levels of technical assistance and facilitation provided by TERP central office staff to participating Tribes during the 1999 calendar year, as well as individual Tribal

reports on 1999 accomplishments. A brief summary of major program accomplishments follows. Finally, this report ends with a number of recommendations to further fulfill the intent of the Native American Lands Mitigation Program (NALEMP) and the Tribal Environmental Restoration Program (TERP) on behalf of the TCC member Tribes."

Thomas, D., Tracey, B., Marshall, H., and Norstrom, R., 1992. Arctic terrestrial ecosystem contamination. *Science of the Total Environment* 122 (1-2), 135-164. *REFERENCE; CONTAMINANTS; radiation; POPs (persistent organic pollutants); MILITARY; MINING; birds; raptor; falcon*

Limited data have been collected on the presence of contaminants in the Arctic terrestrial ecosystem, with the exception of radioactive fallout from atmospheric weapons testing. Although southern and temperate biological systems have largely cleansed themselves of radioactive fallout deposited during the 1950s and 1960s, Arctic environments have not. Lichens accumulate radioactivity more than many other plants because of their large surface area and long life span; the presence and persistence of radioisotopes in the Arctic is of concern because of the lichen---reindeer---human ecosystem. Effective biological half-life of cesium 137 is reckoned to be substantially less than its physical half-life. The database on organochlorines in Canadian Arctic terrestrial mammals and birds is very limited, but indications are that the air/plant/animal contaminant pathway is the major route of these compounds into the terrestrial food chain. For terrestrial herbivores, the most abundant organochlorine is usually hexachlorobenzene followed by hexachlorocyclohexane isomers. PCB accumulation favours the hexachlorobiphenyl, pentachlorobiphenyl and heptachlorobiphenyl homologous series. The concentrations of the various classes of organochlorine compounds are substantially lower in terrestrial herbivore tissues than in marine mammal tissues. PCBs and DDT are the most abundant residues in peregrine falcons (a terrestrial carnivore) reaching average levels of 9.2 and 10.4 micrograms per gram, respectively, more than 10 times higher than other organochlorines and higher than in marine mammals, including the polar bear. Contaminants from local sources include metals from mining activities, hydrocarbons and waste drilling fluids from oil and gas exploration and production, wastes from DEW line sites, naturally occurring radionuclides associated with uranium mineralization, and smoke containing SO₂ and H₂SO₄ aerosol from the Smoking Hills at Cape Bathurst, N.W.T..

Thorsteinson, L., Becker, P., and Hale, D., 1989. Yukon Delta: A synthesis of information. OCS/MMS-89/0081; NTIS: PB90-142746/GAR. National Ocean Surv., Anchorage, AK. *HYDROLOGY; nutrient cycling; vegetation; habitat selection*

The report provides a synthesis of environmental information on the Yukon Delta, primarily using results from studies conducted since 1983. The synthesis characterizes the major physical properties and resources of the Yukon Delta and identifies regional trends in biological use of major habitats. The Yukon Delta provides important seasonal habitat for numerous species of migratory birds, fish, and some marine mammals. The delta is characterized as a "pass-through" system or exporting-type estuary, where physical processes and biological processes annually remove wetland energy reserves. (Sponsored by Minerals Management Service, Anchorage, AK. Alaska Outer Continental Shelf Office.)

Thorsteinson, L., and Taylor, D., 1997. A watershed approach to ecosystem monitoring in Denali National Park and Preserve, Alaska. *Journal of the American Water Research Association* 33 (4), 795-810. *VEGETATION; POPULATION; mammals; birds; CLIMATE; ecology; monitoring; HYDROLOGY*

The National Park Service and the National Biological Service initiated research in Denali National Park and Preserve, a 2.4 million-hectare park in southcentral Alaska, to develop ecological monitoring protocols for national parks in the Arctic/Subarctic biogeographic

area. We are focusing pilot studies on design questions, on scaling issues and regionalization, ecosystem structure and function, indicator selection and evaluation, and monitoring technologies. Rock Creek, a headwater stream near Denali headquarters, is the ecological scale for initial testing of a watershed ecosystem approach. Our conceptual model embraces principles of the hydrological cycle, hypotheses of global climate change, and biological interactions of organisms occupying intermediate, but poorly studied positions in Alaskan food webs. The field approach includes hydrological and depositional considerations and a suite of integrated measures linking key aquatic and terrestrial biota, environmental variables, or defined ecological processes, in order to establish ecological conditions and detect, track, and understand mechanisms of environmental change. Our sampling activities include corresponding measures of physical, chemical, and biological attributes in four Rock Creek habitats believed characteristic of the greater system diversity of Denali. This paper gives examples of data sets, program integration and scaling, and research need.

Tiner, R., Bergquist, H.C., DeAlessio, G.P., and Starr, M.J., 2002. Geographically Isolated Wetlands: A Preliminary Assessment of their Characteristics and Status in Selected Areas of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Northeast Region, Hadley, MA.

http://wetlands.fws.gov/Pubs_Reports/isolated/report_files/3_section/Results/Region_7/r7_results.htm *HYDROLOGY; surface water; flooding*

Region 7 (Alaska)

Three study sites were analyzed in Alaska: Charley River, Kenai, and Mount McKinley. Table 3-7 presents a summary of the data for these study areas.

Percent of Study Areas Covered by Wetlands

Nearly half of two study areas was comprised of wetlands: Charley River (46%) and Mount McKinley (45%). The Kenai study site had 20 percent of its area represented by wetlands.

Percent of Wetland Area Identified as Isolated

Isolated wetland acreage was most extensive within the Kenai study area. About 25 percent of its wetland area was defined as isolated. Mount McKinley and Charley River had 5 percent and 4 percent of their acreage, respectively, mapped in this category. Palustrine scrub-shrub wetland was the predominant isolated type in all study areas. Palustrine emergent wetland was also a common isolated type in the Kenai location.

Percent of Wetlands (Number) Classified as Isolated

All three study areas had more than 60 percent of their wetlands designated as isolated. Isolated wetlands represented about 95 percent of Kenai wetlands. Mount McKinley had 83-84 percent of its wetlands isolated.

Todd, S., 1994. Designing effective negotiating teams for environmental disputes : an analysis of three wolf management plans, University of Michigan, Ph. D., 320 p *POPULATION; management; mammals; wolf*

Tomy, G., Stern, G., Lockhart, W., and Muir, D., 1999. Occurrence of C₁₀--C₁₃ Polychlorinated n-Alkanes in Canadian Midlatitude and Arctic Lake Sediments. Environmental Science & Technology 33 (17), 2858-2863. *CONTAMINANTS; POPs (persistent organic pollutants); sediment; air quality*

Sediment cores from six lakes in Canada ranging from 49 degree N to 81 degree N were analyzed for C₁₀--C₁₃ polychlorinated n-alkanes (PCAs) with the intent of (i) examining the depositional trends with increasing latitude, (ii) studying the historical profiles and fluxes

of PCAs in dated sediment slices, and (iii) investigating possible in situ degradation. Sediment slices were dated using ^{210}Pb and ^{137}Cs , and extracts were analyzed for PCA concentrations by high resolution gas chromatography electron capture negative ion high resolution mass spectrometry (HRGC-ECNI/HRMS) in the selected ion monitoring (SIM) mode. Concentrations of total PCAs in surface sediments declined significantly from 135 ng/g (dry weight (dw)) in sediments from the southern basin of Lake Winnipeg (50 degree N/96 degree W, Manitoba) to 4.52 ng/g in Hazen Lake (81 degree N/71 degree W, high Arctic); corresponding surficial fluxes were 147 and 0.9 $\mu\text{g}/\text{m}^2$ yr, respectively. The high flux of PCAs to the south Lake Winnipeg basin suggests local contamination. This was confirmed by analyzing water collected from the Red River, a river that discharges into the southern basin of Lake Winnipeg, in which elevated levels of PCAs were detected (0.02-0.05 $\mu\text{g}/\text{L}$). The surficial flux of PCAs to Fox Lake (61 degree N/135 degree W), a subarctic lake in the Yukon, was also high, 34 $\mu\text{g}/\text{m}^2$ yr. Much lower fluxes were found in Lake Nipigon (49 degree N/89 degree W, N. Ontario), 3 $\mu\text{g}/\text{m}^2$ yr, the northern basin of Lake Winnipeg (52 degree N/98 degree W, Manitoba), 4 $\mu\text{g}/\text{m}^2$ yr, and to Ya Ya Lake (69 degree N/134 degree W, Arctic) 0.45 $\mu\text{g}/\text{m}^2$ yr. The remote locations of Hazen and Ya Ya Lakes and the low levels of PCAs observed in their corresponding sediment slices are consistent with long-range atmospheric transport. The profiles of PCAs in the midcontinental lakes showed maxima in slices dated from the early 1980s to the 1990s while that of capital sigma DDT showed a maxima in the 1960s. The presence of PCAs in surface sediments over a wide geographic area, including the Canadian Arctic, suggests that these compounds, which are components of commercial short chain chlorinated paraffins, are regionally and globally distributed by long-range atmospheric transport.

Tracy, B.L., Kramer, G.H., Zielinski, J.M., and Jiang, H., 1997. Radiocesium body burdens in residents of northern Canada from 1963-1990. *Health Physics* 72 (3), 431-42. *PEOPLE; contaminants; radiation; mammals; caribou; risk assessment*

Measurements of ^{137}Cs body burdens in over 1,100 people from five northern Canadian communities were carried out with a portable whole body counting system during the winters of 1989 and 1990. These results are compared with over 3,000 similar measurements carried out during 1967-1969. Community mean body burdens and body concentrations had decreased by approximately a factor of 30 between the two survey periods. The dependence of body concentrations on the sex and age of the subjects has also changed significantly. This can be related to changes in the patterns of caribou consumption in the northern communities. Measurements of ^{137}Cs in urine are also available for an earlier period (1963-1966) when world-wide fallout was at its highest level. A normalization procedure was developed to calculate the average radiocesium body concentration in each community from the concentrations in urine. From data spanning a period of nearly 30 y (1963-1990), lifetime radiation doses have been estimated for most communities in the Yukon and Northwest Territories. These cumulative doses vary from 0.3 to nearly 40 mSv, with an Arctic-wide average of about 12 mSv. No health effects would be expected at these levels.

Trakas, K., Lawrence, K., and Shear, N., 1999. Utilization of health care resources by obese Canadians. *Canadian Medical Association Journal* 160 (10), 1457-1462. *PEOPLE; health (comparative); health (condition); health care; obesity; traditional food; economics*

BACKGROUND: The prevalence of obesity in Canada has been increasing in recent years. Using data from the National Population Health Survey (NPHS), the authors determined the prevalence of obesity among Canadians, the associated comorbidities and the patterns of resource utilization by obese people. METHODS: The NPHS, a cross-sectional survey conducted in 1994, was administered to 17,626 Canadians 12 years of age or older who were not long-term residents of hospitals or long-term care facilities

and were not residing on First Nations reserves or Canadian Armed Forces bases, or in the Yukon and Northwest Territories. For the authors' analysis, the study population consisted of 12,318 Canadians aged 20-64 years who were not pregnant and for whom the body mass index (BMI) had been calculated. The prevalence of comorbidities, health status index scores, self-esteem, self-rated health, restriction of activity, health care resource utilization (physician visits, disability days, admissions to hospital and medication use) were determined for obese people (BMI of 27 or greater) and nonobese people. **RESULTS:** The NPHS data revealed that 35.2% of men and 25.8% of women in Canada were obese in 1994. Obese respondents were more likely than nonobese respondents to suffer from stress (adjusted odds ratio [OR] 1.20, 95% confidence interval [CI] 1.11-1.31), activity restrictions (adjusted OR 1.39, 95% CI 1.26-1.54) and a number of chronic comorbidities. Obese respondents were also more likely to consult with physicians (adjusted OR 1.32, 95% CI 1.22-1.43), be prescribed a number of medications and to require excess disability days (adjusted OR 1.22, 95% CI 1.08-1.36). **INTERPRETATION:** Obesity represents a substantial burden on the health of Canadians and on Canada's health care resources.

Trakas, K., Oh, P., Singh, S., Risebrough, N., and Shear, N., 2001. The health status of obese individuals in Canada. *International journal of obesity and related metabolic disorders: journal of the International Association for the Study of Obesity* 25 (5), 662-668. *PEOPLE; health (comparative); health (condition); obesity*

OBJECTIVE: To determine whether there is a clinically relevant difference in the health state utilities of obese and non-obese individuals as measured by the Health Utility Index Mark III. **METHODS:** Secondary analysis of the population-based, cross-sectional, interviewer-administered National Population Health Survey (NPHS), 1996-1997. A probability sample of house-dwelling Canadians, excluding populations on First Nations Reserves, Canadian Armed Forces Bases, the Yukon and Northwest Territories, and long-term residents of hospitals or residential care facilities. The sub-sample used in this analysis consisted of 38 151 respondents (52.4% male) between the ages of 20 and 64 y, excluding pregnant women. Health Utilities Index-Mark III (HUI3) scores were used to define normal weight (body mass index (BMI) 19-24.9 kg/m²), overweight (BMI 25-29.9 kg/m²), obese (BMI 30-34.9 kg/m²), and morbidly obese (BMI > or =35 kg/m²) individuals. HUI3 scores were age- and gender-standardized. **RESULTS:** The overall prevalence of obesity (BMI > or =30 kg/m²) in this Canadian population was 13.3%. The average difference in HUI3 scores between normal weight and morbidly obese respondents was 0.04 (P<0.001). Statistically significant (P<0.05) differences across BMI categories were found in each of the eight component attributes of the HUI3. The attributes with the most substantial difference between normal and obese patients were cognition, mobility and pain. All demonstrated a > or =2-fold increase in the proportion of individuals in poorer classifications of health when normal weight respondents were compared with the morbidly obese. The magnitude of the decrement in utility ratings associated with obesity was comparable with other chronic non-cardiovascular conditions such as migraine or colitis. **CONCLUSION:** The results indicate that changes in self-rated health status appear to be due to significant changes across several relevant domain attributes. Obesity has a significant impact on both quality of life and health.

Turkington, R., John, E., Krebs, C., Dale, M., Nams, V., Boonstra, R., Boutin, S., Martin, K., Sinclair, A., and Smith, J., 1998. The effects of NPK fertilization for nine years on boreal forest vegetation in northwestern Canada. *Journal of Vegetation Science* 9 (3), 333-346.

VEGETATION; willow; spruce; birch; nutrient cycling; growth/development

Plant productivity is limited by mineral nutrient availability in many boreal forest ecosystems. This study is an analysis of the growth responses of components of a

boreal plant community (cryptogams, herbaceous and woody perennials, the dominant shrubs *Salix glauca* (grey willow) and *Betula glandulosa* (bog birch) and the dominant tree *Picea glauca* (white spruce), to the addition of an NPK fertilizer over a nine-year period. The study was carried out in a low-nutrient boreal forest ecosystem in the Yukon territory in northwestern Canada. The following predictions were tested: (1) that there would be an overall increase in abundance (measured either as cover, density, or dry mass) of all components of the vegetation, (2) that vegetation composition would change as more competitive species increased in abundance and (3) that initial community changes in response to fertilization would be transient. In general, all predictions were found to be true. Species composition changed rapidly in response to fertilizer.

Graminoids (e.g. *Festuca altaica*) and some dicots (e.g. *Mertensia paniculata* and *Achillea millefolium*) increased in cover, while other dicots (e.g. *Anemone parviflora*), dwarf shrubs (e.g. *Arctostaphylos uvaursi*), bryophytes and lichens declined. There was a significant increase in the growth rate of the two dominant shrubs and of *Picea*, but not in the cone crop or seed production by *Picea*. Surveys after 1 of 2 years showed responses by the vegetation but more stable patterns of response did not emerge until after 5 or 6 years. There were consistent and directional changes in the percent cover of some of the herbaceous species on control plots. Growth rates of *Salix* and *Betula* varied considerably from year to year, independently of treatment. Long-term studies are essential if we are to understand the role of nutrient limitation in this ecosystem.

Turkington, R., John, E., Watson, S., and Secombe-Hett, P., 2002. The effects of fertilization and herbivory on the herbaceous vegetation of the boreal forest in north-western Canada: a 10-year study. *Journal of Ecology* 90 (2), 325-337. *VEGETATION; herbivory (mammal); snowshoe hare; nutrition*

1 The influence of fertilizer addition and mammalian herbivore exclosures (a 2 x 2 factorial design, with four replicates at each of two sites) on the cover, species composition and diversity of the understory vegetation of the boreal forest in the south-western Yukon, Canada, were investigated from 1990 to 1999. This was done to test whether vegetation composition was controlled by resource level alone (bottom-up control), herbivory alone (top-down control), or by both (interactive control). 2 The density of the major herbivore, the snowshoe hare, varied 25-fold, declining from 148 km² in 1990 to 8 km² in 1994, and increasing to a second peak of 198 km² in 1998. 3 In control plots most species were remarkably constant in percent cover. After 10 years, most of the major species showed significant responses to fertilizer with four species increasing (*Festuca altaica*, *Mertensia paniculata*, *Epilobium angustifolium*, and *Achillea millefolium*), and three declining (*Linnaea borealis*, *Lupinus arcticus*, *Arctostaphylos uva-ursi*). Some species took up to 5 years before a response was detected. 4 Fertilization caused (i) a decline in the number of species, and species evenness in the community, (ii) a reduction in the proportion of woody species, and (iii) an increase in herbaceous dicotyledons and grasses. 5 The exclusion of herbivores had virtually no impact on the abundance of the vegetation or on species diversity, except in 1990-92 during a decline from a peak of 148 hares km² to 29 hares km². 6 These results suggest that the percentage cover and composition of herbaceous vegetation in the boreal forest are determined almost exclusively by the productivity of the site (bottom-up control) and that the activities of mammalian herbivores may be important only during peaks in hare population densities (interactive control). 7 Results were both species-specific and time-dependent, suggesting that long-term studies are needed to discriminate between long-term responses to treatments and transient phenomena.

UAF, 1969. Effects of placer mining on water quality in Alaska. Alaska Water Laboratory, *MINING; gold; WATER QUALITY; surface water*

UAF, USFS, and BLM, 1998. FROSTFIRE: The role of wildfire in Alaska. Bonanza Creek Long Term Ecological Research Program (University of Alaska Fairbanks), Pacific Northwest Research Station (U.S. Forest Service) and Alaska Fire Service (Bureau of Land Management): http://nrm.salrm.uaf.edu/~jirons/cpcrw_www/frostfire/frostfire.htm *VEGETATION; wildfire; ecology; climate*

[The following itinerary describes the proceedings at the FROSTFIRE Synthesis Workshop 21-23 March 2000. The abstracts are available at http://www.lter.uaf.edu/pubs/2000/ff_abstracts.pdf, which was improperly linked to the mainpage (below) when I cited this reference.]

21 March 2000 Tuesday

8:00 8:30 Continental Breakfast
8:30 8:45 Terry Chapin Welcome, Introduction, and Charge
8:45 9:05 Eric Kasischke Alaskan Fire Regime
9:05 9:25 Sam Sandberg Fuels and Fire Behavior
9:25 9:45 Hiroshi Hayasaka Fire Behavior
9:45 10:05 Cathy Cahill and Rich Collins Plume Analysis
10:05 10:25 Break
10:25 10:45 Masami Fukuda Permafrost and Remote Sensing
10:45 11:05 Terry Clark Remote Sensing of Frostfire
11:05 11:25 Dave Valentine and Rich Boone Soil Carbon Balance
11:25 11:45 Larry Hinzman Hydrology, Permafrost and Nutrient Transport
11:45 12:00 Discussion
12:00 1:00 Lunch
1:00 1:20 Scott Rupp Vegetation Dynamics
1:20 1:40 Terry Chapin Vegetation Feedbacks to Climate
1:40 2:00 Dave McGuire Ecosystem Modeling
2:00 2:20 Randi Jandt Fire Management
2:20 2:40 Break
2:40 5:00 Poster Session

22 March 2000 Wednesday

8:30 General discussion of plans for meetings and publications
Hinzman: American Geophysical Union annual meeting (December 2000)
Sandberg: Journal of Wildland Fire
Chapin: Journal of Geophysical Research
Ottmar: Management Reports
Chapin: Data Archival
Involvement of non-FROSTFIRE Scientists?
9:30 Working groups to develop list of JGR/JWF papers and AGU talks
CO2 feedbacks to climate
C budget of fire
Regional C budget
Nitrogen effects on the carbon cycle; fire effects on N budgets
Fire effects on DOC, DIC, and stream outputs of C and N
Surface energy exchange; feedbacks to regional climate
Fire effects on permafrost
Surface energy balance
Hydrologic responses to fire
Remote sensing: regional extrapolations of fire effects
Detection of changes in of fire frequency

Detection of fire severity
Detection of permafrost response
Fire effects on vegetation trajectory
Fire behavior and management
Climate and vegetation effects on fire behavior
Fire prediction and management
Role of human activities in Alaskan fire regime
10:00 Coffee Break
10:30 Working groups discuss synthesis topics and data needs for these syntheses
12:00 Lunch
1:00 Report to whole group with list of papers and synthesis outlines
2:00 Working groups develop explicit plans and schedules for data exchange and synthesis papers; write a one paragraph summary of “the story” that each synthesis paper will tell.
4:30 Report to group as whole about synthesis plans
7:00 Poster Session and Reception

23 March 2000 Thursday

8:30 Discussion of cross-topic synthesis, develop themes and outlines

Examples:

Climate-fire-vegetation interactions

Role of fire in the changing boreal carbon cycle

Past and future changes in boreal fire management

Video?

What else?

10:30 Report to whole group

1:00 Plans for future research

2:00 Wrap-up and future planning

3:00 Writing

UAF, 2002. Alaska Science Forum. University of Alaska Fairbanks Geophysical Institute:
<http://www.gi.alaska.edu/ScienceForum/> REFERENCE

2002. Mineral Industry Research Laboratory Publications. University of Alaska Fairbanks, School of Mineral Engineering: <http://www.uaf.edu/sme/Mirlpub.html> MINING; BIBLIOGRAPHY; economics; infrastructure

Uliassi, D., Huss-Danell, K., Ruess, R., and Doran, K., 1994. Biomass allocation and nitrogenase activity in *Alnus tenuifolia*: Responses to successional soil type and phosphorus availability. *Ecoscience* 7 (1), 73-79. VEGETATION; alder; poplar; soil; nutrient cycling; nitrogen; phosphorus; flooding

Low soil phosphorus availability and leachates from poplar (*Populus balsamifera* L.) have been hypothesized to limit growth and nitrogen fixation of thinleaf alder (*Alnus tenuifolia* Nutt.) in primary successional forests of the Tanana River floodplain (interior Alaska). This greenhouse study isolates the effects of P availability and soil type (successional stage) on alder seedling growth and N₂ fixation (acetylene reduction). We grew seedlings in soil cores collected from early-successional alder stands and mid-successional poplar stands (poplar overstories with alder understories) which had been untreated or P fertilized in a field experiment. Total nodule biomass and nitrogenase activity per plant (measured at harvest) were similar among alders in both the alder and poplar soil. Alders grew larger in poplar soil, but nitrogenase activity per gram of nodule was higher among alders grown in alder soil. Alders in fertilized soils grew larger than

controls and increased biomass allocation to nodules, resulting in much higher nitrogenase activity per plant, but nitrogenase activity per gram of nodule did not differ. Fertilization had a smaller effect on total plant biomass and total nodule biomass in alders grown in poplar soil than in alder soil. Results suggest that low soil P could limit alder growth and N₂ fixation in these floodplain forests, but poplar soil is unlikely to limit growth and N₂ fixation relative to alder soil at natural levels of P.

Uliassi, D.D., 1998. The regulation of symbiotic nitrogen fixation by thinleaf alder in primary successional forests of the Tanana River floodplain, University of Alaska Fairbanks, M.S., 114 p
VEGETATION; alder; NUTRIENT CYCLING; nitrogen; symbiosis; flooding; INCOMPLETE (need abstract)

Unger, S., 2001. 7 Generations: Addressing Village Environmental Issues for the Future Generations of Rural Alaska. Alaska Department of Environmental Conservation; Alaska Inter-Tribal Council, Anchorage. <http://www.state.ak.us/dec/dsps/compasst/7generations/7gen.htm>
waste (hazardous); waste (human); waste (solid); risk assessment; water quality; engineering; military; mining

The 7 Generations manual is designed for people in rural Alaska who want to accomplish environmental planning and management using a community-based approach. The manual contains valuable tools that enable a community to prioritize and identify its environmental issues. This manual was written to assist communities to be more self-reliant and to take responsibility for their own environmental issues.

Building community strength to identify and solve problems is a powerful process that can lead to a healthier and more sustainable community. A community driven by the interests of its members will have a greater sense of ownership and pride in its accomplishments. A self-governing community also will have a greater influence over the goals and future direction in the environmental realm as well as other domains. Although this manual focuses solely on selected environmental issues, the people-driven initiatives discussed are an effective way for a community to take its inherent right to self-govern in all areas by influencing and taking responsibility for educational, social, judicial and health efforts.

The 7 Generations Train-the-Trainer manual is a companion publication used to train others how to use the 7 Generations manual. The activities it contains provide many opportunities for participants to work in groups and present to others the information from 7 Generations. Activities also teach the concepts of pollution prevention and apply these to the information presented in the training. Participants will then have the skills and knowledge to present this training to others.

2001. Train-the-Trainer Manual: 7 generations: addressing village environmental issues for the future generations of rural Alaska. Alaska Department of Environmental Conservation; Alaska Inter-Tribal Council, Anchorage.

<http://www.state.ak.us/dec/dsps/compasst/7generations/7gen.htm> *waste (hazardous); waste (human); waste (solid); risk assessment; water quality; engineering; military; mining*

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USBLM, 1998. NORTHERN INTERTIE PROJECT (TRANSMISSION LINE), HEALY TO FAIRBANKS, ALASKA [EIS]. US Department of the Interior: Bureau of Land Management, Department of Defense (Army), Golden Valley Electric Association, Department of Agriculture Rural Utilities Service, Anchorage, Alaska. *INFRASTRUCTURE; intertie; powerline; economics; environmental impact statement*

PURPOSE: The issuance of a 30-year renewable right-of-way grant to construct and operate a 230-kilovolt (230-kV) transmission line between Healy and Fairbanks, located in southern and central Alaska, is proposed. The applicant, the Golden Valley Electric Association, would construct and operate the facility. The project would also involve modifying the existing Healy substation and constructing a substation (Wilson) and a 40-megawatt battery storage system near Van Horn Road and South Cushman Street. The transmission line would cross federal lands that have been withdrawn for military purposes. The existing transmission line is operating at or near capacity to meet current demands, and those demands are expected to increase by 55 percent in the next four years. Healy currently has three power sources including the power delivered from the Bradley Lake hydroelectric plant and the gas-fired Anchorage generation units to the Healy intertie, power from the Healy clean coal project, and power from the applicant's Healy generation facility. If the intertie between Anchorage and Healy were to fail, 70 megawatts of power would not be delivered to Healy, and, in turn, Fairbanks. If the intertie between Healy and Fairbanks were to fail, all three Healy power sources would be isolated and power could not be delivered to Fairbanks. Furthermore, the generation facilities in and around Healy supply energy which is produced at a lower cost than the energy produced from the oil-fired units in Fairbanks. The applicant has contracts to purchase a set of amount of energy whether they use it or not. Eight alternatives, including a No Action Alternative, are considered in this final EIS. The preferred alternative (the Rex/South Route Alternative with Option B) would extend 105 miles from the Healy powerplant northeast of Walker Dome, past the eastern boundary of Clear Air Force Station, then it would run parallel to the south side of the Tanna River until crossing at Goose Island and entering south Fairbanks. The estimated net cost of the route is \$157,708. **POSITIVE IMPACTS:** The project would enable the applicant to meet current and project energy demands, increase the reliability and capacity of the entire transmission system in southern and central Alaska, furnish access to the economy energy market, provide access to long-term purchases and sales, and diversify fuel resources used to generate electrical power. **NEGATIVE IMPACTS:** The preferred route would cross 657 acres of uplands, 586 acres of shrub bogs and meadows, 401 acres of forested wetlands, 33 acres of riverine wetlands, 134 acres of floating bogs, three streams with anadromous fish, and four acres of lakes and ponds. The project would

result in adverse, direct, and long-term visual impacts from scenic roads and highways. Wildlife would be adversely affected through the removal of vegetation and the construction of transmission towers. The habitat of brown bear, black bear, caribou, and moose would be adversely affected. Up to 25 historic and other cultural resources would occur within one mile of the preferred alternative route. **LEGAL MANDATES:** Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.), Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.), Federal Water Pollution Control Act of 1972 (33 U.S.C. 1251 et seq.), and River and Harbor Act of 1899 (33 U.S.C. 401 et seq.). **PRIOR REFERENCES:** For the abstract of the draft EIS, see 98-0005D, Volume 22, Number 1.

2002. BLM-Alaska Bibliography of Scientific Reports. US Department of the Interior, Bureau of Land Management: http://www.ak.blm.gov/affairs/sci_rpts.html *BIBLIOGRAPHY; geology; history; mining; population; wildfire*

The [bibliography] summarizes various technical, open file, general, or Adventures in the Past Cultural Resources Series scientific reports published by the Bureau of Land Management in Alaska. Most are available at major libraries in Alaska. Individual copies may be obtained from BLM while supplies last. (Many of the reports more than 10 years old are out of print.) For further information contact:

U.S. Department of the Interior
Bureau of Land Management
Alaska State Office (AK-912)
222 West 7th Avenue, #13
Anchorage, Alaska 99513-7599
(907) 271-5555

Most of these reports are available for loan from:
Alaska Resources Library and Information Services
3148 C Street
Anchorage, Alaska 99503
(907) 27-ARLIS

USDHHS, 2002. Alaska Area Office; Division of Planning, Evaluation, and Health Services website. US Department of Health and Human Services; Indian Health Service: <http://www.ihs.gov/FacilitiesServices/AreaOffices/Alaska/dpehs/index.asp> *PEOPLE; health care; health (condition); BIBLIOGRAPHY; demographics; economics; mortality*

The Alaska Area Native Health Service works in conjunction with nine Tribally operated service areas to provide comprehensive health services to 120,000 Alaska Natives (Eskimos, Aleuts, and Indians). Through the provision of 19 Title I contracts, 38 grants and one compact with 21 Title V annual funding agreements. Alaska tribes administer 99% of the Indian Health Service funds earmarked for Alaska. Tribal hospitals are located in the communities of Anchorage, Barrow, Bethel, Dillingham, Kotzebue, Nome and Sitka. There are 24 tribal health centers and 176 tribal community health aide clinics operated throughout the State. The Alaska Native Medical Center (ANMC) in Anchorage serves as the Area's referral center and gatekeeper for specialty care.

The Area Office is located in Anchorage with a staff of 46 individuals. Twenty-three positions are federal residual, one is a personal services contract and the remaining are transitional federal positions. The Alaska Native Tribal Health Consortium (tribally managed by all tribes in Alaska) has responsibility for essential statewide services and ANMC in conjunction with Southcentral Foundation, the local Anchorage tribe for purposes of P.L. 93-638. Other federal agencies such as the Arctic Investigations Laboratory of the Centers for Disease Control (CDC), work closely with the Area Office and the tribes to improve the health status of Alaska Natives.

USDOD, and BLM, 1994. FORT WAINWRIGHT, YUKON MANEUVER AREA, PROPOSED RESOURCE MANAGEMENT PLAN AND FINAL ENVIRONMENTAL IMPACT STATEMENT, FAIRBANKS NORTH STAR BOROUGH, ALASKA. Final Environmental Impact Statement; Agency number: BLM/AK/PT/94/011+1600+080; EPA number: 940001F. Department of Defense, Department of the Army 6th Infantry Division (Light), Department of the Interior, Bureau of Land Management, Anchorage, Alaska. *MILITARY; environmental impact statement; infrastructure; bridge; road; powerline; vegetation; population; sediment*

PURPOSE: The implementation of a management plan is proposed in order to address military uses, economic development, recreation, wildlife habitat, and access in association with the use of the Fort Wainwright Maneuver Area in Alaska. The maneuver area, commonly known as the Yukon Maneuver Area, is a tract of approximately 248,000 acres in the Fairbanks North Star Borough southeast of the city of Fairbanks. It is roughly rectangular in shape, spanning 28 miles east-to-west and 17.5 miles north-to-south; it encompasses much of the land between the Chena and Salcha rivers northeast of the Richardson Highway. Tributaries of the two rivers flow through the area at the bases of 2,000-foot hills, which predominate all but the extreme western portion of the maneuver area. Entrance into the withdrawn lands from the Richardson Highway can be gained through the main gate of Eielson Air Force Base and via Johnson Road. Military facilities within the withdrawn areas include firing ranges, impact areas, landing strips, and training and maneuver areas. The area to be withdrawn would be closed to mineral entry and leasing. Five alternatives, including a No Action Alternative, are considered in this final EIS. Under the proposed plan, which is a modification of the draft EIS's preferred alternative, public access would be allowed to the lands for recreational purposes provided that permission is obtained from the Army at Fort Wainwright. Nonmilitary uses of road and off-road vehicles would be allowed in certain locations. The Army would undertake efforts to improve the fort's vegetation, develop a habitat management plan, and, in consultation with the Bureau of Land Management, develop a forest plan, a cultural resources management plan, and a fire management plan.

POSITIVE IMPACTS: Under the proposed plan, the continued use of, and the expansion of the military uses of, the withdrawn areas would be assured. Valuable habitat, vegetative cover, water resources, soil resources, and local socioeconomic uses would be protected. **NEGATIVE IMPACTS:** Besides the effects of the military activities for which the land has been withdrawn and that are beyond the scope of this plan, other unavoidable adverse impacts would result from the implementation of the management scheme under the proposed plan. Off-road vehicle use would crush some vegetation, primarily in areas near the road network; in particularly high use areas, off-road vehicle use would also disturb soils. Some soil would erode and sediment would be transported into streams and lakes. Vegetative resources in many areas could remain damaged for decades. Surface disturbances, such as timber harvesting, road construction, recreation facility construction, and mining, would destroy or adversely alter visual and cultural resources. **LEGAL MANDATES:** Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.) and Military Lands Withdrawal Act of 1986 (P.L. 99-606). **PRIOR REFERENCES:** For the abstract of the draft EIS, see 88-0292D, Volume 12, Number 5.

USDOD, 1999. ALASKA ARMY LANDS WITHDRAWAL RENEWAL FOR FORT WAINWRIGHT AND FORT GREELY WEST TRAINING AREA, CITY OF FAIRBANKS, CITY OF NORTH POLE, AND CITY OF DELTA JUNCTION, NORTH STAR BOROUGH, ALASKA. Final Environmental Impact Statement EPA # 990153F. Department of Defense: Department of the Army, Assistant Chief of Staff for Installation Management, Fort Richardson, Alaska. *MILITARY; environmental impact statement*

PURPOSE: The renewal of land withdrawals related to the Army operations of the Fort Jonathan Wainwright Yukon Training Area (formerly known as the Fort Wainwright

Maneuver Area), the Fort Greely West Training Area (formerly known as the Fort Greely Maneuver Area), and the Fort Greely East Training Area (formerly known as the Fort Greely Air Drop Zone), all of which lie in Alaska, is proposed. The forts offer extensive areas providing terrain and conditions representative of northern theatres of war. Fort Wainwright lies approximately 120 miles south of the Arctic Circle near the city of Fairbanks in the interior of Alaska. The 915,098-acre installation consists of the Main Post, the Tanana Flats Training Area, and the Yukon Training area. The Yukon Training Area is a rectangular, 247,952-acre parcel located 16 miles east-southeast of Fairbanks and immediately east of Eielson Air Force Base. The other parcels are associated with Fort Greely, a 661,341-acre installation lying 105 miles southeast of Fairbanks near the city of Delta Junction. These parcels include the Fort Greely West and East training areas. Fort Greely consists of the Main Post, the West and East training areas, Gerstle River Test Site, Black Rapids Training Area, and Whistler Creek Rock Climbing Area. The 571,995-acre West Training Area is bounded by Richardson Highway to the east and the Little Delta River to the west. The 51,590-acre East Training Area stretches east of the Richardson Highway to Granite Creek. Two alternatives are considered in this draft EIS, specifically, the denial of renewal of the land withdrawals and the approval of renewal. The preferred alternative would renew the existing withdrawals for a period of 50 years until November 6, 2051. **POSITIVE IMPACTS:** The renewal of the land withdrawals would allow the Army to continue its training operations on the affected lands, contributing to the military's readiness for combat in northern regions, particularly in Europe and North America. **NEGATIVE IMPACTS:** The military use of the withdrawn lands and the associated airspace would result in some conflicts with other users, including recreationists. The military operations, particularly those resulting in vehicle emissions and ice fog, would degrade air quality in the affected areas. The use of ammunition would result in the release of soil and water pollutants, and the military operations would generate noise and destroy wildlife habitat disturb wildlife, particularly moose, caribou, and bison. **LEGAL MANDATES:** Engle Act of 1958 (P.L. 85-337) and Military Lands Withdrawal Act of 1986 (P.L. 99-606). **PRIOR REFERENCES:** For the abstract of the draft EIS, see 99-0004D, Volume 23, Number 1.

2000. NATIONAL MISSILE DEFENSE DEPLOYMENT; FORT GREELY, SHE MYA ISLAND, AND DENALI AND FAIRBANKS NORTH STAR BOROUGH, ALASKA, CALIFORNIA, MASSACHUSETTS, AND CAVALIER, GRAND FORKS, PEMBINA, RAMSEY, AND WALSH COUNTIES, NORTH DAKOTA. [EIS]. Environmental Impact Statement; EPA number: 000443F. Department of Defense; Ballistic Missile Defense Organization, Department of the Air Force, Department of the Air Navy, Department of the Army Corps of Engineers, Department of the Army Space and Missile Defense Command, Department of Transportation Federal Aviation Administration, Huntsville, Alabama. *MILITARY; environmental impact statement; vegetation; noise; infrastructure*

PURPOSE: The deployment of a national missile defense (NMD) program in Alaska, California, Massachusetts, and North Dakota is considered. The NMD system would be a fixed, land-based, non-nuclear missile defense system with a land- and space-based detection system capable of responding to limited strategic ballistic missile threats to the United States. The proposed Alaskan sites include Clear Air Force Station (AFS) in Denali Borough, Eareckson Air Station (AS) on Shemya Island, Eielson Air Force Base (AFB) in Fairbanks North Star Borough, Fort Greely, and Yukon Training Area in Fairbanks North Star Borough. The proposed California site is Beale AFB. The proposed Massachusetts site is Cape Cod AFS. The proposed North Dakota sites include Cavalier AFS in Pembina County, Grand Forks AFB in Grand Forks County, Stanley R. Mickelsen Safeguard Complex (SRMSC) Missile Site Radar in Cavalier County, SRMSC Remote Spring Launch Site 1 in Ramsey County, SRMSC Remote Launch Site 2 in Cavalier

County, and SRMSC Remote Spring Launch Site 4 in Walsh County. Key issues identified during scoping include those related to airspace restrictions from X-band radar (XBR) operation; construction and operation impacts on vegetation, wildlife, threatened and endangered species, wetlands, and fisheries; potential risks to the public from the transportation and operation of the ground-based interceptor (GBI); electromagnetic radiation impacts to wildlife and the public; socioeconomic impacts and benefits from NMD deployment; construction and operation impacts on local water quality; increases in hazardous waste generation; and increases in restricted public use around NMD deployment sites. Two alternatives, including a No Action Alternative, which would not deploy the NMD system, are considered in this final EIS. If the initial decision were not to deploy under the No Action Alternative, the NMD program would use the time to enhance the existing technologies of the various system elements. The NMD program would also have the option to add new elements if and as they were developed. For potential sites being considered for NMD deployment, the No Action alternative would be a continuation of activities currently occurring or planned at those locations. Under the proposed action, NMD elements and element locations would be selected. The NMD main elements considered for deployment would include the GBI, in-flight interceptor communications system (IFICS) data terminal, XBR, upgraded early warning radar (UEWR), and satellite detection systems, the fiber optic line required to link some of the NMD elements, and battle management, command, and control (BMC2). Under the preferred alternative, an NMD system would be deployed at one GBI site with up to 100 silos. The preferred site for the GBI and BMC2 would be Fort Greely. Under this configuration, the XBR would be at Eareckson AS. The NMD system would make use of the UEWR and the existing satellite detection systems that would be in place at the time of deployment. Since the IFICS data terminal locations have not been identified, no preferred location has been selected. **POSITIVE IMPACTS:** The NMD would be used to protect against non-nuclear missile attack. The development and deployment of the antimissile system would generate substantial employment and income. **NEGATIVE IMPACTS:** The construction of NMD facilities would result in the displacement of land, possibly including wetland. The project could adversely affect geological, historical, and archaeological resource sites, depending on the sites chosen. In the unlikely event of a liquid propellant leak, hazardous materials would be released into the environment. Prairie potholes would lie in the path of some of the fiber optic cables in North Dakota. The construction of fiber optic facilities during harvest times for communities and subsistence users could interfere with harvest activities. **LEGAL MANDATES:** Alaska National Interest Lands Conservation Act of 1980 (Public Law 96- 487), National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 et seq.), and Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6901 et seq.). **PRIOR REFERENCES:** For the abstract of the draft supplement to the draft EIS, see 00-0159D, Volume 24, Number 2. For the abstract of the draft EIS, see 99-0324D, Volume 23, Number 4.

2001. The CRREL Virtual Library. Cold Regions Research and Engineering Laboratory (CRREL), US Army Corps of Engineers: Department of Defense: http://www.crrel.usace.army.mil/library/crrel_library.html *BIBLIOGRAPHY; military; engineering; hydrology; water quality; ground water; surface water; sediment; soil; ground ice / permafrost; glaciology; river ice; air quality; infrastructure; imaging (remote sensing); precipitation; snow; contaminants; remediation*

The Cold Regions Research & Engineering Laboratory Library, is recognized as the world's foremost collection of cold regions scientific and technical literature. The library holds over 25,000 monographs, 75,000 reports, 225,000 micrographic items, 502 scientific serials, the CRREL historical archives, and a complete collection of U.S. Geological Survey topographic maps. A virtual library collection compliments nicely

the need for print products and services. Meeting the varying needs of our internal research staff while responding to more than 2000 outside requests a year is the primary mission of the CRREL Library staff.

2002. Alaska Formerly Used Defense Sites, Geographic Information System World Wide Web Access. Cold Regions Research and Engineering Laboratory (CRREL), Army Corps of Engineers: Department of Defense: http://137.161.179.3/fuds/map/fud_index.html *MILITARY; WATER QUALITY; SOIL; waste (hazardous); CONTAMINANTS; ground water; POPs (persistent organic pollutants); POL (petroleum/oil/lubricants = hydrocarbons); radiation; reclamation; remediation*

USEPA, 1993. ALASKA BATTERY ENTERPRISES Site Information. Environmental Protection Agency: <http://www.epa.gov/superfund/sites/rodsites/1000017.htm> *CONTAMINANTS; metals; lead; soil; ground water; remediation*

Abstract: The 1-acre Alaskan Battery Enterprises site is located in Fairbanks, Alaska. Fairbanks is situated on the Tanana-Chena floodplain, does not appear to be impacted by site conditions. Land use in the area is and commercial and residential. The site is comprised of the Alaskan Battery Enterprise (ABE) property and the surrounding right-of-way property, owned by the Alaskan Department of Transportation. The site was operated as a battery related business from 1962 until 1992, when site operations ceased. Since at least 1969, the owner disassembled, recycled, and sold used and new batteries. During the 1960s and 1970s, battery casings were crushed and used for fill onsite, and the associated lead was reused in batteries or shipped offsite for recycling. Prior to 1986, spent battery acid was discharged onsite directly onto the ground, but later the acid was collected for reuse. Scrap batteries were stored onsite and subject to weathering, and domestic wastewater also was discharged onsite into septic cribs that were constructed from buried automobile bodies. In 1986, after ABE was connected to the municipal wastewater system, the use of these cribs was discontinued. In 1980, an EPA site inspection determined that electrolyte fluid from batteries had been dumped directly onto the ground during recycling and that crushed batteries had been used as fill in the front lot. Further State and EPA studies revealed elevated levels of lead in surface soil and subsequently, in 1987, the area was excavated and the soil was used as fill offsite. In 1988, EPA initiated a removal action that included extensive sampling and removal of 2,900 cubic yards (cy) of soil contaminated with greater than 1,000 mg/kg lead for offsite disposal. In 1989, a subsequent removal action excavated and removed offsite an additional 860 cy of leadcontaminated soil. In 1992, the ABE site was selected to be used as a demonstration site for the Superfund Innovative Technology Evaluation (SITE) Program for the soil washing technology. Previous site removal actions, coupled with the excavation of surface and subsurface soil for the demonstration effort, have removed or remediated all onsite contaminated soil to below cleanup levels; therefore, there are no contaminants of concern affecting this site. **SELECTED REMEDIAL ACTION: The selected remedial action for this site is no further action, with ground water monitoring for two years. Results of sampling during the RI and SITE investigations indicate that there are no contaminants remaining onsite above health-based levels, therefore no additional action is necessary. There are no present worth or O&M costs associated with this no action remedy. **PERFORMANCE STANDARDS OR GOALS:** Not applicable. **INSTITUTIONAL CONTROLS:** Not applicable.**

Remedy: EPA's decision for the ABE site is No Further Action. The removal actions conducted in 1988-89, and the excavation of soil for the Superfund Innovative Technology Evaluation (SITE) demonstration conducted in 1992, have reduced concentrations of contaminants in soils to levels that do not pose a risk to human health

and the environment and have eliminated the need to conduct additional remedial action at the site. Groundwater monitoring will be conducted for a period of two years to confirm that the groundwater has not been contaminated.

1995. ARCTIC SURPLUS: Site Information. Environmental Protection Agency: <http://www.epa.gov/superfund/sites/rodsites/1000082.htm> CONTAMINANTS; SOIL; metals; lead; arsenic; manganese; POPs (persistent organic pollutants); POL (petroleum/oil/lubricants = hydrocarbons); PAHs (byproducts of combustion = hydrocarbons); remediation

Please note that the text in this document summarizes the Record of Decision for the purposes of facilitating searching and retrieving key text on the ROD. It is not the officially approved abstract drafted by the EPA Regional offices. Once EPA Headquarters receives the official abstract, this text will be replaced.

Arctic Surplus Salvage Yard (Arctic Surplus) is a privately owned salvage yard located about five miles southeast of Fairbanks, Alaska. It occupies approximately 24.5 acres on the northeast corner at the intersection of Badger Road and the Old Richardson Highway. Private residences in the Clear Creek Estates subdivision and a salvage yard in Tract B bound the northern side of the property, and the Alaska Railroad and Old Richardson Highway separate the site from private residences to the south. Badger Road borders the Arctic Surplus property on the west, separating it from Fort Wainwright and the Defense Reutilization Marketing Office (DRMO); and McPeak Sand and Gravel Company adjoins the property to the east.

The first documented land use at the Arctic Surplus site was the operation of a municipal landfill in the southwest part of the site. The landfill was operated between 1944 and 1956 by the military. At closure, the landfill was capped with ash. Between 1959 and 1989, the site was operated as a privately owned salvage yard. Activities conducted as part of the salvage yard operation included storage of large quantities of materials intended for scrap and reclamation, including drummed wastes, transformers, batteries, asbestos, bulk asbestos, asbestos-clad vessels, gas cylinders, and containers of unknown wastes. Activities that contributed significantly to the present site contamination included battery processing for lead recovery, transformer storage and processing, storage of liquid wastes in drums and other containers, and operation of an incinerator fueled by waste oils, including transformer oil. Frequent site traffic and movement of materials contributed to the distribution of contaminants across wide areas of the site.

The Arctic Surplus site consists of the Arctic Surplus Salvage Yard Facility which is currently fenced and includes the surrounding adjacent off site properties which have been impacted by the operations of the salvage yard. The entire site area has been used to store, salvage, reclaim, or dispose of material mainly from sale of surplus goods from local military bases. Tracked vehicles, trucks of all sizes, and metal scrap from multiple sources are all found at Arctic Surplus. The amount of scrap metal is a factor in managing the site.

A private residential structure is located in the northwest corner of the property, and 81 office trailers occupies an area along the northern property boundary. A small pond occupies an abandoned gravel pit in the northeast corner of the site. There are numerous unpaved roads throughout the site, with piles of scrap and salvaged material covering much of the ground between the roads. Trees and shrubs have grown in and around the scrap and salvage materials. An eight foot high cyclone type fence was erected around the perimeter of the site in 1989 which was used to restrict unauthorized entry to the site. Hazardous materials were removed by U.S. Environmental Protection Agency (EPA) from the site during the summer of 1989. Further removal actions were taken in 1990, and 1991 under an EPA Removal Order. The site was fenced for the first time and asbestos, pesticide, chlordane, liquid waste drums, contaminated soil, incinerator with dioxins, and PCBs were removed from the site during these summer work periods. These actions

were taken to control access to the site until the site could be fully evaluated by the Remedial Investigation and Feasibility Studies (RI/FS).

Remedy: The selected remedy is a series of actions which address the principal threats, lead and polychlorinated biphenyls (PCBs), and other contaminants at the site.

The remedy combines source remediation, treatment of highly contaminated soils (hot spots), containment of hazardous substance residuals left on site after treatment, and institutional controls to reduce the health risks posed by the contaminants in the soils at Arctic Surplus. Soil is the media which contains the elevated risks at Arctic Surplus. The selected remedial actions consist of the following: relocation and processing, including decontamination, of salvage material and debris that must be moved to provide access to the contaminated site soil; excavation of contaminated soil and stockpiling for treatment or disposal. Soils outside of the current fenced area with contaminant concentrations above 1000 mg/kg lead, 10 mg/kg PCBs, or chlorinated dioxin/furans above risk-based levels of concern will be excavated; treatment of contaminated soil exceeding 50 mg/kg PCBs by solvent extraction, and solidification/stabilization of soils exceeding 1000 mg/kg lead, pesticides will be transported to an off-site permitted disposal facility; consolidation of both the contaminated and treated Hot Spot soils into a containment area over the old, closed landfill located in the southwestern part of the site; capping of the soil in the containment area and the existing landfill with a TSCA chemical waste landfill cap; and, institutional controls including long-term groundwater monitoring, operation and maintenance of the fences and cap; and restrictions to prevent use of groundwater, to maintain a current industrial use, and to prevent any unauthorized access or use of the capped area.

2002. National Priorities List Site Listing [by State]. US Environmental Protection Agency: http://yosemite.epa.gov/r10/nplpad.nsf/State_View?OpenView&Start=1&Count=30&Expand=1.2 #1.2 CONTAMINANTS; metals; lead; POPs (persistent organic pollutants); acidification; POL (petroleum/oil/lubricants = hydrocarbons); WATER QUALITY; ground water; surface water

2002. POGO Gold Mine EIS/NEPA Project. Environmental Protection Agency: <http://www.epa.gov/r10earth/pogo.htm> MINING; gold; WATER QUALITY; ground water; surface water; arsenic; cyanide; economics; HYDROLOGY; ground ice / permafrost; risk assessment; snow; monitoring; environmental impact statement; infrastructure; road; bridge; airstrip; powerline

Pogo Mine Project: An Introduction

The Project:

The proposed Pogo Gold Mine would be located about 38 miles northeast of Delta Junction, Alaska, near the Goodpaster River (see figure 1). Teck-Pogo, Inc., the "applicant," plans to develop the mine on state-owned land. It would be an underground mine with a surface mill producing up to 500,000 ounces of gold each year. The applicant hopes to begin construction in 2002, and proposes to operate the mine 24 hours a day, 365 days a year, for about 12 years. This predicted mine-life is based on existing information; on-going exploration could increase the life of the mine. The project would employ up to 385 employees. Workers would be housed on site. An airstrip would be constructed at the mine site. A powerline from the regional grid would supply power.

Ore Processing:

After grinding, ore would be processed using gravity separation and a 'flotation' process to produce a concentrate. Gold would then be leached out of the concentrate in tanks using cyanide. Ten percent of all tailings would be cyanide tailings. Cyanide tailings would be treated and combined with other tailings and cement, then returned underground. Remaining tailings would be stacked on the ground. A surface pond would

collect site precipitation and runoff from the dry stack tailings, and recycle the water to the mill. Any excess process water would be treated before discharge to assure that water quality standards are met.

Tailings: crushed rock left over after the gold has been removed

Road Access:

The applicant has proposed building a 46- to 49-mile road from the Richardson Highway to the mine area. The applicant has proposed that road access be restricted to mine-related vehicles which would carry five to seven large trucks per day all year. The Alaska Department of Natural Resources (ADNR) retains authority for access restrictions for any proposed roads on state-owned lands. ADNR is participating in this federal EIS process with EPA to determine the appropriate access restrictions. Although EPA is preparing this EIS, EPA has no authority over ADNR access decisions.

ADNR: Alaska Department of Natural Resources

There are two road options: an all-season road or an annual winter road.

For the all-season road, two routes are being considered. The first would run up the northwest side of Shaw Creek Valley, cross Shaw Creek, and continue 18 miles to the Goodpaster River and the mine site. At least four bridges would be required. The second all-season route option would begin near Quartz Lake and follow the ridge northwest of the Goodpaster River Valley to the mine site. One bridge would be required.

A winter road, the second road option, would be constructed each year. Temporary bridge structures and ice bridges, and snow and ice ramps, would be installed. The winter road would operate for about 8 weeks in winter, and carry 30-35 large trucks per day. Two winter-only road routes are being considered. First is the existing winter trail from the Quartz Lake area up the Goodpaster River, which has 9 Goodpaster River crossings and several other minor crossings. The second is a route up Shaw Creek Valley and then an 18-mile road to the Goodpaster River Valley and the mine site, requiring 6 water crossings.

Agency Involvement:

Many state and federal permits are required, including a wastewater discharge permit from EPA called an NPDES permit. Because the proposed mining project could significantly affect the environment, an Environmental Impact Statement is necessary.

NPDES: National Pollutant Discharge Elimination System

The U.S. Environmental Protection Agency (EPA) is the federal agency responsible for preparing the EIS. EPA will prepare the EIS using a contractor, Michael Baker, Jr., Inc. Baker works under the direct supervision of EPA. The U.S. Army Corps of Engineers and the Alaska Department of Natural Resources are closely participating in the EIS process. Several other agencies are also involved. For a one-page outline that explains each agency's permitting authorities, contact Matt Harrington (see page 9).

2002. Alaska's Environment. Environmental Protection Agency:

<http://yosemite.epa.gov/R10/HOMEPAGE.NSF/webpage/Alaska's+Environment> WATER QUALITY; AIR QUALITY; CONTAMINANTS; MINING; CLIMATE; waste (hazardous); waste (solid)

Here you will find some of the more common links to information about the environment in Alaska. This is not an all inclusive list of information on the State of Alaska. If you don't find what you are looking for, be sure to check the Region 10 program buttons to the left.

2002. FORT WAINWRIGHT: Site Information. US Environmental Protection Agency:
<http://www.epa.gov/superfund/sites/rodsites/1001146.htm> *MILITARY; CONTAMINANTS; POL (petroleum/oil/lubricants = hydrocarbons); POPs (persistent organic pollutants); metals; soil; WATER QUALITY; ground water; surface water*

2002. EIELSON AIR FORCE BASE: Site Information.
<http://www.epa.gov/superfund/sites/rodsites/1000110.htm> *MILITARY; CONTAMINANTS; POL (petroleum/oil/lubricants = hydrocarbons); POPs (persistent organic pollutants); metals; soil; WATER QUALITY; ground water; surface water; MILITARY; INFRASTRUCTURE*

2002. Archived Sites; Alaska. US Environmental Protection Agency:
<http://www.epa.gov/superfund/sites/arcsites/akarclst.htm> *CONTAMINANTS; POL (petroleum/oil/lubricants = hydrocarbons); POPs (persistent organic pollutants); metals; MILITARY; INFRASTRUCTURE*

USFWS, 2001. Environmental Contaminants Program [bibliography]. US Fish and Wildlife Service: <http://www.r7.fws.gov/es/studies.html> *BIBLIOGRAPHY; WATER QUALITY; CONTAMINANTS; POPs (persistent organic pollutants); POL (petroleum/oil/lubricants = hydrocarbons); metals; ; mammals; birds; fish*

Environmental Contaminants Program: To protect, improve and restore the quality of fish, wildlife and habitat resources through the identification, prevention and correction of environmental contaminant problems in Alaska.

[The page provides links to the following documents:]

Contaminant Studies and Technical Reports

Organochlorine Analysis in Burbot (*Lota lota*) (pdf. 451 KB)

Contaminants in Peregrine Falcon Eggs

Peregrine Falcon Population Trends: Porcupine River, Alaska

Contaminant Assessment: Kenai National Wildlife Refuge

Kensington Mine Area: Baseline Contaminants Study

Contaminant Data: Selawik Wildlife Refuge (pdf. 7,513 KB)

Contaminant Data: Nowitna Wildlife Refuge (pdf. 1,971 KB)

Metal Analyses at Kanuti Wildlife Refuge (pdf. 6,311 KB)

Metal and Water Quality Analyses at Koyukuk, Nowitna and Innoko Wildlife Refuges (pdf. 9,122 KB)

Fact Sheets

Contaminants in Wildlife (pdf. 614 KB)

Contaminants in Salmon (pdf. 3,814 KB) or (pdf. 544 KB)

Contaminants in Spectacled Eiders (pdf. 713 KB)

Contaminated Military Sites on Refuges (pdf. 1,032 KB)

European Crane Fly Control and Lawn Care (pdf. 1,283 KB)

Facts about Lead Poisoning in Waterfowl

Lead: Part 1 Lead: Part 2 Lead: Part 3

Spill Response

**Our Role in Response (pdf. 2,382 KB) or (pdf. 448 KB)
Spill Response Pocket Guide (pdf. 90 KB)**

2002. US Fish and Wildlife Service, Alaska Region Fisheries Resources: Technical Reports. US Fish and Wildlife Service, Alaska Region: <http://www.r7.fws.gov/fish/index.html>
BIBLIOGRAPHY; POPULATION; fish; salmon; chinook; chum; coho; silver; trout; burbot; pike; distribution; genetics; monitoring; morphology

USGS, 1997. How Does Climate Change Influence Alaska's Vegetation? Insights from the Fossil Record. FS-071-97. United States Geological Survey, Denver, CO.
<http://greenwood.cr.usgs.gov/pub/fact-sheets/fs-0071-97/> *CLIMATE; VEGETATION*

Excerpt from Report: The study of past climates and ecological changes in Alaska are an important key to understanding the likely consequences of future climate changes in high latitude ecosystems. Future climate changes, whether triggered by human-induced changes in the atmosphere or by natural climate cycles will result in changes in the species composition and distribution of vegetation types. On the basis of the fossil record and climate history of Alaska, we can expect that future periods of cooler, drier climate will result in shrinkage of forest boundaries, lowering of altitudinal tree line, and expansion of tundra vegetation into lower elevations. A future change to warmer, moister climates will result in expansion of Alaska's forests into areas now occupied by tundra. The past record also shows that the magnitude of future global scale climate changes and ecological responses will be greater at high latitudes than at lower latitudes.

1998. Arctic National Wildlife Refuge, 1002 Area, Petroleum Assessment, 1998, Including Economic Analysis. United States Geological Surveys: <http://geology.cr.usgs.gov/pub/fact-sheets/fs-0028-01/fs-0028-01.htm> *INFRASTRUCTURE; pipeline; road; economics*

Introduction

The Alaska National Interest Lands Conservation Act (1980) established the Arctic National Wildlife Refuge (ANWR) (fig. 1). In section 1002 of that act, Congress deferred a decision regarding future management of the 1.5-million-acre coastal plain ("1002 area") in recognition of the area's potentially enormous oil and gas resources and its importance as wildlife habitat. A report on the resources (including petroleum) of the 1002 area was submitted in 1987 to Congress by the Department of the Interior (DOI). Since completion of that report, numerous wells have been drilled and oil fields discovered near ANWR (fig. 2), new geologic and geophysical data have become available, seismic processing and interpretation capabilities have improved, and the economics of North Slope oil development have changed significantly.

The U.S. Geological Survey (USGS) commonly is asked to provide the Federal Government with timely scientific information in support of decisions regarding land management, environmental quality, and economic and strategic policy. To do so, the USGS must anticipate issues most likely to be the focus of policymakers in the future. Anticipating the need for scientific information and considering the decade-old perspective of the petroleum resource estimates included in the 1987 Report to Congress, the USGS has reexamined the geology of the ANWR 1002 area and has prepared a new petroleum resource assessment.

Summary

In anticipation of the need for scientific support for policy decisions and in light of the decade-old perspective of a previous assessment, the USGS has completed a reassessment of the petroleum potential of the ANWR 1002 area. This was a comprehensive study by a team of USGS scientists in collaboration on technical issues (but not the assessment) with colleagues in other agencies and universities. The study

incorporated all available public data and included new field and analytic work as well as the reevaluation of all previous work.

Using a methodology similar to that used in previous USGS assessments in the ANWR and the National Petroleum Reserve—Alaska, this study estimates that the total quantity of technically recoverable oil in the 1002 area is 7.7 BBO (mean value), which is distributed among 10 plays. Most of the oil is estimated to occur in the western, undeformed part of the ANWR 1002 area, which is closest to existing infrastructure. Furthermore, the oil is expected to occur in a number of accumulations rather than a single large accumulation. Estimates of economically recoverable oil, expressed by probability curves, show increasing amounts of oil with increasing price. At prices less than \$13 per barrel, no commercial oil is estimated, but at a price of \$30 per barrel, between 3 and 10.4 billion barrels are estimated. Economic analysis includes the costs of finding, developing, producing, and transporting oil to market based on a 12 percent after-tax return on investment, all calculated in constant 1996 dollars.

The amounts of in-place oil estimated for the ANWR 1002 area are larger than previous USGS estimates. The increase results in large part from improved resolution of reprocessed seismic data and geologic analogs provided by recent nearby oil discoveries.

2000. Hydrologic Data. United States Geological Survey, Alaska Division:
<http://ak.water.usgs.gov/Data/water.htm> *HYDROLOGY; ground water; surface water; WATER QUALITY*

2001. Water Quality in the Yukon River Basin. Factsheet FS-050-01. U.S. Geological Survey, Anchorage. <http://water.usgs.gov/nasqan/progdocs/factsheets/yukonfact/yukonfs.html> *WATER QUALITY; surface water; CONTAMINANTS; metals; sediment; NUTRIENT CYCLING; carbon; nitrogen; phosphorus; CLIMATE*

The Yukon River Basin, which encompasses 330,000 square miles in northwestern Canada and central Alaska (Fig. 1), is one of the largest and most diverse ecosystems in North America. The Yukon River is also fundamental to the ecosystems of the eastern Bering Sea and Chukchi Sea, providing most of the freshwater runoff, sediments, and dissolved solutes. Despite its remoteness and perceived invulnerability, the Yukon River Basin is changing. For example, records of air temperature during 1961- 1990 indicate a warming trend of about 0.75 °C per decade at latitudes where the Yukon River is located. Increases in temperature will have wide-ranging effects on permafrost distribution, glacial runoff and the movement of carbon and nutrients within and from the basin. In addition, Alaska has many natural resources such as timber, minerals, gas, and oil that may be developed in future years. As a consequence of these changes, several issues of scientific and cultural concern have come to the forefront. At present, water quality data for the Yukon River Basin are very limited. This fact sheet describes a program to provide the data that are needed to address these issues.

2002. Alaska Science Center [website]. United States Geological Survey:
<http://alaska.usgs.gov/> *HYDROLOGY; geology; WATER QUALITY; glacial discharge; glaciation; sediment; VEGETATION; mapping; population; mammals; birds; fish; contaminants; imaging (remote sensing)*

Where the USGS works to understand the Alaskan environment through biology, geology, geography, and water resources. [This home page for the Alaska Division of the USGS provides links to numerous programs, projects, and findings in the following research areas:]

USGS and Water in Alaska

The Water Resources Office works on a variety of programs including: glacier monitoring, hydrologic data collection, the National Water-Quality Assessment (NAWQA), and volcano hazards.

USGS and Geography/Mapping in Alaska

The Geographic Sciences Office has three programmatic Components in Alaska including: Geographic Analysis and Monitoring (GAM), Land Remote Sensing (LRS), and Cooperative Topographic Mapping (CTM).

USGS and Geology in Alaska

The Geologic Sciences Office has programs active in mineral resources, energy, volcano hazards and earthquake hazards.

USGS and Biology in Alaska

The Biological Science Office and the Alaska Cooperative Fish & Wildlife Research Unit conduct research on wildlife and their vast habitats in Alaska. USGS scientists provide biological information and research findings to resource managers, policymakers, and the public to support sound management of biological resources and ecosystems in Alaska.

2002. Open-File Reports [Online]. US Geological Survey:

<http://pubs.usgs.gov/products/books/openfile/> *BIBLIOGRAPHY; MINING; HYDROLOGY; WATER QUALITY*

Open-file reports include unpublished manuscript reports, maps, and other material that are made available for public consultation at depositories. They are a nonpermanent form of publication that may be cited in other publications as sources of information.

Most open-file reports are available from USGS Information Services, Box 25286, Federal Center, Denver, CO 80225 (telephone: 303-202-4210; e-mail: infoservices@usgs.gov).

USNPS, and USFWS, 1999. LOWER SHEENJEK RIVER, ALASKA. Environmental Impact Statement EPA # 990382F. US Department of the Interior: National Park Service, Fish and Wildlife Service, Anchorage, Alaska. *POPULATION; environmental impact statement; management*

PURPOSE: The inclusion in the National Wild and Scenic Rivers System (NWSRS) of the Lower Sheenjek River, located in northeastern Alaska, is proposed. The river is a 277-mile free-flowing, unpolluted tributary of the Porcupine River. The study area encompasses the lower 99 miles of the river flowing through the Yukon Flats National Wildlife Refuge. The river outside the study area, within the Arctic National Wildlife Refuge, is already included in the NWSRS. The entire study area is eligible and suitable for inclusion in the system, meeting the criteria for classification as wild. The area is characterized by outstandingly remarkable cultural, wildlife, scenic, and recreational values and has historically provided access to important resources used by local people for subsistence. The area provides habitat for waterfowl, moose, black bear, grizzly bear, and beaver, and the scenery is appealing as the river flows through thickly forested, boggy flats. Finally, the river offers excellent boating waters and camping opportunities which are easily accessible. With the exception of five relatively small private parcels, the entire study area is federally owned. Two alternatives, including a No Action Alternative (Alternative B), are considered in this final EIS. Under the proposed action (the preferred alternative, Alternative A), the entire Lower Sheenjek River would be recommended for inclusion as a wild river in the NWSRS. The management of all federal lands would remain with the U.S. Fish and Wildlife Service. The management objectives would focus

on keeping the area free of water resource development projects and major extractive resource development (timber logging and oil and gas development) and minimize the impact of recreational use. The estimated cost of corridor administration is \$5,000 per year. **POSITIVE IMPACTS:** The designation of the Lower Sheenjek as a wild river would provide additional protection and management attention relative to other rivers and resources in the Yukon Flats National Wildlife Refuge and encourage consistent management of the lower and upper segments of the river. **NEGATIVE IMPACTS:** Oil and gas development and other potential resource development would be foregone, as would road, utility, and pipeline construction. **LEGAL MANDATES:** Alaska National Interest Lands Conservation Act of 1980 (P.L. 96-487) and Wild and Scenic Rivers Act of 1968, as amended (16 U.S.C. 1271 et seq.). **PRIOR REFERENCES:** For the abstract of the draft EIS, see 98-0425D, Volume 22, Number 4.

Ussery, X., Gessner, B., Lipman, H., Elliott, J., Crain, M., Tien, P., Parkinson, A., Davidson, M., Facklam, R., and Breiman, R., 1996. Risk factors for nasopharyngeal carriage of resistant *Streptococcus pneumoniae* and detection of a multiply resistant clone among children living in the Yukon-Kuskokwim Delta region of Alaska. *Pediatric Infectious Disease Journal* 15 (11), 986-992. *PEOPLE; health (condition); infants; children; respiratory infection; bacteria; pneumonia*
Children <2 years old living in the Yukon-Kuskokwim Delta (YKD) region of Alaska have one of the highest pneumococcal bacteremia rates of in the world. To determine the prevalence of and risk factors for infection with intermediate or resistant *Streptococcus pneumoniae* in the YKD, we cultured nasopharyngeal secretions of healthy children less than or equal to 5 years old, reviewed their hospital records and administered questionnaires to accompanying parents. Of 185 children evaluated we obtained 95 pneumococcal isolates; drug susceptibility patterns and serotyping results were available for 92. Of these, 33 (36%) were intermediate or resistant to at least one drug class tested; 27 isolates were intermediate (minimum inhibitory concentration 0.1 to 1.0 mg/l) and none were resistant to penicillin. Compared with other isolates, capsular serotype 6B isolates were more likely to be intermediate or resistant to at least one drug (relative risk, 5.3; P < 0.001) and to more than one drug (relative risk, 17.0; P < 0.001). The majority of 6B isolates had identical pneumococcal surface protein A patterns. Carriage of intermediate or resistant pneumococcus was associated with age <2 years (relative risk, 3.0; P < 0.001) but not with antibiotic use or other evaluated risk factors. Young age but not antibiotic use was associated with carriage of intermediate or resistant *S. pneumoniae* in the YKD region of Alaska. Much of the intermediate or resistant pneumococcus in the YKD may have resulted from the proliferation of a single capsular serotype 6B clone.

UWTV, 2002. Community needs assessment 2002: Compass, charting a new direction for our community's future. Community needs assessment, United Way COMPASS project. United Way of the Tanana Valley, Fairbanks. *PEOPLE; health (condition); economics; infrastructure; alcohol*

Contents: Overview: Executive summary -- Community Indicators: summary- Characteristics of the population -- Households, families and housing -- Income, poverty and hunger -- Public assistance -- Industry -- Employment -- Education -- Vital statistics -- Substance abuse and mental health -- Health facilities and providers -- Law enforcement - - Crime rates and correctional facilities -- Family violence -- Child care -- Recreation and organizations -- Transportation -- Key Informant Survey: summary -- Survey data report -- Survey instrument -- Household Survey: summary.

Van Blaricum, S., Miller, J., and Russell, G., 1995. High latitude river runoff in a doubled CO₂ climate. *Climatic Change* 30 (1), 7-26. *CLIMATE; hydrology; modeling; carbon; snow*
A global atmospheric model is used to calculate the monthly river flow for nine of the world's major high latitude rivers for the present climate and for a doubled CO₂ climate.

The model has a horizontal resolution of 4 degree x 5 degree , but the model's runoff from each grid box is quartered and added to the appropriate river drainage basin on a 2 degree x 2.5 degree resolution. A routing scheme is used to move runoff from a grid box to its neighboring downstream grid box and ultimately to the mouth of the river. In a model simulation in which atmospheric carbon dioxide is doubled, mean annual precipitation and river flow increase for all of these rivers, increased outflow at the river mouths begins earlier in the spring, and the maximum outflow occurs approximately one month sooner due to an earlier snow melt season. In the doubled CO₂ climate, snow mass decreases for the Yukon and Mackenzie rivers in North America and for rivers in northwestern Asia, but snow mass increases for rivers in northeastern Asia.

Van Cleve, K., Dyrness, C.T., Viereck, L.A., Fox, J., Chapin III, F.S., and Oechel, W., 1983. Taiga ecosystems in interior Alaska. *Bioscience* 33, 39-44. *INCOMPLETE (need abstract); NUTRIENT CYCLING; HYDROLOGY; VEGETATION; POPULATION; carbon; nitrogen; ground ice / permafrost*

Van Cleve, K., Chapin III, F.S., Dyrness, C.T., and Viereck, L.A., 1991. Element cycling in taiga forests: state- factor control. *Ecology* 2, 228-238. *NUTRIENT CYCLING; nitrogen; carbon; INCOMPLETE (need abstract)*

Van Cleve, K., Viereck, L., and Dyrness, C., 1996. State factor control of soils and forest succession along the Tanana River in interior Alaska, U.S.A. *Arctic and Alpine Research* 28 (3), 388-400. *SOIL; sediment; NUTRIENT CYCLING; nitrogen; carbon; wildfire; flooding*
State factor controls of soil and forest development were examined in floodplain primary and upland secondary successional ecosystems along the Tanana River in interior Alaska. Topography is the principal difference in state factor control of structure and function of these systems. It interacts with type of disturbance, sedimentation, or fire, thus conditioning ecosystem response. Sedimentation adds new, low-fertility inorganic alluvium to new or established floodplain surfaces and may bury established soils exposing them to a more constant physical environment. Mineralization of buried organic matter then occurs under more favorable conditions of temperature and moisture, providing for a higher, sustained recycling of nutrients for plant grown compared with decomposition of surface litter. The new alluvium is low in organic matter and nitrogen, and improvement in soil fertility depends on the growth of alder with its nitrogen-fixing capability. These soils are salt-affected and alkaline because of salts inherited in the alluvium and surface evaporation of soil solution that rises by capillary movement from shallow ground water. In the uplands, fire acts as a rapid decomposer mineralizing nutrients as organic materials burn. Combustion of surface organic matter reduces the insulating effect of these detrital layers, warming the soil. In areas underlain by permafrost the thickness of the active layer increases and soil drainage may improve following fire. Although some carbon and nitrogen may be lost by volatilization, the postfire soil for plant colonization has a legacy of fertility from the previous ecosystem. There is a reserve of soil nutrition available to support early seedling establishment and growth. In floodplain soils, the legacy may appear in buried organic layers.

Varughese, P.V., Grauwiler, A., Carter, A.O., and Duclos, P., 1990. Pertussis outbreak in the Yukon Territory--1989. *Canadian Disease Weekly Report* 16 (14), 63-7. *PEOPLE; health (condition); respiratory infection; INCOMPLETE (need abstract)*

Vavrek, M., Fetcher, N., McGraw, J., Shaver, G., Chapin III, F., and Bovard, B., 1999. Recovery of productivity and species diversity in tussock tundra following disturbance. *Arctic, Antarctic, and Alpine Research* 31 (3), 254-258. *VEGETATION; disturbance; wildfire; recovery*

Tundra ecosystems appear to recover slowly from disturbance, but little long-term data concerning plant diversity has been available. We examined recovery of tundra vegetation in Alaska, U.S.A., 23 yr after fire and 24 yr after bulldozing. Primary productivity, depth of thaw, and vascular plant diversity were compared between disturbed and undisturbed tundra to determine whether recovery was complete. Productivity, species richness, and diversity did not differ between burned and unburned plots. Depth of thaw, however, remained greater in burned relative to unburned plots. In contrast, depth of thaw was the only characteristic that did not differ between bulldozed and control plots. Productivity and species richness were greater in bulldozed plots, but diversity was less than control plots. The differences between the two disturbances suggest that, ultimately, recovery depends more on the impact of disturbance on vegetation than changes in the abiotic environment. Vegetative propagules persisted in the soil after fire, but not bulldozing. Therefore, recolonization after fire included plants from the seed bank and vegetative propagules. Vegetation on bulldozed plots was dominated only by seed bank species. Thus, more than two decades after disturbance, recovery of tundra vegetation appeared to be a function of the nature of the disturbance.

Veres, A., Pienitz, R., and Smol, J., 1995. Lake water salinity and periphytic diatom succession in three subarctic lakes, Yukon Territory, Canada. *Arctic* 48 (1), 63-70. *POPULATION; invertebrates; microbes; diatom; limnology; water quality; sodium; seasonality*

Seasonal changes in water chemistry and periphytic diatom assemblages were monitored for a saline, a subsaline, and a freshwater lake in the central Yukon Territory. Athalassic saline lakes, such as these, are believed to be extremely rare in arctic regions. All three study lakes exhibited a gradual shoreline retreat over the season (28 May to 22 August 1992) due to evaporative water loss. As the season progressed, the saline lake exhibited a marked increase in conductivity and salinity, similar to changes observed for inland salt lakes in more southern regions. The seasonal changes in water chemistry were less pronounced in the subsaline and freshwater lakes. The periphytic diatom populations of the saline lake closely tracked changes in the lake's salinity, exhibiting a successional shift from taxa with low salt tolerances (e.g., *Nitzschia cf. commutata* and *N. cf. palea*) to those with high salt tolerances (e.g., *Amphora acutiuscula*) over the study period. Periphytic diatoms in the subsaline and freshwater lakes also exhibited marked successional changes, shifting to almost complete dominance by a single species (*Cocconeis placentula* and *Achnanthes minutissima* respectively), but these shifts were not related to lake water salinity alone.

Vetter, W., Bartha, R., Stern, G., and Tomy, G., 1999. Enantioselective determination of two persistent chlorobornane congeners in sediment from a toxaphene-treated Yukon lake. *Environmental Toxicology and Chemistry* 18 (12), 2775-2781. *CONTAMINANTS; POPs (persistent organic pollutants); sediment*

The composition of toxaphene residues and the enantiomeric ratios of the major congeners were studied in the top 10 slices (1935-1992) of a sediment core collected from Hanson Lake in the Yukon Territories (Canada). This lake was treated with toxaphene as a pesticide in July 1963. Electron-capture negative ion mass spectrometry and electron-capture detection were applied in combination with enantioselective gas chromatography using modified cyclodextrin columns. Of the 10 toxaphene peaks identified in each of the sediment slices, two congeners, 2-exo, 3-endo, 6-exo, 8,9,10-hexachlorobornane (B6-923 or Hx-Sed) and 2-endo, 3-exo, 5-endo, 6-exo, 8,9,10-heptachlorobornane (B7-1001 or Hp-Sed), were the most abundant. Each of the three chiral stationary phases used in this study was successful at resolving the enantiomers in at least one of the two congeners. Among them was permethylated beta - cyclodextrin (Chirasil-Dex), which, up until now, has never been used for enantiomer separation of compounds of technical toxaphene. B6-923 and another less abundant, as

of yet unknown, hexachlorobornane were racemic in all sediment core slices. For B7-1001, the latter eluting enantiomer was always more predominant. Furthermore, the enantiomeric ratio was found to consistently decrease with time from approximately 0.8 in the early slices (similar to 1950) to 0.7 in the slice representing 1992, implying that the first eluted B7-1001 enantiomer is less persistent than the second. B6-923 and B7-1001 are most likely metabolites of the more highly chlorinated congeners. A structural evaluation provided evidence that reductive dechlorination at carbons with geminal chlorine atoms is the primary microbial degradation pathway in sediments from Hanson Lake.

Vetter, M., 2000. Grasslands of the Aishihik-Sekulmun Lakes Area, Yukon Territory, Canada. *Arctic* 53 (2), 165-173. *VEGETATION; distribution*

Grassland communities found on dry, steep, south-facing slopes in the Aishihik-Sekulmun Lakes area, southwest Yukon Territory, are dominated by *Artemisia frigida* and *Carex filifolia*, with *Calamagrostis purpurascens*, *Poa glauca*, *Penstemon gormanii*, *Phlox hoodii*, and *Potentilla nivea* subdominant. The grasslands are similar in terms of dominants and subdominants to other grasslands in southwest Yukon, but twelve species that have not been recorded at other sites were found in the Aishihik-Sekulmun area. The composite species list from southwest Yukon grasslands was compared to those from grasslands found in Alaska and in the boreal forest on the northern Great Plains. These three regions share a number of species; however, at least 25% of the species in each region are restricted to that region alone and absent from the other two. The southwest Yukon grasslands flora contains the following groups: species restricted to southwest Yukon, species found in both southwest Yukon and Great Plains grasslands, species found in both southwest Yukon and Alaska grasslands, and species found in grasslands in all three regions. Further work is needed to more fully characterize the floristic components of southwest Yukon grasslands and variations among them.

Viereck, L.A., and Foote, J.M., 1972. The status of *Populus balsamifera* and *P. trichocarpa* in Alaska. *Canadian field-naturalist* 84, 169-173. *INCOMPLETE (need abstract); VEGETATION; poplar*

Viereck, L.A., 1979. Characteristics of treeline plant communities in Alaska. *Holarctic Ecology* 2, 228-238. *INCOMPLETE (need abstract); VEGETATION; treeline*

Vitt, R.B., 1971. Hunting practices of the Upper Tanana Athapaskans: College, University of Alaska, M.A., 192 p *PEOPLE; subsistence; anthropology*

Volz, T.J., 2000. Phytochemical comparison of *Puccinellia arctica* to *Poa pratensis*, *Puccinellia langeana*, and *Puccinellia phryganodes* for evidence of chemical defense, University of Alaska Fairbanks, M.S., 102 p *VEGETATION; grasses; chemical defense; herbivory; goose*

Summary: "*Puccinellia arctica* is a species of arctic grass that is unpalatable to Canada geese, *Branta canadensis*, and may be an effective and non-lethal means of controlling the growing populations of urban Canada geese that are problematic in many areas of North America. The secondary metabolite profile of *P. arctica* was compared to the metabolite profiles of three palatable grass species to determine the plausibility that *P. arctica* is chemically defended. The volatile and non-volatile secondary metabolite profiles of both *P. arctica* and the palatable grasses were the same. No alkaloids were detected in any of the grasses. Condensed tannin levels were similar in all of the grasses. Gallotannin levels were higher in the palatable grasses than in *P. arctica*. However, ellagitannin levels were higher in *P. arctica* than in the palatable grasses and may be responsible for its unpalatability to Canada geese"

Vörösmarty, C., Hinzman, L., Peterson, B., Bromwich, D., Hamilton, L., Morison, J., Romanovsky, V., Sturm, M., and Webb, R., 2001. The Hydrologic Cycle and its Role in Arctic and Global Environmental Change: A Rationale and Strategy for Synthesis Study. Arctic Research Consortium of the U.S., Fairbanks, Alaska. <http://www.arcus.org/ARCSS/hydro/>
REFERENCE; HYDROLOGY; CLIMATE; NUTRIENT CYCLING; flooding; freeze-thaw cycles; glacial discharge; modeling; ground ice / permafrost; thermokarst; river ice; sea level

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Wackett, J., 2002. Factors affecting Yukon teen pregnancy decline in the mid and late 1990s. *Journal of obstetrics and gynaecology Canada/Journal d'obstetrique et gynecologie du Canada* 24 (11), 889-893. *PEOPLE; adolescents; reproduction*

Teen pregnancy has declined throughout North America in the 1990s. In Yukon Territory, Canada, teen pregnancy in the late 1990s was almost 40% lower than in the early 1990s. This rate of decline is significantly greater than most recently reported national rates of teen pregnancy decline in Canada and United States. Identifying possible causes of the Yukon decline may help policy makers and program managers plan and implement teen pregnancy prevention strategies. Data on Yukon teen pregnancy prevention initiatives were collected through numerous discussions and interviews with Yukon service providers, teens, and the general public between 1994 and 2001. Analysis of data demonstrates that multiple new initiatives spanning many sectors were implemented in the mid and late 1990s that could have contributed to the decline in Yukon teen pregnancy. A multi-dimensional approach to teen pregnancy prevention that included researching and evaluating family planning programs and policies before, during, and after implementation, increasing access to longer-acting hormonal contraceptives, providing continuing family planning medical education to health care providers and other youth service providers, subsidization of contraceptives, delivery of innovative family planning mass media campaigns, and delivery of ongoing sexual health education programs may have significantly contributed to the decline in Yukon teen pregnancy. Collaboration among service providers across many service sectors (clinical, public health, education, First Nations, government communication and policy, grassroots) facilitated coordination of the multi-dimensional approach.

Wagener, S., and LaPerriere, J., 1985. Effects of placer mining on the invertebrate communities of interior Alaska streams. *Freshwater Invertebrate Biology* 4 (4), 208-214. *POPULATION; invertebrates; insects; MINING; limnology; water quality; surface water; sediment*

To determine the effect of placer mining on benthic macroinvertebrates the authors determined selected water quality characteristics and sampled benthic invertebrates in nine hydrologically similar and proximally located streams, ranging from unmined to heavily mined streams. Placer mining caused increased turbidity, and increased amounts of settleable solids, and suspended sediment (nonfilterable residues). Sediment from placer mining was associated with decreased density and biomass of invertebrates. In a stream where mining began in mid-August, Orthocladiini (Diptera: Chironomidae) and Chloroperlid stoneflies decreased in abundance while they were not decreased in a nearby unmined stream. Water mites seemed to be the organisms most affected by placer mining.

Walker, L.R., 1985. The processes controlling primary succession on an Alaskan flood plain, University of Alaska, Fairbanks, Ph. D., 187 p *VEGETATION; succession; flooding; climate; herbivory*

Wania, F., and Mackay, D., 1995. A global distribution model for persistent organic chemicals. *Science of the Total Environment* 160-161 (Ecological Effects of Airborne Contaminants), 211-232. *REFERENCE; CONTAMINANTS; POPs (persistent organic pollutants); long range transport; sediment*

A nonsteady-state, multi-compartmental mass balance model of organic contaminant fate is presented in which the global environment is represented by nine sequentially arranged climatic zones. Each zone has an air, ocean water, fresh water, fresh water sediment, and two soil compartments, connected by advective and intermedia transport processes. Degradation can take place in every compartment and zone. The time, magnitude, and medium of chemical discharge is specified for each climatic zone. The seasonal variability of some key parameters such as air and ocean water temperature is

taken into account. The mass balances for each of the compartments result in a system of 54 differential equations, solved numerically to yield estimates of concentrations, masses, transport fluxes, and reaction rates as a function of time. A series of illustrative calculations studies the major factors governing the global dispersion of persistent organic chemicals: (1) temperature, (2) chemical degradability, (3) environmental descriptors such as transport rates and organic carbon contents, (4) location and amount of chemical discharge and (5) physico-chemical properties. The calculations confirm that condensation at low temperatures can result in elevated contaminant concentrations in the polar regions and that chemicals show distinct global distribution patterns based on their physico-chemical properties.

Wanty, R.B., 1999. Regional baseline geochemistry and environmental effects of gold placer mining operations on the Fortymile River, eastern Alaska [microform]. Open-file report ; 99-328. US Geological Survey, Reston, Va.? *MINING; gold; WATER QUALITY; ground water; surface water; sediment; contaminants*

Ward, R., and Larsen, D., 1995. Summary of 1992 moose surveys in the Aishihik, Onion Creek, Big Salmon, Mayo and Dawson areas: Survey report. NTIS/MIC9902123. Fish & Wildlife Branch, Whitehorse, Yukon. *POPULATION; mammals; moose; modeling; management*
Moose surveys were conducted in 1992 over portions of five survey areas in south-west Yukon. This report presents summaries of moose population and harvest information for those areas. Physical, climatic, and habitat characteristics of the survey areas are described along with survey methods and population modelling procedures. Results and discussion relate to population characteristics and distribution during early winter surveys and late winter population composition counts. The concluding section discusses reasons for moose population decline, consequences of excessive harvest, and harvest restrictions.

Ward, J., Rexstad, E., Sedinger, J., Lindberg, M., and Dawe, N., 1997. Seasonal and annual survival of adult Pacific brant. *Journal of Wildlife Management* 61 (3), 773-781. *POPULATION; birds; waterfowl; goose; recovery; reproduction; distribution*

Declining mid-winter counts of Pacific brant (*Branta bernicla nigricans*) and reduced numbers of nesting birds on their main breeding grounds prompted us to assess factors that may be limiting recovery of this population. We estimated seasonal and annual survival rates of adult brant in 1986-93 from resightings of leg-banded birds. Brant were banded at a major colony on the Yukon-Kuskokwim Delta, Alaska (Y-K Delta) in 1986-92, and resighted there in 1987-93 as well as at major fall and spring migration and wintering areas in 1990-93. Seasonal survival was the same for males and females. Mean monthly survival rate was lowest (P less than or equal to 0.05) in late spring migration (15 Apr-1 Jun), the period of greatest subsistence harvest on the breeding grounds, and highest in winter (1 Jan-1 Mar), the period of greatest sport harvest. Annual survival rate did not vary among years ($F = 0.51$; 5, 718 df; $P = 0.91$) and averaged 0.840 (SE = 0.031) from 1986 to 1993. Subsistence harvest has contributed to low population levels of Pacific brant.

Webb, M., 1985. The last frontier, University of New Mexico Press, 416 p *PEOPLE; anthropology; non-indigenous; behavior (habits and lifestyles)*

Weber, M., 1982. Nitrogen dynamics through the forest floor of two interior Alaska black spruce ecosystems, University of Alaska, Fairbanks, Ph.D., 139 p *NUTRIENT CYCLING; nitrogen; black spruce*

Weber, P., 1986. Downstream effects of placer mining in the Birch Creek basin, Alaska. Technical Report 86-7. Alaska Department of Fish and

Game, <http://biology.usgs.gov/s+t/SNT/noframe/ak177r.htm> *INCOMPLETE (need abstract); WATER QUALITY; surface water; limnology; MINING; gold; fish; limnology*

Wegner, M., 1997. Transient groundwater and surface-water interactions at Fort Wainwright, Alaska: Fairbanks, University of Alaska, M.S. Thesis *INCOMPLETE (need abstract); HYDROLOGY; ground water; surface water; ground ice / permafrost*

Weicker, J.J., 2000. Aspects of genetic and morphological variation in selected new world land birds, University of Alaska Fairbanks, M.S., 72 p *POPULATION; birds; warbler; genetics; modeling*

Summary: "The objective of this thesis is to examine variation in certain New World land birds, focusing on morphological difference at the intraspecific level and genetic differences at the intra- and interspecific levels. First, I investigate sexual dimorphism in the Wilson's Warbler (*Wilsonia pusilla*), a Nearctic-Neotropic migrant parulid. Using museum specimens, I quantify the degree of dimorphism and devise a method to distinguish the sexes using morphological measurements. Second, I outline a new method of approximating Weir and Cockerham's θ (1984, 1993), an unbiased estimator of genetic population structure. The method uses commonly published parameters and obviates the need to recode existing allozyme data sets to calculate θ . The estimation algorithm is shown to be useful for both model populations and real-world avian populations."

Wein, E.E., 1994. The high cost of a nutritionally adequate diet in four Yukon communities. *Canadian Journal of Public Health* 85 (5), 310-312. *PEOPLE; nutrition; traditional food*

The cost of purchasing a nutritionally adequate diet in four Yukon communities was examined, based on the 46 food items and quantities of the federal government's Northern Food Basket. In Old Crow, unit purchase prices were on average 250% of those in Edmonton, while in three southern Yukon communities, unit purchase prices were about 125% of those in Edmonton. In quantities needed to meet weekly nutrient needs of a family of four, the cost in Old Crow was 320% of that in Edmonton, while in three southern Yukon communities, it was 140%. It appears that due to financial necessity, Yukon aboriginal people need continuing access to traditional food resources (wild game animals, birds, fish and berries). Since the Northern Food Basket does not include any traditional foods, it alone is of limited acceptability to these people. The high cost of marketed food and the role of traditional foods in contemporary diets should be considered in giving dietary advice and in determining food allowances in social assistance programs.

1995. Evaluating food use by Canadian aboriginal peoples. *Canadian Journal of Physiology and Pharmacology* 73 (6), 759-764. *PEOPLE; subsistence; nutrition; traditional food; native perspective*

Canadian Aboriginal people encompass diverse cultural groups, whose daily food patterns vary in regard to the kinds and proportions of indigenous foods. Standard dietary methods of assessing food consumption sometimes require modification to be understandable and acceptable to Aboriginal communities. Depending upon the purpose of the research, food frequency methods, repeated 24-h recalls of individual food consumption, and (or) examination of food preferences and food health beliefs may be used. Consultation with Aboriginal community leaders in planning the research is essential, to ensure collaboration and support. Explaining the purpose and methods to community members requires assistance of a respected local Aboriginal person, fluent in the language. Extra time is required for becoming acquainted with local foods, for translation, and for training community members as interviewers. Examples of these

principles are discussed from the author's experience in the Yukon, the Northwest Territories, and northern Alberta.

Wein, E.E., and Freeman, M., 1995. Frequency of traditional food use by three Yukon First Nations living in four communities. *Arctic* 48 (2), 161-171. *PEOPLE; subsistence; traditional food; nutrition*

This study documented the frequency of use of traditional food species among 122 adults from three Yukon First Nations. The informants resided in four communities: Haines Junction, Old Crow, Teslin, and Whitehorse. Food patterns were examined in two ways: (1) estimated frequency of household use of traditional food species over a one-year period, and (2) frequency of traditional foods in four daily diet recalls of men and women, collected once per season. On average, Yukon Indian households used traditional foods over 400 times annually. Moose was consumed on average 95 times yearly, caribou 71, chinook salmon 22, Labrador tea 20, cranberries and crowberries each 14, and blueberries 11 times yearly. According to household estimates, traditional foods were consumed almost as often in Whitehorse as in Haines Junction. Teslin surpassed both these, while Old Crow had the highest frequency. Daily diets of adult individuals indicated that traditional foods were consumed on average 1.14 times per day. Traditional foods were reported twice daily in Old Crow diets, once daily in each of Teslin and Haines Junction, and 0.5 times daily in Whitehorse diets. Measured by frequency of use, traditional foods-especially moose, caribou and salmon-remain extremely important in contemporary diets of these Yukon Indian people.

Welbourn, M.L., 1983. Ecologically based forest policy analysis : fire management and land disposals in the Tanana River Basin, Alaska, Cornell University, Ph. D., 230 p *VEGETATION; ecology; forestry; wildfire; land use*

Weller, G., and Anderson, P.A., eds., 1999. Assessing the Consequences of Climate Change for Alaska and the Bering Sea Region. Center for Global Change and Arctic System Research, for U.S. Global Change Research Program, National Science Foundation, U.S. Department of Interior, International Arctic Science Committee, Fairbanks, Alaska. *CLIMATE; subsistence; people; population; mammals; birds; fish; invertebrates; insects; microbes; forestry; wildfire; succession; ground ice / permafrost; thermokarst; river ice; infrastructure; economics; snow*

PREFACE

The objectives of this interdisciplinary workshop were to assess the nature and magnitude of changes in the Alaska/Bering Sea region as a consequence of climate change; predict/assess the consequences of these changes on the physical, biological and socio-economic systems in the region; determine the cumulative impacts of these changes on the region, including assessment of past impacts; and begin to investigate possible policy options to mitigate these cumulative impacts. The assessment covered climate-related consequences on the following sectors:

Fisheries

Effects on fisheries due to climate change have been observed in Alaska where a major international fishery exists in the Bering Sea. These effects, which resulted in increases in catches in some areas and decreases in others, need to be assessed. This assessment needs to also consider fisheries policies, market prices, changes in technology for fish harvesting and utilization, changes in fisheries management and changes in societal needs and preferences.

Forestry

The effects of climate change observed on the Alaska boreal forests include unprecedented insect outbreaks, increased fire frequency and intensity, and the effects of permafrost thawing in changing the landscape. The northward migration of the forests

and a lengthened growing season are factors that will become more important to both forestry and agriculture as the climate continues to become warmer.

Infrastructure

Permafrost thawing is occurring throughout Alaska and is already adversely affecting roads, houses, airfields and other infrastructure, as well as slowly changing the boreal forest to bogs and grasslands. As the climate continues to warm, more permafrost will thaw and snow and ice will melt. The resulting impacts will become more serious and will require further monitoring, modeling, and assessment to determine the rates of change, the spatial extent of thawing and melting, and its effects.

Subsistence

Changes in the high-latitude environment, including a reduced sea ice cover, changes in ocean temperatures and snow cover on land, and thawing of permafrost and coastal erosion have influenced the subsistence hunting and fishing practices of Alaska's Native population. The abundance and distribution of fish, marine and land mammals and reduced or altered access to these food resources are all critical factors in assessing future consequences for Alaska Natives.

Wildlife

Seabird populations in Alaska are larger and more diverse than in any similar region in the Northern Hemisphere. They are good indicators of healthy marine ecosystems and can be useful in measuring change in the marine environment. Recent marked shifts in climate have affected entire ecosystems and the continuing study of seabirds is expected to provide vital clues on the health of these ecosystems.

This workshop was part of the U.S. Global Change Research Program's National Assessment of the Potential Consequences of Climate Variability and Change. The Alaska regional assessment was originally begun under the auspices of the International Arctic Science Committee in 1995. This was the fourth annual workshop on this topic held in Alaska. Future workshops are planned to update our assessment of climate change impacts as more information and data become available. The reports published to date are:

- * 1996. Preparing for an Uncertain Future: Impacts of Short- and Long-Term Climate Change in Alaska. P. Anderson and G. Weller, eds. Center for Global Change and Arctic System Research, University of Alaska Fairbanks, Fairbanks, Alaska, 43 pages.
 - * 1997. The Impacts of Global Climate Change in the Bering Sea Region. An Assessment Conducted by the International Arctic Science Committee under its Bering Sea Impacts Study (BESIS). Results of a Workshop at Girdwood, Alaska, September 1996. Center for Global Change and Arctic System Research, University of Alaska Fairbanks, Fairbanks, Alaska, 40 pages.
 - * 1998. Implications of Global Change in Alaska and the Bering Sea Region. Proceedings of a Workshop at the University of Alaska Fairbanks on 3–6 June 1997. G. Weller and P.A. Anderson, eds. Center for Global Change and Arctic System Research, University of Alaska Fairbanks, Fairbanks, Alaska, 152 pages plus appendices.
 - * 1999. Assessing the Consequences of Climate Change for Alaska and the Bering Sea Region. Proceedings of a Workshop at the University of Alaska Fairbanks, 29–30 October 1998. G. Weller and P.A. Anderson, eds. Center for Global Change and Arctic System Research, University of Alaska Fairbanks, Fairbanks, Alaska, 94 pages (this volume).
- WERC, 1996? Fort Wainwright Environmental Reports; a reference list of environmental reports relating to geohydrologic investigations at Fort Wainwright, Alaska. Water and Environmental Research Center; University of Alaska Fairbanks:
<http://www.uaf.edu/water/projects/ftww/publications/ref1.txt> *HYDROLOGY; ground water; surface water; SOIL; ground ice / permafrost; remediation; CONTAMINANTS; monitoring;*

metals; arsenic; barium; cadmium; chromium; lead; POPs (persistent organic pollutants); POL (petroleum/oil/lubricants = hydrocarbons); MILITARY; waste (hazardous); modeling; remediation; risk assessment

WERC, and ENSR, 1999. Miscellaneous Hydrological Data Sources. Water and Environmental Research Center, UAF and Environmental and Energy Development Solutions, Westford, MA: http://www.uaf.edu/water/projects/ftww/gwdata/misc_data.html *HYDROLOGY; ground water; surface water; ground ice / permafrost; glaciology; WATER QUALITY*

2000. Ground-Water and Surface-Water Interactions, Fort Wainwright, Alaska. Water and Environmental Research Center, UAF and Environmental and Energy Development Solutions, Westford, MA: <http://www.uaf.edu/water/projects/ftww/gwsw/gwsw.html> *CONTAMINANTS; HYDROLOGY; ground water; surface water; transport*

Ground-water and surface-water (GW/SW) interactions account for most of the dynamic ground-water variation in the Fort Wainwright area. GW/SW interactions control vertical water-table changes, changing flow directions, and reversing vertical flow gradients. Environmental investigations frequently need to address varying rates and directions of contaminant movement related to the relative locations of the Chena and Tanana Rivers. Our investigation efforts are providing U.S. Army Alaska (USARAK), U.S. Army Corps of Engineers, Alaska District (COE), and their contractors insight into these critical processes. Our project data and reports are presented in the below tables and links. Please contact us with any questions. You will find the primary project contacts listed at the bottom of this page.

2002. Fort Wainwright Hydrological Data Network. Water and Environmental Research Center, UAF and Environmental and Energy Development Solutions, Westford, MA: <http://www.uaf.edu/water/projects/ftww/gwdata/gwdata.html> *HYDROLOGY; MILITARY; ground water; surface water; SOIL*

ENSR and WERC maintain a hydrologic network of data stations on Fort Wainwright. This effort benefits environmental programs for Fort Wainwright and U.S. Army Alaska. We monitor ground-water elevations, soil temperature, and soil moisture content at numerous well sites throughout the Fort Wainwright project area. Various surface-water data is also collected. The below lists links to selected site information. The U.S. Army Corps of Engineers (COE) identification system uses the term AP for "auger powered". This indicates the method of site installation. The USGS identification system uses FW to indicate "Fort Wainwright" and m to indicate "monitoring well", p to indicate "pumping well", b to indicate "soil boring", and d to indicate "driven well" following ASTM, DOD, and EPA abbreviation standards. Both identification system are given to help cross-reference information previously archived under various names. USGS Ground-Water Site Inventory (GWSI) Database records are listed for selected wells. Please refer to the GWSI listing of database field descriptions and codes to help use of GWSI data. Multiple sites in the same row represent various aquifer depths and/or adjacent surface-water bodies. Water-level tables are in Excel 97 format. Operable Unit numbers indicate regulatory program units which the data may be applicable for interpretation. Please contact us if you do not see information you are looking for. The user is responsible for the proper application of the data. The publication page lists additional information.

[This paragraph is followed by links to ground water data, soil temperature data, and soil moisture data.]

West, E.W., 1991. An annotated list of vertebrate species of ecological concern in Alaska. Alaska Natural Heritage Program, The Nature Conservancy, Anchorage.

<http://biology.usgs.gov/s+t/SNT/noframe/ak177r.htm> *INCOMPLETE (need abstract); POPULATION*

Whalen, S., and Reeburgh, W., 2000. Methane Oxidation, Production, and Emission at Contrasting Sites in a Boreal Bog. *Geomicrobiology Journal* 17 (3), *NUTRIENT CYCLING; carbon; HYDROLOGY*

Boreal peatlands, a major source of atmospheric CH₄, are characterized by a rapidly fluctuating water table position and meter-scale variations in relief. Regional and ecosystem-based studies show that water table position generally controls CH₄ emission from boreal peatlands by influencing the relative extent of the zones of CH₄ oxidation and production within the peat profile. We used a combined field and laboratory study to assess the influence of local hydrology on the short-term dynamics of CH₄ production, oxidation, and emission from sites in an Alaskan boreal peatland that were characterized by temporarily (site LB1A) and permanently (LB2) water-saturated subsurface peat during the thaw season. The two sites contrasted sharply with respect to the dynamics of CH₄ cycling. Site LB1A, which showed low CH₄ concentrations in pore water (< 2μM) and unsaturated peat (< 2.6 nM), consumed both atmospheric CH₄ and CH₄ diffusing upward from the saturated zone for a net flux of 0.9 mg CH₄ per m² per day. In contrast, LB2 had pore water CH₄ concentrations, 300μM and emitted CH₄ at 69mg per m² per day. Roughly 55% of the CH₄ diffusing upward from the saturated zone at LB2 was oxidized in transit to the peat surface. Methane oxidation potentials (V_{ox}) were maximum in the 10-cm zone immediately above the local water table at both sites but were greater on a dry mass (dw) basis at LB2 (498-650 ng CH₄ per g_{dw} per hour than at LB1A (220-233ng CH₄ per g_{dw} per hour. Methane production potentials (V_p) were low (< 2ng CH₄ per g_{dw} per hour at LB1A, but the maximum at LB2 (139ng CH₄ per g_{dw} per hour was spatially coupled with the maximum V_{ox}. Methanogens exposed to O₂ produced no CH₄ in a subsequent 48 hour anoxic incubation, whereas methanotrophs incubated anoxically oxidized CH₄ vigorously.

Wheatley, M., 1991. Developing an integrated traditional/clinical health system in the Yukon. *Arctic Medical Research Supplement*, 217-220. *PEOPLE; health care; traditional medicine*

The introductory steps have been taken in Yukon. Elders have met and voiced their concerns and initial contacts have been made with government officials, medical and legal consultants. A proposal is now being developed to obtain funding to design a suitable model for an integrated Yukon Indian/clinical health care system. One of the next steps, following on the advice of the Elders, should be for communities to establish their own projects to record the plants and practices used, with the assistance of their Elders. The communities should also identify people who use traditional practices who are willing to come forward. They could then come together with the Elders to discuss their concerns. Beyond that, representatives from the traditional system will need to meet with representatives of the mainstream system, to discuss areas of co-operation. Once the "content" has been identified, the model for integrating the two health systems can be addressed. This will necessitate further meetings of Yukon Territorial Government officials, legal advisors, medical advisors, and Yukon First Nations representatives. The proposal currently being developed will build on the initial steps which have been taken. The Yukon Territorial Government has indicated a willingness to look at ways of including traditional health care practices for patients who wish to use them. The receptivity of government and Yukon medical profession and the expressed concerns of the Elders indicate that now is the time to proceed.

Wheeler, P., 1987. Salmon Fishing Patterns Along the Middle Yukon River at Kaltag, Alaska. Technical Paper No. 156. Alaska Department of Fish and Game, *PEOPLE; traditional food; management*

This study describes historical and contemporary salmon fishing patterns in the middle Yukon River community of Kaltag. The research focused on the interrelationship between commercial and subsistence salmon fisheries and the effects of state fishing regulations on traditional fishing patterns. Fieldwork was conducted during the 1985 salmon fishing season.

White, J., Ager, T., Adam, D., Leopold, E., Liu, G., Jette, H., and Schweger, E., 1997. An 18 million year record of vegetation and climate change in northwestern Canada and Alaska: Tectonic and global climatic correlates. *Paleogeography, Paleoclimatology, Paleoecology* 130 (1-4), 293-306. *CLIMATE; vegetation; distribution; geology*

We reconstruct long-term vegetation/paleoclimatic trends, spanning the last 18 million years, in Alaska, Yukon and far western Northwest Territories. Twenty-one average percentage spectra for pollen and spores are assembled from eight surface/subsurface sections. The sections are dated independently or by correlation. Pollen and spore ratios indicate the direction of change in vegetation and climatic parameters -- growing season temperature (Test), tree canopy density (Cest) and paludification at study sites (Pest). A global warm peak ca. 15 Ma [about 15 million years ago] is shown by the abundance of thermophilous taxa, including *Fagus* and *Quercus*. A temperature decline immediately following 15 Ma parallels climatic reconstructions based on marine oxygen isotopes. Subsequent declines correlate to the Messinian event and the onset of late Pliocene-Pleistocene glaciation. After 7 Ma herbs and shrubs become more important elements of the palynological assemblages, suggesting a more continental, colder/drier climate. However, a late Pliocene warm interval is evident. Vegetation/climatic changes during the early to late Miocene show synchrony with, and are most economically attributable to, global events. After 7 Ma, vegetation /climate change is attributed primarily to latest Miocene-to-Pleistocene uplift of the Alaska Range and St. Elias Mts. The continuing influence of global climatic patterns is shown in the late Pliocene warm interval, despite uplift to the south. The opening of the Bering Strait ca. 3 Ma may have moderated the climate in the study area.

Whitfield, P., 2001. Linked hydrologic and climate variations in British Columbia and Yukon. *Environmental Monitoring and Assessment* 67 (1-2), 217-238. *CLIMATE; HYDROLOGY; snow; ecology*

Climatic and hydrologic variations between the decades 1976-1985 and 1986-1995 are examined at 34 climate stations and 275 hydrology stations. The variations in climate are distributed across a broad spatial area. Temperatures were generally warmer in the most recent decade, with many stations showing significant increases during the spring and fall. No significant decreases in temperature were found. Significant increases in temperature were more frequent in the south than in the northern portions of the region. Significant changes in precipitation were also more prevalent in the south. In coastal areas, there were significant decreases in precipitation during the dry season, and significant increases during the wet season. In the BC interior, significant precipitation decreases occurred during the fall, with significant increases during the winter and spring. In the north there were few changes in precipitation. The hydrologic responses to these variations in climate follow six distinctive patterns. The spatial distribution of these patterns suggests that in different ecozones, small variations in climate, particularly temperature, elicit different hydrologic responses.

Whitfield, P., and Clark, M., 2001. Using Force Analysis to Target Collection and Analysis of Environmental Information. *Environmental Management* 28 (1), 75-85. *MODELING; management; climate; hydrology; snow; mining; risk assessment*

Knowledge of the forces driving and modifying ecosystems can be employed in concert with signal analysis to target the data most likely to yield sensitivity and resilience information. One can optimize return of information per investment of resources by

targeting segments of signals that are dominated by the force of interest, coupled with scientific understanding of the system of interest. This force analysis approach is an effective means both to design efficient new monitoring programs and to target relevant information in large data files. We present five example applications of force analysis. Three examples illustrate this approach for an evaluation of whether Canadian rivers might be sensitive to changes in climate. It was concluded that Canadian rivers appear to be sensitive to changing climate. A fourth example illustrates how automated snow pillow data may be evaluated to ascertain the sensitivity of snow accumulation to change in climate. It was concluded that snow accumulation at the site evaluated did appear to be sensitive to changing climate. The fifth example illustrates the assessment of whether a river recovers with the elimination of inputs of iron from an abandoned mine. It was concluded that resilience remained unproven since the river had not as yet restabilized. The force analysis approach focuses data collection or data evaluation on those data required to answer specific resource management questions, greatly reducing collection or consideration of data that are not relevant to that question. This approach is potentially very cost-efficient and therefore is likely to be of interest to hydrologists, climatologists, and environmental data managers.

Whitney, P.H., 1973. Population biology and energetics of three species of small mammals in the taiga of interior Alaska: College [Fairbanks], University of Alaska, Ph.D., 254 p
POPULATION; mammals; metabolism; biochemistry; INCOMPLETE (need abstract)

Whitten, K.R., 1975. Habitat relationships and population dynamics of dall sheep (*Ovis dalli dalli*) in Mt. McKinley National Park, Alaska, University of Alaska, Fairbanks, M.S., ix, 177 leaves : ill. ; 28 cm p *POPULATION; mammals; sheep; habitat selection; behavior (territorial?)*

Whitten, K., 1995. Antler loss and udder distention in relation to parturition in Caribou. *Journal of Wildlife Management* 59 (2), 273-277. *POPULATION; mammals; caribou; reproduction; modeling*

Wildlife biologists commonly assume that retention of antlers and development of distended udders during the calving season are reliable indicators of parturition in female caribou (*Rangifer tarandus*), but that assumption has not been tested adequately in free-ranging animals. Therefore, I recorded antler retention and udder distention and related those characteristics to parturition in radio-collared females of the Porcupine Caribou Herd in Alaska and Yukon Territory 1983-90 (n = 491). Five percent of cows never grew antlers. Ninety-nine percent of cows with hard antlers at the beginning of the calving season were parturient, whereas 86% of cows that shed antlers were not parturient ($P < 0.001$). Ninety-six percent of parturient cows developed distended udders 1-21 days before parturition. Cows retained distended udders for 0-27 days after their calves died. I correctly determined parturient status of collared caribou cows with 97% reliability by using simultaneous observations of antler retention, udder distention, and/or presence of a calf at heel in a survey conducted 4-5 days after the beginning of calving. In contrast, I incorrectly determined parturient status in 11.6, 8.2, and 45.1% of the same cows solely on the basis of antlers, udders, or presence of calves, respectively. I found no support for estimating early calf mortality from proportions of cows having distended udders but no calves at heel. Pregnant cows as well as cows with dead calves could have large udders, and parturient cows did not always retain udders after their calves died.

Wilcox, J.A., 1989. Age, sex, and size of Yukon River salmon catch and escapement. Technical fishery report ; 89-14. Alaska Dept. of Fish and Game, Division of Commercial Fisheries, Juneau. *INCOMPLETE (need abstract); POPULATION; fish; salmon; chinook; coho; sockeye; chum; distribution; growth/development; management*

Wilcox, W.J., II, 2001. The origin and composition of aerosols in the Alaskan airshed, University of Alaska Fairbanks, M.S., 182 p *AIR QUALITY; contaminants; POPs (persistent organic pollutants); acidification; long range transport; fate; modeling; economics*

Summary: "Since the Alaskan airshed north of the Alaska Range receives a substantial portion of its anthropogenic aerosol and gaseous pollutants through long-range transport, Alaskan air quality is influenced to an unusually high degree by the political and economic events of other countries. An understanding of the political and economic forces at work in the various circumpolar nations is key to an understanding of the observed decline in Arctic haze, the present state of Arctic air pollution, and likely future developments. It is shown in this thesis that Arctic haze has declined in Interior Alaska over the last decade and a half. This decline appears to be driven by the widespread emission reductions which have occurred in North America, Europe, and the former Soviet Union (FSU) between 1988 and 1998. If true, this linkage indicates that the story of Arctic haze is not yet a post-mortem. EMEP projections for 2005 foresee a continuing decline in emissions across Europe and a leveling off in North America, but emissions in the European FSU are expected to double by 2005. Events in the FSU, and perhaps Asia as well, threaten to abrogate any further progress made by Europe and North America and could perhaps revive the phenomenon"

Wiles, G., Jacoby, G., Davi, N., and McAllister, R., 2002. Late Holocene glacier fluctuations in the Wrangell Mountains, Alaska. *Geological Society of America Bulletin* 114 (7), 896-908.

CLIMATE; HYDROLOGY; surface water; glacial discharge; glaciology

Four intervals of late Holocene glacier advance are recognized from study of nine valley glaciers in the Wrangell and westernmost St. Elias Mountains of Alaska. The oldest glacial advance is recognized at the Nabesna and Barnard Glaciers where live radiocarbon ages suggest advance as early as 2700 cal. (calibrated) yr B.P. Two additional radiocarbon-dated advances are centered on cal. yr A.D. 300 and the beginning of the Little Ice Age about A.D. 1200. The best-documented Little Ice Age advances occurred during the mid-1600s through the 1800s and are recognized at all nine glaciers. These latter advances are dated by tree rings of trees overrun by glaciers in five glacier valley, by 17 radiocarbon dates, and by tree-ring and lichen ages from 20 moraines that were deposited during the culmination of these advances. The glacial chronology is broadly similar to chronologies from adjoining Alaskan mountain ranges, at both coastal and interior sites for the past 3000 yr. There are, however, differences in timing of advances during the first millennium A.D. The glacial history for the past 2000 yr is also consistent with temperature-sensitive proxy records from interior Alaska and Yukon Territory.

Wilkinson, D.A., 1999. A Weighty Matter: Neuropeptides Involved In Appetite And Energy Homeostasis. *The Scientist* 13 (18), 18. *REFERENCE; PEOPLE; health (condition);*

biochemistry; enzymology; diabetes; obesity; health (effects); endocrinology

The hypothalamus has long been known as a control center for feeding and weight control behaviors. Complex regulatory feedback loops enable this portion of the brain to determine satiety and metabolic activity. Not surprisingly, the control mechanisms are complex and involve different biochemical pathways.^{1,2,3}

A series of pioneering experiments demonstrated that disruption of the ventromedial hypothalamus causes animals to eat more and gain weight. In contrast, when the lateral hypothalamus is destroyed, animals eat less, lose weight, and may even starve to death. These experiments led to the suspicion that the hypothalamus contained ventromedial "satiety" and lateral "feeding" regions. Although these early notions are now recognized as simplistic, they provided a conceptual framework upon which subsequent work in the obesity research field has been built.³ Recent studies in this field have explored the

actions of nerve cell hormones (neuropeptides) found in the hypothalamus. Several of these important molecules are discussed here.

Neuropeptide Y (NPY) is a 36 amino acid peptide hormone that begins and ends with tyrosine (Y) residues.^{1,2,3} NPY is expressed abundantly in several areas of the brain, exerting multiple biological effects. Within the hypothalamus, NPY is synthesized primarily by neurons found within a region known as the arcuate nucleus. These neurons extend to several different parts of the hypothalamus. The binding of NPY to receptors within one of the targeted regions (the periventricular nucleus) stimulates food intake in animal models. The repeated injection of NPY into the hypothalamus summarily results in obesity. In rodents, weight loss caused by caloric restriction ("dieting") stimulates NPY release in the periventricular nucleus.

NPY isn't famous solely because it is a potent appetite stimulator in animals. In the hypothalamus alone, this busy little neuropeptide employs several different tactics aimed at promoting weight gain. For example, hypothalamic NPY also stimulates the secretion of insulin and cortisol, ultimately shifting metabolism to favor the synthesis and storage of fat. The dogged hormone doesn't content itself with merely stimulating feeding activity and fat accumulation; it also lowers energy expenditure by inhibiting sympathetic nervous system outflow.

Does all of this "chubby chat" elicit hope of blocking NPY action? In 1996 like-minded researchers reported their studies with knockout mice lacking the NPY gene.⁴

Surprisingly, the mice had a normal phenotype, except for an increased susceptibility to seizures.

Expression of hypothalamic NPY increases in response to fasting in rats. Increased levels of the neuropeptide are also observed in two rather famous strains of mutant mice [obesity (ob/ob) and diabetes (db/db)]. The products of the ob and db genes constitute a hormone/receptor pair (leptin and the leptin receptor, respectively).^{1,2,3} These celebrity mice are unable to produce (ob/ob) or respond to (db/db) leptin, a peptide hormone produced by fat cells. Both types of mice are characterized by an early onset of severe obesity. They eat excessively, show inappropriately low energy expenditure, and have an inherited form of diabetes. When leptin is administered to ob/ob mice, a remarkable turnaround is observed. The mice eat less, they become more active, their metabolic rates increase, and they lose a significant amount of weight. Consistent with all of these healthy changes, NPY levels of ob/ob mice fall markedly after introduction of ectopic leptin.

These and other observations strongly suggest that NPY is one target of the adipocyte-derived leptin. Early studies fueled a great deal of interest in leptin as a potential therapeutic for use in weight-loss regimens; however, it was quickly understood that reality is a bit more complex than that. Obesity in humans, and in various rodent models as well, correlates strongly with higher levels of circulating leptin. This indicates that obesity is not usually due to an inability to produce leptin. Rather, weight problems may more often be attributed to a decreased sensitivity to the hormone.

Leptin is often referred to as a "double agent."^{1,2,3} On the one hand, increasing levels of this hormone may serve as a "Let's trim down" message sent straight from one's own burgeoning fat stores. In this model, circulating leptin levels rise with growing obesity and engage receptors in the hypothalamus. Consequently, activities aimed at weight reduction are initiated—food intake is reduced, and energy expenditure is increased via different mechanisms.

On the other hand, falling leptin levels serve as a "red alert" for impending starvation. Decreases in circulating leptin levels evoke a distinct set of adaptive responses aimed at conserving energy for survival. For example, starvation suppresses reproductive capacity and sympathetic nervous system activity but stimulates feeding behavior.

Much to the inconvenience of people who live in a food-flush environment, the opposing antiobesity and antistarvation agendas do not appear to be pursued with equal vigor. Starvation poses a more immediate and frequent threat for humans as a whole. From an evolutionary perspective, the threat of whole-scale starvation may simply outweigh the risks associated with accumulating increased numbers of obese individuals during times of plenty.

Initially, NPY was thought to be leptin's major target. This notion was quickly dashed by the lack of a lean phenotype in NPY knockout mice. Mice lacking both leptin and NPY were obtained by crossing *ob/ob* and NPY knockout mice. These progeny, which don't express leptin or NPY, are obese. However, they are significantly less obese than are mice solely lacking the fat-derived hormone, implying that increased NPY levels contribute to obesity in *ob/ob* mice. It is clear that the brain must also have other targets that mediate responses to both high and low leptin levels. In fact, the interplay between leptin, NPY, and other regulatory molecules is currently a hotbed of investigation. Fat, yellow mice pointed the way toward new frontiers in the realm of hypothalamic leptin targets. In the lethal yellow strain of mutant mice, obesity is accompanied by altered hair pigmentation. The disorder is caused by the deregulated and ectopic expression of *agouti*.^{1,2,3} *Agouti* is a 131 amino acid protein. It is normally restricted to hair follicles, where it affects pigmentation by inhibiting the binding of melanocyte stimulating hormone (alpha-MSH) to MC1 melanocortin receptors. *Agouti* also blocks endogenous ligands from binding to several other members of the melanocortin receptor family, including MC4 receptors, which are largely restricted to the brain. This finding led to suggestions that *agouti* might cause obesity by creating a melanocortin receptor blockade in the brain.

Targeted deletion of the MC4 receptor produced a syndrome of obesity similar to that of lethal yellow mice. As expected, these mice did not have the alterations in coat color associated with the deregulated expression of *agouti* in skin. Further experimentation with MC4 agonists (which decrease food intake) and antagonists (which increase food intake) supported the role of MC4 in a pathway that inhibits food intake and fat storage. It is thought that the MC4 receptor likely mediates some of leptin's actions, but additional work will be required to define precisely what these are.

What is MC4's natural ligand? Surprisingly, alpha-MSH itself appears to be one endogenous ligand of the MC4 receptor.³ This hormone is generated from pro-opiomelanocortin (POMC) precursors present in the arcuate nucleus. It has been hypothesized that rising leptin levels drive the increased expression of arcuate POMC. The resultant alpha-MSH binds to MC4 receptors in the hypothalamus, ultimately decreasing food intake. More recently, an antagonistic MC4 ligand has been discovered.³ Called the *agouti*-related peptide (AGRP), this neuropeptide is expressed primarily in the arcuate nucleus. Its expression is greatly increased in *ob/ob* mice. AGRP antagonizes alpha-MSH's "counterobesity" role in the hypothalamus (MC4-mediated) but does not interfere with alpha-MSH's pigmentation agendas in the skin (MC1-mediated). Thus, the ratio of agonist (MSH) to antagonist (AGRP) may influence the ultimate output from MC4 receptors.

Melanin-concentrating hormone (MCH) was first discovered in chub salmon pituitaries.³ Salmon MCH regulates skin color by acting on melanosomes within pigmented skin cells. This cyclic peptide hormone lightens skin by inducing aggregation of melanosomes. In contrast, salmon alpha-MSH facilitates skin darkening in this system by inducing dispersion of melanosomes.

In 1996 PCR-based differential display was used to search for transcripts important in the *ob/ob* phenotype.⁵ This screen showed that MCH is expressed at higher levels in the hypothalamus of *ob/ob* mice than in littermate controls, suggesting that MCH may be

another leptin target. Intracerebroventricular administration of this hormone to rats stimulates feeding, consistent with a role for the hormone in weight control. It is important to point out that the opposing actions of MCH and alpha-MSH in fish skin are not affected by binding to the same receptor. This is in distinct contrast to the interplay between hypothalamic AGRP and alpha-MSH, which antagonize each other by acting on the same receptor. MCH has no affinity for known melanocortin receptors. Two different research groups at Harvard, one directed by Eleftheria Maratos-Flier and the other by her husband, Jeffrey S. Flier, joined forces to generate and characterize mice carrying a targeted deletion of MCH.⁶ MCH-deficient mice are mildly anorexic and have an inappropriately increased metabolic rate, despite their reduced amounts of both leptin and arcuate nucleus POMC mRNA. These findings indicate that MCH is a critical regulator of feeding and energy balance and that MCH acts downstream of the leptin and melanocortin systems. It also appears that the deletion of a gene encoding a single peptide can, in fact, result in leanness. MCH was recently found to bind SLC-1, a G protein-coupled receptor that can no longer be called an "orphan."⁷

Recently two additional neuropeptides were independently discovered by different research groups.³ One group used direction tag PCR subtraction to identify mRNAs specifically expressed in the hypothalamus.⁸ This team discovered an mRNA expressed in the lateral hypothalamus. The two peptides encoded by this mRNA were named hypocretins.

Concurrently another group was busy pursuing a somewhat different goal. This team, led by Masashi Yanagisawa, a Howard Hughes Medical Institute investigator at University of Texas Southwestern Medical Center, was eager to discover new peptide hormones. Yanagisawa's group started with the hypothesis that many uncharacterized G protein-coupled receptors bind to undiscovered signaling molecules, including the sought-after peptide hormones.⁹ Their game plan was to use so-called "orphan" receptors to capture their cognate peptide hormones. They first searched for potential G protein-coupled receptors by combing through expressed sequence tag databases, then narrowed their screen to 50 candidate receptors. Cell lines expressing each candidate were generated and screened for the ability to activate calcium currents in brain extracts. They purified and cloned cDNAs from two candidates that passed this screen. In honor of the Greek word for appetite (orexis), the proteins encoded by these cDNAs were christened orexins A and B. (It was later found that the orexins and the aforementioned hypocretins are actually the same molecule.)

The two orexins are generated from a single protein precursor (prepro-orexin) by proteolytic processing and are expressed exclusively within the lateral hypothalamus.

These neuropeptides stimulate food consumption when administered centrally. Restricting caloric intake increases the expression of the orexins. Histochemical studies have revealed that the expression of the prepro-orexin gene is significantly decreased in ob/ob and db/db mice.¹⁰

These findings are consistent with a role for orexins in feeding behavior and suggest that they might also be leptin targets. However, the precise physiological roles of orexins haven't been completely characterized yet.¹¹ In fact, recent work from Yanagisawa's group indicates that orexins also function to regulate sleep/wakefulness states.¹² Understanding of how leptin and other neuropeptides interact to produce the complex behaviors associated with appetite and satiety will deepen as researchers continue to delve into their mysteries. Certainly other still-to-be-discovered molecules will be recognized as playing important roles.

Research in neurobiology encompasses the full gamut of tools and methods. Questions are probed from every conceivable angle, using biochemistry, immunohistochemistry, molecular biology, computer modeling, positron emission scanning, and behavioral

techniques. Thus, a discussion of each company and its relevant offerings would require a special edition of *The Scientist* all its own. The accompanying table is constructed to help point researchers toward companies offering classes of products for use in these studies.

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Biochemistry: 13[6]:14, March 15, 1999.

Leptin: 12[14]:14, July 6, 1998.

Neurodegenerative disease-related Hot Papers noted in *The Scientist*

Neurotrophic Factors: 12[13]:11, July 20, 1998.

Neurochemistry: 12[3]:13, Feb. 2, 1998.

Neurology: 12[2]:11, Jan. 19, 1998.

Neuroscience: 11[23]:12, Nov. 24, 1997.

1. B. Spiegelman et al., "Adipogenesis and obesity: rounding out the big picture," *Cell*, 87:377, 1996.
2. M. Schwartz et al., "Neuroendocrine responses to starvation and weight loss," *New England Journal of Medicine*, 336:1802-11, 1997.
3. J. Flier et al., "Obesity and the hypothalamus: novel peptides for new pathways," *Cell*, 92:437, 1998.
4. J. Erickson et al., "Sensitivity to leptin and susceptibility to seizures of mice lacking neuropeptide Y," *Nature*, 381:415-21, 1996.
5. D. Qu et al., "A role for melanin-concentrating hormone in the central regulation of feeding behaviour," *Nature*, 380:243-7, 1996.
6. M. Shimada et al., "Mice lacking melanin-concentrating hormone are hypophagic and lean," *Nature*, 396:670-4, 1998.
7. Y. Saito et al., "Molecular characterization of the melanin-concentrating-hormone receptor," *Nature*, 400:265-9, 1999.
8. L. de Lecca et al., "Obesity and the hypothalamus: novel peptides for new pathways," *Proceedings of the National Academy of Sciences*, 95:332-7, 1998.
9. T. Sakurai et al., "Orexins and orexin receptors: a family of hypothalamic neuropeptides and G protein-coupled receptors that regulate feeding behavior," *Cell*, 92:573-85, 1998.
10. Y. Yamamoto et al., "Down regulation of the prepro-orexin gene expression in genetically obese mice," *Brain Research and Molecular Brain Research*, 19:14-22, 1999.
11. C. Edwards et al., "The effect of the orexins on food intake: comparison with neuropeptide Y, melanin-concentrating hormone and galanin," *Journal of Endocrinology*, 160:R7-R12, 1999.
12. R. Chemelli et al., *Cell*, in press, Aug. 20, 1999.

Williams, C., and Lipkin, R., 1991. Rare plants of the Steese National Conservation Area and White Mountain National Recreation Area. Report to U.S. Bureau of Land Management. The Alaska Natural Heritage Program and The Nature Conservancy, Anchorage.
http://www.uaa.alaska.edu/enri/aknhp_web/bib/bib.html *INCOMPLETE (need abstract);*
VEGETATION; distribution; disturbance

Williams, C., McDonald, K., Rignot, E., Viereck, L., Way, J., and Zimmermann, R., 1995. Monitoring, classification, and characterization of interior Alaska forests using AIRSAR and ERS-1 SAR. *Polar Record* 31 (177), 227-234. *VEGETATION; imaging (remote sensing); monitoring; flooding; seasonality; freeze-thaw cycles*

At the Bonanza Creek Experimental Forest (BCEF), past ecological research has been directed at forest successional processes on the floodplain of the Tanana River and adjacent uplands. Research at the Bonanza Creek site continues on the mosaic of forests, shrublands, and wetlands in a wide variety of successional stages on the Tanana floodplain. This paper reviews research since 1988 into the capabilities of Synthetic Aperture Radar (SAR) for monitoring, classification, and characterization of these forests using radar remote sensing and modelling techniques. Classifications of successional stages, obtained by use of different classifiers on multi-frequency and multi-polarimetric AIRSAR data, are contrasted; these classifications have been used to predict classification accuracies obtained with ERS-1 data, and to estimate the utility of an ERS-1 and RADARSAT combination for classification. Forest classifications, used in combination with ground-truth data for more than 50 forest stands, are used to summarize the distribution of biomass on the landscape. This will allow projections of future biomass. Monitoring of forest phenology, seasonality of flooding, and freeze-thaw transitions is ongoing. Also, direct monitoring of dominant tree species is demonstrating diurnal variation and interrelationships among environmental, physiological, and backscatter measurements.

Williams, D., and Burn, C., 1996. Surficial Characteristics Associated with the Occurrence of Permafrost near Mayo, Central Yukon Territory, Canada. *Permafrost and Periglacial Processes* 7, 193-206. *CLIMATE; ground ice / permafrost; modeling; vegetation*

Key criteria have been isolated for predicting the location of discontinuous permafrost in central Yukon Territory. Eighteen soil, vegetation, and topographic variables were documented at 60 sites in a 2500 km² area, and analysed to establish their association with the occurrence of permafrost. The singular features most associated with permafrost were a thick surface organic layer and a hummocky microtopography. In combination, soil moisture content and organic-layer thickness were diagnostic of permafrost occurrence. The thickness of the organic layer, a horizon of low thermal diffusivity, governs attenuation of the summer temperature wave; soil moisture content supplies water for evapotranspiration, which reduces surface temperature. Variation in these indices accounted for 95% of variation in permafrost occurrence within the 60 sites. A diagnostic system to predict permafrost occurrence was constructed with these indices, and tested against field data from 60 different sites. The occurrence of permafrost in the second data set was predicted correctly at every site. The critical soil moisture content and organic-layer thickness were 25% (gravimetric) and 11 cm, respectively. Permafrost is present where these values are exceeded. The results indicate that the occurrence of permafrost in this portion of the discontinuous zone can be determined from relatively few variables.

Wilmot, R., Everett, R., Spearman, W., Beccus, R., Varnavskaya, N., and Putivkin, S., 1993. Genetic stock structure of western Alaska chum salmon and a comparison with Russian Far East stocks. *Canadian Journal of Fisheries and Aquatic Sciences/Journal Canadien des Sciences Halieutiques et Aquatiques* Ottawa 51 (suppl. 1), 84-94. *POPULATION; fish; salmon; chum; genetics*

Substantial genetic divergence was found among chum salmon (*Oncorhynchus keta*) populations collected from North America and Russia. Five major groups of populations can be identified by geographic region: (1) lower Yukon River summer run; (2) upper Yukon River fall run; (3) Bristol Bay area; (4) Alaska Peninsula; and (5) Russia. The hierarchical gene diversity analysis showed that 95.42% of the diversity can be explained by heterogeneity within sites, 1.36% among sites, 0.49% between Yukon River run timing, 1.69% among areas, and 1.04% among countries. The Alaska Peninsula populations are genetically more similar to populations from Russia than to those from western Alaska, and two populations from the upper Yukon River are distinct from other nearby

populations. Possible reasons for these findings concern the complex glacial histories of the watersheds.

Wilson, S.S., 1994. Not just knowledge, but a way of looking at the world: Gwitch'in native elders, University of Alaska Fairbanks, M.A., 89 p *PEOPLE; anthropology; native perspective; traditional knowledge*

Wilson, C., Hutchinson, T., and Burn, C., 1996. Natural Revegetation of Placer Mine Tailings Near Mayo, Central Yukon. *Yukon Quaternary Geology* 1, 47-62. *VEGETATION; soil; recovery; mining*

Placer mining occurs extensively in parts of the Yukon, denuding riparian zones and lining valley bottoms with mine tailings. Revegetation of tailings was examined at two placer mines near Mayo to determine the influence of environmental variables on the speed and direction of the natural process. Vegetation species density and frequency on various substrates were compared with: age, slope and aspect of the site, and Ph, particle size distribution, moisture content and organic content of the soil. In central Yukon, tailings are first colonized by ruderal (weedy pioneer) species such as fireweed and members of the Compositae (dandelion) family. These are replaced by willow-dominated communities after nine years. Willow communities support many species characteristic of the adjacent undisturbed black spruce forest, suggesting that the placer succession is similar to that of riverbank environments in interior Alaska. Revegetation of the tailings proceeds at the same rate for the first twelve years as does that following natural disturbance. Of the environmental factors examined, only age and slope were, statistically, associated with rate of revegetation. Both the percent cover and the number of species at a site were inversely associated with slope, suggesting that reduction of slope angle enhances vegetation regeneration.

Wilson, L., 1997. Summary of bird mortalities in British Columbia and Yukon, 1963-94. # 249; NTIS/MIC-97-04253. Canadian Wildlife Service, *POPULATION; birds; mortality; contaminants*
Summarizes and discusses details of 304 bird mortality events, involving over 52,000 individual birds, reported in British Columbia and Yukon Territory between 1963 and 1994. Information is included on mortality numbers, event dates and locations, most probable causes of death, and presence of toxicologically relevant contaminant levels in wildlife. The appendix contains individual case reports on the 304 events, providing such information as species and numbers killed, location, probable cause of death, toxicology data, and laboratory reports covering such matters as physical examination of the birds, histopathology, and pathological diagnosis. .

Wilson, S., and Gajewski, K., 2002. Surface-sediment diatom assemblages and water chemistry from 42 subarctic lakes in the southwestern Yukon and northern British Columbia, Canada. *Ecoscience* 9 (2), 256-270. *LIMNOLOGY; POPULATION; invertebrates; microbes; diatom; sediment; nutrition; distribution; surface water; water quality*

Modern diatom assemblages were related to surface water chemistry from 42 lakes in the southwestern Yukon and in northern British Columbia. The lakes were alkaline (pH ranged from 7.5 to 9.4) with high specific conductance (mean = 379 μ S/cm). The lakes spanned a relatively wide range of trophic conditions, with the majority being oligotrophic or meso-eutrophic. Lake water depth, alkalinity, lake surface area, and Mg [magnesium] accounted for most of the variation in the diatom assemblages. Diatom assemblages most closely resembled those of the southern interior of British Columbia, where high conductance lakes are numerous, although many of the taxa were common to other northern regions, including Siberia, Alaska and other parts of the Yukon. These data may be used in conjunction with other data from northern regions, including the Yukon and Alaska, to provide broader descriptions of environmental preferences of

diatom taxa by extending the range of environmental variables such as alkalinity and specific conductance.

Wivell, C., Olmsted, C., Steinwand, D., and Taylor, C., 1993. Earth remote sensing satellite-1 synthetic aperture radar mosaic of the Tanana river basin in Alaska. *Photogrammetric Engineering and Remote Sensing* 59 (4), 527-528. *HYDROLOGY; vegetation; imaging (remote sensing)*

Because the pixel location in a line of synthetic aperture radar (SAR) image data is directly related to the distance the pixel is from the radar, terrain elevations cause large displacement errors in the geo-referenced location of the pixel. This is especially true for radar systems with small angles between the nadir and look vectors. Thus, to geo-register a SAR image accurately, the terrain of the area must be taken into account. As part of the 1992 National Aeronautics and Space Administration's Earth Observing System Version 0 activities, a prototype SAR geocoding and terrain correction system was developed at the U.S. Geological Survey's (USGS) EROS Data Center (EDC) in Sioux Falls, South Dakota. Using this system with 3-arc-second digital elevation models (DEMs) mosaicked at the EDC Alaska Field Office, 21 ERS-1 SAR scenes acquired at the Alaska SAR Facility were automatically geocoded, terrain-corrected, and mosaicked. The geo-registered scenes were mosaicked using a simple concatenation.

Wolfe, R., 1981. Norton Sound/Yukon Delta sociocultural systems baseline analysis. Technical paper () ; no. 59. Alaska Department of Fish and Game, Division of Subsistence, Juneau. *INCOMPLETE (need abstract); PEOPLE; subsistence; traditional food; economics*

Wolfe, R., and Walker, R., 1987. Subsistence economies in Alaska: productivity, geography, and development impacts. *Arctic Anthropology* 24 (2), 56-81. *PEOPLE; subsistence; economics; infrastructure; road*

This paper describes the productivity and geographic distribution of subsistence harvests in Alaska during the 1980s. Subsistence harvests of a statewide sample of 98 communities are presented, analyzed by size, composition, and locations. The analysis indicates that subsistence harvests of fish, land mammals, marine mammals, and other wild resources are making substantial contributions to the economies of most rural communities in Alaska. Community harvest levels tend to increase in areas away from urban centers, not connected by roads to urban areas, with lower degrees of settlement entry and with lower mean personal incomes. These relationships suggest that certain types of economic development can create conditions which diminish subsistence productivity. Construction of roads and settlement entry into roaded areas produce changes associated with lower subsistence harvests, including increased competition for wild resources, increased habitat alteration, and changing community economic orientations away from mixed, subsistence-market adaptations. By recognizing the substantial contributions subsistence harvests make to the state's regional economies, economic development might be planned in ways which enhance, rather than erode, the state's rural subsistence base.

Wolfe, R., and Bosworth, R., 1990. Subsistence in Alaska: a Summary. Division of Subsistence, Alaska Department of Fish and Game, Juneau, Alaska.

<http://www.state.ak.us/adfg/subsist/download/subsum90.pdf> *PEOPLE; subsistence; traditional food; economics; management*

Subsistence is important to the economies and culture of many families and communities in Alaska. This report describes some characteristics of subsistence in Alaska, based on studies by the Division of Subsistence, Alaska Department of Fish and Game.

This report briefly summarizes these rapid, on-going changes. It describes subsistence management as it looked in late February 1991.

Wolfe, R., 1991. Trapping in Alaska Communities with Mixed Subsistence-Cash Economies. Technical Paper No. 217. Alaska Department of Fish and Game, *PEOPLE; traditional food; trapping; land use; management*

This report describes the role of trapping in the mixed subsistence-cash economies of rural Alaskan communities. The fur harvests of a sample of communities are presented and analyzed. The report shows that most households earn relatively modest amounts of money annually from fur sales. Trapline activities also produce wild foods, raw materials, and fuel consumed locally. Other social values also derive from trapping, especially the socialization of young males into the traditional culture.

2000. Subsistence in Alaska: A Year 2000 Update. Division of Subsistence, Alaska Department of Fish and Game, Juneau, Alaska. <http://www.state.ak.us/adfg/subsist/download/subupd00.pdf> *PEOPLE; subsistence; fish; mammals; birds; traditional food; economics; nutrition*

Subsistence fishing and hunting are important for the economies and cultures of many families and communities in Alaska. Subsistence exists alongside other important uses of fish and game in Alaska, including commercial fishing, sport fishing, personal use fishing, and general hunting. This report provides an update on subsistence in Alaska, including the dual state-federal management system.

Wolfe, R., Marcotte, J., Andersen, D., Walker, R., Georgette, S., and Peterson, S., ? Fish and Game Harvest and Use in Nenana Valley, Alaska. Technical Paper No. 169. Alaska Department of Fish and Game, *PEOPLE; traditional food; land use; management*

This report describes the patterns of wild resource use and the economy of residents of the Nenana Valley, including the communities of Anderson, Healy, McKinley Village, and the road connected vicinity (the George Parks Highway from milepost 216 to milepost 300) in central interior Alaska, based on research conducted by the Division of Subsistence, Alaska Department of Fish and Game, in 1988. The area contains a diverse social mixture of communities, representing a consolidation of old and recent homesteads, historic mining communities, railroad stations, and national park enclaves. The patterns of resource use represent those of a geographically dispersed, road-connected, primarily non-Native population (1,721 people in 1987) with different levels of monetary income. Research found that moose and caribou were the major resources harvested for food, mixed with relatively small quantities of fish, small game, and furbearers. Per capital harvests ranged from 49.6 lbs. in Anderson to 92 lbs. in McKinley Park Village.

Wong, M.P., 1985. Chemical residues in fish and wildlife harvested in northern Canada. ISBN 0-662-15277-8. Department of Indian and Northern Affairs, *CONTAMINANTS; POPs (persistent organic pollutants); metals; risk assessment; traditional food*

During the past decade, knowledge of chemical contamination in the Arctic food chain has increased with the acquisition of new residue information. The recent finding of elevated levels of toxic chemical residues in tissues of the polar bear, *Ursus maritimus*, has focused attention on the diet of northern native populations who traditionally rely upon marine and terrestrial mammals, fish, birds and plants for food. Concern surrounding the possibility of chemical exposure has been heightened by the government encouraging the consumption of 'country foods' and breast-feeding of infants, rather than relying on the more expensive products from the south. Although the significance to human health is still not known, the situation has increased awareness of the potential of exposure to contaminants of northern natives. In response to these concerns, the Department of Indian Affairs and Northern Development (DIAND), with the cooperation of other federal departments and the territorial governments, has initiated a review of the available information on native diets, residue levels in country foods, and

the potential sources of pollutants in order to evaluate the implications of possible exposure of native groups to these contaminants.

Wood, S., 1977. Hair mineralization of the snowshoe hare (*Lepus americanus*) in interior Alaska, University of Alaska, Fairbanks, M.S., 52 p *POPULATION; mammals; snowshoe hare; metabolism; metals*

WQWG, 1973? Bibliography of Water Quality Information [microform]. Yukon River Basin study technical report. Water quality; no. 6. Water Quality Work Group Canada. Environmental Protection Service., Ottawa? *INCOMPLETE (need abstract); WATER QUALITY*

Wuerthner, G., 2001/2002. Keeping the Grizzly in Grizzly Creek. *POPULATION; mammals; grizzly bear; habitat selection; management; infrastructure*

The connection is more than coincidental between Grizzly Creek in Yukon Territory's Tombstone Range and Grizzly Creek, 1,500 miles to the south in Absaroka Beartooth Wilderness north of Yellowstone National Park. The presence of bears, wolves, and other wildlife in both Grizzly Creeks demonstrates better than any map the geographical and ecological unity still found along the spine of the Rocky Mountains. Nowhere else in the temperate world is there such a tremendous opportunity to protect functioning ecosystems across a broad landscape. The Rockies' spectacular and unspoiled landscapes provided inspiration for some of the world's earliest efforts at wildlands preservation. Yellowstone was the first national park, established in 1872. The first successful effort to save a jeopardized species--the bison--was begun in Yellowstone in the late 1890s. Given its place in environmental history, it is not surprising that the Rockies would be one of the first areas in the country where a bold new vision for large-scale conservation would be born. At a 1993 meeting, biologists and activists decided to inaugurate a land protection campaign based on the knowledge that many wildlife species, including grizzlies and wolves, wandered widely without regard for political domain or land ownership. The Yellowstone to Yukon (Y2Y) plan seeks to protect most of the remaining wildlands and restore lands that are critical linkage. The Wilderness Society has played a major role in Y2Y planning since its inception. Defending the new roadless area protection policy from attacks by the Bush administration in Washington is critical to Y2Y's success. The importance of these roadless lands is more than just an issue of acreage. Each roadless area acts as either a stepping stone linking the existing large core protected areas or surrounds one of these areas, effectively enlarging the size of the core and enhancing its effectiveness as a conservation unit. The Y2Y vision is committed to supporting sustainable economies and the continuation of human activities that do not pose threats to wildlife or ecosystem integrity. At the heart of the Y2Y vision is the promise of finding a new way of living with the Earth, not merely on it.

Wuttig, K.G., 1997. Successional changes in the hydrology, water quality, primary production, and growth of juvenile Arctic grayling of blocked Tanana River sloughs, Alaska, University of Alaska Fairbanks, M.S., 105 p *POPULATION; fish; grayling; hydrology; surface water; water quality; growth/development*

Xiao, Q.-F., Ustin, S., and Wallender, W., 1996. A spatial and temporal continuous surface-subsurface hydrologic model. *Journal of Geophysical Research D; Atmospheres* 101 (D23), 29565-29584. *HYDROLOGY; modeling; soil; imaging (remote sensing)*

A hydrologic model integrating surface-subsurface processes was developed based on spatial and temporal continuity theory. The raster-based mass balance hydrologic model consists of several submodels which determine spatial and temporal patterns in precipitation, surface flow, infiltration, subsurface flow, and the linkages between these submodels. Model parameters and variables are derived directly or indirectly from

satellite remote sensing data, topographic maps, soil maps, literature, and weather station data and are stored in a Geographic Information System (GIS) database used for visualization. Surface resolution of cells in the model is 20 m by 20 m (pixel resolution of the Systeme Probatoire d'Observation de la Terre (SPOT) satellite image) over a 2511 km² study area around the Crazy Mountains, Alaska, a watershed on the Arctic Circle draining into the Yukon River. The outputs from this model illustrate the interaction of physical and biologic factors on the partitioning of hydrologic components in a complex landscape.

Yarie, J., and Van Cleve, K., 1996. Effects of carbon, fertilizer, and drought on foliar chemistry of tree species in interior Alaska. *Ecological Applications* 6 (3), 815-827. *VEGETATION; nutrient cycling; nutrition; nitrogen; carbon; phosphorus; climate*

Changes in foliar chemistry resulting from changes in forest-floor and mineral-soil moisture availability, forest-floor microbial energy supply, and nitrogen availability were investigated across the successional sequences in both upland and floodplain landscape positions. Three amendments, sugar, sawdust, and nitrogen fertilizer (NH₄NO₃), were applied to a series of three upland and four floodplain successional sites. The sugar and sawdust treatments were designed to increase the carbon: nitrogen ratio (C/N) of the forest floor to values typical of black spruce sites (C/N = 50). The nitrogen fertilizer treatment was designed to equal estimated yearly N mineralization in an attempt to double available nitrogen in the forest floor. A moisture exclusion treatment was designed to remove all summer rainfall from the treatment plots. Foliar phosphorus concentrations were higher in the upland sites than on the floodplain. No consistent differences were reported among successional stages within a landscape unit. The effect of either sugar or sawdust treatment was to decrease foliar phosphorus concentrations. Sugar produced more significant differences than did sawdust. Sugar treatments decreased foliar nitrogen in all tree species except for white spruce, while fertilizer tended to increase foliar nitrogen. In the second year following treatment there was not an increase in foliar nitrogen concentration resulting from fertilizer treatment.

Yarie, J., 1997. Nitrogen productivity of Alaskan tree species at an individual tree and landscape level. *Ecology* (Washington, D C) 78 (8), 2351-2358. *NUTRIENT CYCLING; forestry; poplar; birch; spruce; aspen; nitrogen; modeling*

The nitrogen-productivity (N-productivity) concept represents one approach for development of algorithms for expansion from the individual tree to stand or landscape levels of estimation of primary production across the Earth's surface. A simple equation based on the N-productivity concept can be used to estimate plant production from the individual tree to stand level geographic units. Maximum N-productivity equations were developed for balsam poplar, white birch, and white spruce on an individual tree basis for the taiga of interior Alaska. Maximum N-productivity equations were also developed for aspen, balsam poplar, and white spruce on a unit area basis (square meters). A single equation for all species sampled and individual stands was developed on a unit area basis. The calculated productivity for test stands was in close agreement to the measured productivity from the landscape perspective. The set of equations presented can be used for calculation of taiga forest productivity in a geographic model developed within a GIS (Geographic Information System) software package in which the landscape unit is an integral part of the model structure.

Yarie, J., Viereck, L., Van Cleve, K., and Adams, P., 1998. Flooding and Ecosystem Dynamics along the Tanana River. *Bioscience* 48 (9), 690-695. *HYDROLOGY; soil; flooding*

Flooding represents one of the primary state factors controlling the floodplain ecosystem processes in interior Alaska. In this article, we describe effects of flooding on ecosystem dynamics on the Tanana River floodplain. These dynamics are similar to those of the floodplains of many large boreal rivers. We begin by reviewing controls on

ecosystem processes in the floodplain using the state-factor approach (Jenny 1941, 1980). This approach makes it possible to relate various characteristics of the soil to climate, parent material, biological community, topography, and time, as well as to additional factors at various sites across the landscape. Flooding becomes a very important state factor on the floodplain of the Tanana River.

Yarie, J., 2000. Boreal forest ecosystem dynamics. I. A new spatial model. *Canadian Journal of Forest Research* 30 (6), 998-1009. *VEGETATION; nutrient cycling; nitrogen; modeling; soil; climate*

Modeling the biology of forest ecosystems has been devoted to a combination of theoretical and empirical approaches representing the function of a forest ecosystem generally within an undefined spatial context. Moving to a large spatial context will require the use of theoretical representations of critical ecosystem functions that can be represented on an individual cell basis. A Spatial Alaskan Forest Ecosystem Dynamics (SAFED) model was developed that is based on the nitrogen productivity concept for forest growth, litter fall quality, and microbial efficiency for forest floor decomposition. Climate and ecosystem disturbances were handled as restricted stochastic [random] processes. The restriction was based on known state-factor relationships. The state factors are used to describe a broad-scale classification of the landscape to define basic limitations for the randomly derived driving Variables used in the model. The model has been programmed as ARC /INFO macro language within the GRID package. The current version of the model has been verified as functional from an individual tree basis (1-m² cell size) within an old-growth white spruce (*Picea glauca* (Moench) Voss) forest found in interior Alaska.

2000. Boreal forest ecosystem dynamics. II. Application of the model to four vegetation types in interior Alaska. *Canadian Journal of Forest Research* 30 (6), 1010-1023. *VEGETATION; nutrient cycling; nitrogen; modeling; soil; climate; flooding*

The Spatial Alaskan Forest Ecosystem Dynamics (SAFED) model was validated across four of the most common vegetation types found in interior Alaska. The vegetation types were an aldef (*Alnus* spp.) - balsam poplar (*Populus balsamifera* L.) site (FP2), an old-growth balsam poplar and white spruce (*Picea glauca* (Moench) Voss) site (FP3), a mixed deciduous (primarily birch (*Betula papyrifera* Marsh.) and aspen (*Populus tremuloides* Michx.)) and white spruce site (UP2), and a mature white spruce site (UP3). The FP site types are common on the floodplain along the Tanana River and the UP site types are common in the uplands in interior Alaska. SAFED is based on nitrogen productivity for vegetation growth, litter fall quantity and quality, and microbial efficiency for forest floor decomposition. The state factors (climate, topography, and disturbance) are used to describe a broad-scale classification of the landscape to define basic limitations for the driving variables. Climate and ecosystem-level disturbances are handled as restricted stochastic processes. The model has been programmed in a spatial framework as an ARC/INFO AML within the GRID package. The current version of the model has been validated as functional from an individual tree basis (1-m² cell size) in a number of forest types found in interior Alaska. The growth, litter fall, and forest floor decomposition were compared with data from the sites. An estimate of yearly carbon balance for the four sites was calculated.

YCC, 1997. Survey of contaminants in Yukon country foods. Synopsis of Research Conducted Under the 1995/96 Northern Contaminants Program Yukon Contaminants Committy (Environmental Studies 74), 265-275. *CONTAMINANTS; traditional food; risk assessment*
Objectives: 1. To determine the presence and quantity of organic and inorganic contaminants in country foods used in the Yukon. 2. To identify potential health risks to First Nations and others consuming country foods. 3. To identify potential health

problems in wildlife populations as a result of contaminant loading. 4. To develop baseline data on levels of inorganic and organic contaminants in wildlife in the Yukon.

Yesner, D., 2001. Human dispersal into interior Alaska; antecedent conditions, mode of colonization, and adaptations. *Quaternary Science Reviews* 20 (1-3; Beringian paleoenvironments workshop; 1997), 315-327. *PEOPLE; anthropology; sediment*

In spite of more than a half-century of exploration, no definitive evidence has yet come to light for human occupation in eastern Beringia preceding 12,000 yr BP. The oldest dates--between 11,500 and 12,000 yr BP--are from sites in interior and northern Alaska.

Archaeological sites dating to this time period, such as the Broken Mammoth site in the central Tanana River Valley, have yielded evidence of pioneer colonization by groups with relatively little knowledge of lithic resources. Three possibly older cave sites--Bluefish Caves, Lime Hills Caves, and Trail Creek Caves--have stratigraphic and taphonomic problems that are not easily resolved. No sites in the glaciated coastal zone of southern Alaska are Pleistocene in date, and numerous objections can be raised to the viability of the coastal migration hypothesis, particularly in the western Gulf of Alaska region. For northern and interior Alaska, the earliest colonization appears to have been a "push-pull" phenomenon, linked to the dissolution of the Bering Land Bridge through a combination of rising sea levels and ameliorating climate. The climate of the "Birch-Poplar" rise in the terminal Pleistocene may have forced the extinction of obligate grazers such as mammoth and horse, but it seems to have favored other taxa such as bison and elk, at least until 9000 yr BP. Faunal data from the Broken Mammoth site in the central Tanana valley, with good organic preservation, demonstrate the utilization of a wide diversity of taxa, including small game, waterfowl, and fish. Faunal and sedimentological data give slight support to a Younger Dryas reversal, but this was dwarfed by the mid-Holocene period of dry, windy conditions during which interior Alaska may have been largely abandoned.

YFC, 1997. Ecosystem-Based Management Application to Yukon Forests: Presentations of the Yukon Forest Strategy Conference on Ecosystem-Based Management. The Yukon Forest Strategy Conference on Ecosystem-Based Management. Yukon Forest Commission (Canada), Whitehorse, Yukon. v. Vol. 1: Summary; Vol. 2: Presentations *VEGETATION; forestry; wildfire; modeling; native perspective*

The report documents presentations and workshops at a conference held to identify solutions to some of the short- and long-term issues related to ecosystem-based forest management in the Yukon and to contribute to the development of a Yukon forest strategy. Topics covered include: Forest management models; boreal forest fire; stand-level forest practices; Yukon forest ecology; fish and wildlife; spatial data in resource management; First Nations perspectives and approaches to forest management; protected areas; harvest planning and procedures; incorporating natural disturbance regimes in harvest design; risk management; wildlife requirements in harvest planning; and logging options. It includes a glossary and a draft report from a workshop on the sustainable forest economy.

YHSS, Yukon health status report. Yukon Health and Social Services, [Whitehorse]. *INCOMPLETE (need abstract)*

Yip, R., Limburg, P.J., Ahlquist, D.A., Carpenter, H.A., O'Neill, A., Kruse, D., Stitham, S., Gold, B.D., Gunter, E.W., Looker, A.C., Parkinson, A.J., Nobmann, E.D., Petersen, K.M., Ellefson, M., and Schwartz, S., 1997. Pervasive occult gastrointestinal bleeding in an Alaska native population with prevalent iron deficiency. Role of *Helicobacter pylori* gastritis. *Journal of the American Medical Association* 277 (14), 1135-9. *PEOPLE; health (condition); nutrition; iron deficiency; biochemistry; enzymology; parasitic infection*

OBJECTIVE: To confirm prevalent iron deficiency among Yupik Eskimos living in Alaska and to explore the frequency of and potential lesions accounting for occult gastrointestinal bleeding. **DESIGN:** Descriptive survey. **SETTING:** Rural Arctic community. **SUBJECTS:** A total of 140 adult volunteers from 3 villages in the Yukon-Kuskokwim Delta region of western Alaska. **MAIN OUTCOME MEASURES:** Daily iron intake, hematologic and biochemical indexes of iron status, fecal hemoglobin levels, stool parasites, and endoscopic findings. **RESULTS:** While dietary iron intake by Yupiks was similar to that of a reference population, iron deficiency prevalence was increased 13-fold in Yupik men and 4-fold in Yupik women. Fecal hemoglobin levels were elevated in 90% of subjects contrasted with only 4% of a reference group; median levels were 5.9 and 0.5 mg of hemoglobin per gram of stool, respectively. Among 70 Yupik subjects with elevated fecal hemoglobin levels who had endoscopy performed, 68 (97%) had an abnormal gastric appearance consisting of erythema, mucosal thickening, diffuse mucosal hemorrhages, erosions, or ulcerations. Gastric biopsies revealed chronic active gastritis with associated *Helicobacter pylori* in 68 (99%) of 69. No other hemorrhagic gastrointestinal disease was detected. **CONCLUSIONS:** Based on this study sample, occult gastrointestinal bleeding appears to be pervasive in the Yupik population and likely underlies the prevalent iron deficiency. An atypical hemorrhagic gastritis associated with *H pylori* infection is present almost universally and may represent the bleeding source.

Young, T.K., Schraer, C.D., Shubnikoff, E.V., Szathmary, E.J., and Nikitin, Y.P., 1992. Prevalence of diagnosed diabetes in circumpolar indigenous populations. *International Journal of Epidemiology* 21 (4), 730-6. *REFERENCE; PEOPLE; health (comparative); diabetes; genetics*

The prevalence of diagnosed diabetes in several genetically closely related indigenous populations in the circumpolar arctic and subarctic regions of Russia, Alaska and Canada is compared. The age-standardized (to the IARC's hypothetical world population) prevalence ranged from 1.8/1000 among the Chukchi and Eskimo of Chukotka, 3.6 and 7.9/1000 among the Eskimos/Inuit of the Canadian Northwest Territories (NWT) and Alaska respectively, 7.1, 9.3 and 18.6/1000 among Athapaskan Indians in the NWT, Yukon and Alaska respectively, to a high of 22.7/1000 among the Aleuts in Alaska. All are below the US all-race prevalence of 23.5/1000 and far below the extreme high prevalence reported from many North American Indian tribes. As a group, such arctic and subarctic peoples have a much shorter and less intense history of European contact and acculturation. Environmental factors are also likely to be responsible for the current differences between these indigenous populations in the circumpolar region, assuming that they share susceptibility genes for diabetes inferred from their close genetic relationships based on markers in other loci. Formal surveys of glucose tolerance and potential risk factors such as diet, physical activity, obesity, insulin resistance and genetic admixture in the circumpolar region would improve knowledge of the aetiology of diabetes in genetically and culturally diverse human populations.

Youngblood, A., and Max, T., 1992. Dispersal of White Spruce Seed on Willow Island in Interior Alaska. FSRPPNW443; PB92238914. Forest Service; Pacific Northwest Research Station, Portland, OR. *VEGETATION; white spruce; recovery; forestry; modeling; flooding*

The seasonal and spatial patterns of dispersal of white spruce (*Picea glauca*) seed were studied from 1986 to 1989 in floodplain stands along the Tanana River near Fairbanks, Alaska. Analysis of the 1987 crop showed that production of filled seed was strongly related to estimated production of total seed and unrelated to selected stand structural characteristics. A mathematical expression, developed to estimate dispersal of filled seed into clearcut openings, predicted dispersal between 10 and 120 meters from the edge of an opening. The pattern of wind during the seed-dispersal season was

predictable and consistent with winds measured at the Fairbanks International Airport. The results give forest managers ways to increase natural regeneration of white spruce in interior Alaska.

YRITWC, 2002. Yukon River Unified Watershed Assessment. Yukon River Inter-Tribal Watershed Council, Anchorage. *WATER QUALITY; MINING; MILITARY; health (condition); history; traditional food; traditional knowledge; subsistence; land use; risk assessment*

Yue, S., and Wang, C., 2002. Regional streamflow trend detection with consideration of both temporal and spatial correlation. *International Journal of Climatology* 22 (8), 933-946. *CLIMATE; HYDROLOGY; surface water*

It is known that serial correlation within time series at sites and cross-correlation among sites in a specific region will influence the ability of statistical tests to assess the field significance of trends over the region. However, serial and/or cross-correlation has been ignored in field trend-analyses. This study attempts to develop a methodology that takes into account both serial and cross-correlation in the assessment of the field significance of trends. The regional average Mann-Kendall (RAMK) statistic is used to represent the regional properties of trends at a regional scale. The null distribution of the RAMK statistic is derived on the basis that the joint probability distribution of independent normal variables is also normally distributed. The variance of the RAMK statistic is then modified by serial and cross-correlation. The applicability of the method was demonstrated by applying it to assess the field significance of trends in annual mean, annual maximum, and annual minimum daily streamflow from 1967 to 1996 in ten major homogeneous climate regions of Canada. The results indicate that the method developed provides more accurate assessment of the field significance of trends than that without consideration of serial and cross-correlation.

At the significance level of 0.10, annual mean daily flow increased significantly in the region of Yukon and northern BC mountains whereas it decreased significantly in the Pacific and the Prairie regions. Annual maximum daily flow decreased significantly across southern Canada, except in the Pacific region. Annual minimum daily flow decreased significantly in the Pacific region and in southeastern Canada, with the exception of the region of Great Lakes and St Lawrence river basin, whereas it increased significantly in the region of Yukon and northern BC mountains. Copyright (C) 2002 Royal Meteorological Society.

Zachel, C.R., 1985. Food habits, hunting activity, and post-fledging behavior of northern goshawks (*Accipiter gentilis*) in interior Alaska, University of Alaska, Fairbanks, M.S., 81 p *POPULATION; birds; raptor; behavior (feeding); behavior (territorial); predation*

Zarnke, R.L., and Rosendal, S., 1989. Serologic survey for *Mycoplasma ovipneumoniae* in free-ranging dall sheep (*Ovis dalli*) in Alaska. *Wildlife Disease* 25 (4), 612-3. *POPULATION; mammals; sheep; respiratory infection; pneumonia; management*

Indirect hemagglutination tests on sera from 251 Dall sheep (*Ovis dalli*) from interior Alaska collected during the period 1979 to 1987 revealed no evidence of exposure to *Mycoplasma ovipneumoniae*. Apparently, this potentially fatal disease agent has not been introduced into free-ranging Dall sheep populations. In the interest of continued health of such Dall sheep, strict enforcement of domestic animal health regulations and prudent land use practices are clearly indicated.

Zarnke, R.L., Worley, D.E., Ver Hoef, J.M., and McNay, M.E., 1999. *Trichinella* sp. in wolves from interior Alaska. *Wildlife Disease* 35 (1), 94-7. *POPULATION; mammals; wolf; parasitic infection*

Tongue samples were collected from 148 wolf (*Canis lupus*) carcasses during 1993 and 1994 near Fairbanks (Alaska, USA). A standard peptic digestion procedure was used to detect *Trichinella* sp. larvae. Larvae were found in 54 of 148 (36%) samples. There was no significant difference in sex-specific prevalence. Prevalence was significantly related to age. There was no relationship between the number of larvae/g of host tissue and the age or sex of the host. *Trichinella* spp. infection may cause illness in individual wolves. However, there was no indication the parasite had any impact on the population.

Zavaleta, E., 1999. The Emergence of Waterfowl Conservation Among Yup'ik Hunters in the Yukon-Kuskokwim Delta, Alaska. *Human Ecology* 27 (2), 231-266. *MANAGEMENT; waterfowl; native perspective; traditional food*

This paper presents evidence of emerging waterfowl conservation practices and attitudes among certain groups of contemporary Yup'ik subsistence hunters in the Yukon-Kuskokwim Delta, a remote, wetlands dominated region of western Alaska crucial to several species of Pacific migratory birds. By examining what factors motivate hunters to follow restraint practices and evaluating how federal goose management policies impact these factors, I argue that recent policy has succeeded not by enforcement of regulations but by providing minimum necessary conditions for voluntary conservation to emerge as a cultural practice. This example of cooperative management may serve as a model for future, sustainable wildlife policies that involve indigenous resource users.

Zhang, T., Stamnes, K., and Bowling, S., 2001. Impact of the Atmospheric Thickness on the Atmospheric Downwelling Longwave Radiation and Snowmelt under Clear-Sky Conditions in the Arctic and Subarctic. *Journal of Climate* 14 (5), 920-939. *REFERENCE; CLIMATE; AIR QUALITY; hydrology; surface water; snow*

Studies show that the energy available to melt snow at high latitudes is almost exclusively provided by radiation. Solar energy determines the period of possible snowmelt, while downwelling atmospheric longwave radiation modifies the timing and triggers the onset of snowmelt. Atmospheric thickness, defined as the vertical distance between the 500- and 1000-mb pressure surfaces, is directly related to the mean temperature and water vapor path of an atmospheric layer and thus has a direct influence on the downwelling longwave radiation and snowmelt. A comprehensive radiative transfer model was applied to calculate the downwelling longwave radiation to the snow surface over the period of snowmelt from 1980 through 1991 using radiosonde data obtained at Barrow and McGrath, Alaska, under clear-sky conditions. The results indicate that the atmospheric thickness has a positive impact on downwelling longwave radiation, which ranges from about 130 W / m² for an atmospheric thickness of 4850 m to about 280 W / m² for an atmospheric thickness of 5450 m. This study demonstrates that atmospheric water vapor path has a greater impact on atmospheric downwelling longwave radiation to the snow surface than the mean atmospheric temperature. This study also indicates that when the near-surface air temperature is used to infer downwelling longwave radiation, significant errors can occur. Thus, compared with the results obtained from the atmospheric radiative transfer model, the empirical formula due to Parkinson and Washington underestimates the downwelling longwave radiation when the near-surface air temperature is relatively high and overestimates it when the near-surface air temperature is relatively low. Investigations of the relationship between the atmospheric thickness and the snowmelt onset were conducted. Results indicate that for the period from 1980 through 1991, an atmospheric thickness of 5250 m at Barrow and 5200 m at McGrath in Alaska was sufficient to trigger the onset of snowmelt. The difference in the threshold values of the atmospheric thickness may be due to differences in the atmospheric structure and different contributions of other energy sources such as sensible and latent heat to melt snow. This study also demonstrates that snow cover disappears earlier during warm and wet (higher atmospheric

temperature and precipitable water path, and greater atmospheric thickness) springs and later during cold and dry (lower atmospheric temperature and precipitable water path, smaller atmospheric thickness) springs. Atmospheric precipitable water path has a greater impact on snowmelt than the mean atmospheric temperature. Generally, higher atmospheric temperature is correlated with higher atmospheric water vapor path and since atmospheric temperature is closely coupled to the atmospheric water vapor path in the Arctic and Subarctic and since it can be obtained through routine numerical weather prediction models, the atmospheric thickness may be used as a reliable indicator of regional-scale snowmelt in the Arctic and subarctic.

Zhang, X., 2001. Assessment of total mercury and methyl mercury in selected subsistence fish in Western Alaska, University of Alaska Fairbanks, M.S., 118 p *CONTAMINANTS; mercury; bioaccumulation; risk assessment; salmon; chum; coho; chinook; sockeye; pike; grayling; whitefish; children; dietary advisory*

Summary: "Total Hg (THg) and methylmercury (MeHg) were examined in muscle and liver samples of salmon species (Chinook: *Oncorhynchus tshawytscha*; Chum: *O. keta*; Sockeye: *O. nerka*; Coho: *O. kisutch*) and freshwater fish species (Pike: *Esox lucius*; Grayling: *Thymallus arcticus*; Whitefish: *Caregonus nelsoni*) collected in 1999 and 2000 from the Western Alaska rivers (Yukon, Kuskokwim, Nushagak and Kvichak). The THg in salmon muscles has a mean value of 62 ng/g (ww). In Pike muscles, THg has a mean value of 879 ng/g. The mean concentrations of THg in Grayling and Whitefish muscle are 153 ng/g and 32 ng/g respectively. In salmon muscle and liver the MeHg levels constitute 77% and 62% of the THg levels, respectively. In Pike muscle the MeHg levels constitute 100% of the THg levels. A significant correlation between Hg levels and fish length was found. Calculated consumption limits indicate that children may consume 0.05-1.5 kg of fish per month, depending on the species consumed. The study suggests that, from 1979 to 1998, nearly 21 kg of MeHg was transported by Sockeye salmon to Alaskan rivers of the Bering Sea east coast"

2001. Modeling stand-level canopy maintenance respiration of black spruce ecosystems in Alaska : implications for spatial and temporal scaling, University of Alaska Fairbanks, M.S., 40 p *NUTRIENT CYCLING; nitrogen; carbon; vegetation; soil; modeling*

Summary: "Canopy respiration represents an important part of the carbon budget of black spruce forests. In this study I scaled hourly models of foliar maintenance respiration (R_m) to estimate canopy R_m for individual stands, and investigated issues in scaling the models to estimate canopy R_m using mean monthly temperature data. I used data from several stands to develop hourly stand-specific and stand-independent models of canopy R_m . Analysis of stimulated canopy R_m indicated that stand-level controls over foliar N concentration should be considered in models that estimate canopy R_m of black spruce stands across the landscape. Uncertainty analyses indicated that the parameter that describes maintenance respiration rate at 0C per g N has the greatest influence on annual estimates of canopy maintenance respiration. Finally, comparisons of monthly R_m between the hourly and monthly versions of the models indicated that mean monthly temperature can be used to drive models of canopy R_m with little loss of precision"

Zhang, X., Harvey, K., Hogg, W., and Yuzyk, T., 2001. Trends in Canadian streamflow. *Water Resources Research* 37 (4), 987-998. *INCOMPLETE (need abstract); HYDROLOGY; surface water; river ice*

Zhang, X., Naidu, A., Kelley, J., Jewett, S., Dasher, D., and Duffy, L., 2001. Baseline concentrations of total mercury and methylmercury in salmon returning via the Bering Sea (1999-2000). *Marine Pollution Bulletin* 42 (10), 993-997. *CONTAMINANTS; metals; mercury; fish; salmon; chinook; coho; sockeye; chum*

Zhuang, Q., 2001. Modeling the influences of climate change, permafrost dynamics, and fire disturbance on carbon dynamics of high latitude ecosystems, University of Alaska Fairbanks, Ph. D., 218 p *CLIMATE; NUTRIENT CYCLING; carbon; nitrogen; vegetation; black spruce; soil; ground ice / permafrost; snow; wildfire; modeling*

Summary: "A Soil Thermal Model (STM) with the capability to operate with a 0.5-day internal time step and to be driven with monthly input data was developed for applications with large-scale ecosystem models. The use of monthly climate inputs to drive the STM resulted in an error of less than 1C in the upper organic soil layer and in an accurate simulation of seasonal active layer dynamics. Uncertainty analyses identified that soil temperature estimates of the upper organic layer were most sensitive to variability in parameters that described snow thermal conductivity, moss thickness, and moss thermal conductivity. The STM was coupled to the Terrestrial Ecosystem Model (TEM), and the performance of the STM-TEM was verified for the simulation of soil temperatures in applications to black spruce, white spruce, aspen, and tundra sites. A 1C error in the temperature of the upper organic soil layer had little influence on the carbon dynamics simulated for a black spruce site. Application of the model across the range of black spruce ecosystems in North America demonstrated that the STM-TEM has the capability to operate over temporal and spatial domains that consider substantial variations in surface climate. To consider how fire disturbance interacts with climate change and permafrost dynamics, the STM was updated to more fully evaluate how these factors influence ecosystem dynamics during stand development. The ability of the model to simulate seasonal patterns of soil temperature, gross primary production, and ecosystem respiration, and the surface climate. To consider how fire disturbance interacts with climate change and permafrost dynamics, the STM was updated to more fully evaluate how these factors influence ecosystem dynamics during stand development. The ability of the model to simulate seasonal patterns of soil temperature, gross primary production, and ecosystem respiration, and the age-dependent pattern of above-ground vegetation carbon storage was verified. The model was applied to a post-fire chronosequence in interior Alaska and was validated with estimates of soil temperature, soil respiration, and soil carbon storage that were based on measurements of these vari [?!] growth of moss, changes in the depth of the organic layer, and nitrogen fixation should be represented in models that simulate the effects of fire disturbance in boreal forests. Furthermore, the sensitivity analyses revealed that soil drainage and fire severity should be considered in spatial application of these models to simulate carbon dynamics at landscape to regional scales"

Zuercher, G., Roby, D., and Rexstad, E., 1999. Seasonal changes in body mass, composition, and organs of Northern red-backed voles in interior Alaska. *Journal of Mammalogy* 80 (2), 443-459. *POPULATION; mammals; vole; health (condition); metabolism; nutrition; seasonality*
Northern red-backed voles (*Clethrionomys rutilus*) undergo a pronounced annual cycle in body mass and are heaviest in summer and lightest in winter. We trapped voles throughout 1994 to determine how changes in body composition and organ size contributed to this cycle. Body mass peaked in summer for females and spring for males. Seasonal changes in body mass were primarily due to changes in lean mass. Body mass was 30-50% lower in winter than summer, and water content of lean mass was lowest in winter. Total body fat was low throughout the year but peaked (as with body mass) in spring (males) or early summer (females). Energy reserves in the form of fat depots are apparently most crucial during the breeding season. A low relative ash content in early summer was possibly due to a cation imbalance in the diet. Absolute and relative sizes of different body components contributed to the annual cycle in total body mass. All body components (except brown adipose tissue) declined in absolute mass, dry mass, and percent water during autumn, with skeletomuscular components contributing most to

loss of total body mass. Most body components declined in proportion to declines in total body mass. However, liver, reproductive tract, and muscle mass of males declined proportionally more than total body mass; heart, brain, and bone declined proportionally less. Whole body analyses suggest that the annual cycle of body mass in *C. rutilus* is driven by seasonal changes in optimal body size. Component analyses are consistent with the hypothesis that the primary selective force driving seasonal changes in body components is the enhanced overwinter survival of *C. rutilus* with relatively small body size.

Zurita, R.B., 1992. A case-control study of chronic otitis media and acculturation among the Yukon-Kuskokwim Delta Eskimos: Ann-Arbor, University of Michigan, Ph.D., x, 177 leaves : ill., map p *PEOPLE; children; health (condition); otitis media; anthropology; hearing loss*

First paragraph of introduction:

This disertation is aimed at investigating the effects of social, cultural, economic, and ecological factors on the prevalence of chronic otitis media (COM), a major cause of morbidity among Alaskan Eskimo children. Since the pathogenesis of COM has been determined, as will be discussed later, interest is focused here on the effects of social, cultural, economic, and ecological factors that may influence the risk for COM in this population of children. An understanding of these factors may in turn provide clues as to appropriate interventions to control or limit the high prevelance of the disease among Native Alaskans...