

G. AGUIAR

**Supplemental Feeding of Smooth Brome Grass (*Bromus Inermis*) Haylage to Reindeer**

*George Aguiar, Reindeer Research Program, University of Alaska Fairbanks, School of Natural Resources and Agricultural Sciences*

Contact e-mail: fsgaa@uaf.edu

*Greg Finstad, Reindeer Research Program, University of Alaska Fairbanks, School of Natural Resources and Agricultural Sciences*

Contact e-mail: ffglf@uaf.edu

Profitability of reindeer farming in the state of Alaska is influenced by the high shipping cost of imported feed components. The Reindeer Research Program at the Agricultural and Forestry Experiment Station of the University of Alaska Fairbanks has developed a milled balanced ration containing oats, barley and Smooth Brome grass, all of which are produced locally and readily consumed by reindeer.

However, milled feed costs could be reduced or marginal grazing areas could be used if a low-cost, nutritious and palatable supplemental feed could be found. Grass and legume haylage has been shown to be a cost-effective supplemental feedstuff used in other livestock industries and reindeer production systems in Scandinavia. Grass haylage can be produced in Alaska and could provide a nutritional and cost-effective supplement to Alaska producers if reindeer would consume and demonstrate acceptable performance. Eight steers, two years of age, were randomly allocated to a control group or a treatment group fed a regular milled ration for approximately five weeks, but the hay component was replaced with Smooth Brome grass haylage. In a follow-up experiment all animals were fed the standard milled ration, but given Smooth Brome grass haylage ad lib on the side to determine whether or not pre exposure had any effect on intake of the supplement.

Mean dry matter intake (DMI) of animals fed a milled ration using haylage ( $20.9\text{g} \pm 0.2$  concentrate/kg body weight) was not significantly different than the control group ( $20.8\text{g} \pm 0.3$  concentrate/kg body weight). Control animals had a significantly higher DMI of haylage on the side ( $1.1\text{g} \pm 0.1$  concentrate/kg body weight) than treatment animals ( $0.6 \pm 0.1$  concentrate/kg body weight).

Haylage was readily consumed by reindeer when used as a component in a milled ration, however additional mechanical and labor input during milling would likely make its use unprofitable. Pre exposure to the haylage in a milled ration did not significantly increase DMI of haylage when given as a supplement suggesting reindeer will consume the haylage but is not preferred forage.

**Session:** Reindeer Herding

## A. AHMASUK

### **Subsistence & Traditional Ecological Knowledge**

*Austin Ahmasuk, Nome Eskimo Community*

Contact e-mail: aahmasuk@gci.net

Alaska laws and regulations governing subsistence incorporate scientific, public, and political motivations. Regulations governing subsistence are made by state and federal commissions. Regulations governing the Seward Peninsula, Norton Sound, and Chukchi Sea Coast will be considered in the next year late 2009 and early 2010.

The Alaska Constitution provides for meaningful public involvement in fish and game management, and environmental management. Alaska Statutes (AS) give guidance to the Alaska Boards of Fish and Game as to how regulations are to be written. The Alaska Department of Fish and Game (ADF&G) carries out the regulations. AS 16.05.258, the subsistence priority, means that subsistence is the priority management goal. Alaska Administrative Code (AAC) implements statutes, they are the seasons and bag limits. Local citizen advisory committees are mandated by law for fish and game management, but not environmental management.

Numerous congressional laws provide for meaningful public and tribal involvement in fish and game management. The Migratory Bird Treaty Act (MBTA), Marine Mammal Protection Act (MMPA), Alaska National Interest Land Conservation Act (ANILCA), Alaska Native Claims Settlement Act (ANCSA), Northern Pacific Halibut Act (PHTA), Stevens, Magnusson-Stevens Fishery Conservation and Management Act, National Environmental Policy Act (NEPA), etc. give guidance to the Secretary of the Interior as to how regulations are to be written. Bureau of Land Management (BLM), National Park Service (NPS), United States Fish and Wildlife Service (USFWS), and the National Marine Fisheries Service (NMFS) are given management authority over certain fish and game resources and are mandated with specific provisions that may differ between agencies. The Code of Federal Regulations implements the numerous congressional laws. Local citizen advisory committees are mandated by law for fish and game management. Tribal consultation is mandated by Presidential Executive Order.

Traditional knowledge is a key aspect to nearly every regulation and when ideas for implementing traditional knowledge are well thought out there are good chances for satisfactory regulation development.

**Session:** Subsistence

## A. AHMASUK

### **Tribal In-stream Water Quality Studies**

*Austin Ahmasuk, Nome Eskimo Community*  
Contact e-mail: aahmasuk@gci.net

The Nome Eskimo Community (NEC) In-stream Water Quality Study is one component of the environmental program. NEC is one of 225 federally-recognized Alaska Native tribes in the state of Alaska. The NEC tribal council directs major policy issues of the environmental program to benefit its tribal members. The treeless terrain of the Nome area provides for unique insights into stream water quality metrics that are little studied. In-stream water quality metrics are an excellent way to understand climatological and seasonal changes in streams. Streams are highly utilized by aquatic and terrestrial life, as well as subsistence users. Due to the complexity of privately-owned land near Nome, state or publicly-owned lands were chosen for field locations. Field locations were chosen for their representativeness of stream types within the Nome area. NEC's stream studies follow commonly accepted rapid assessment protocols using commonly available meters, collection kits, and forms adapted from existing programs. GIS software will assist in understanding water quality metrics and maps will be portrayed as data is developed.

This project will conduct biological, chemical and partial physical assessments of Nome area watersheds. Multiple and single discharge watersheds exist within the Nome area that have never been assessed but have been subjected to various amounts of disturbance. Biological assessments will entail rapid study of macro invertebrates. Partial physical assessments will examine stream types in selected portions of streams, by assessing habitat types and stream flow. Chemical assessments will measure acidity (pH), dissolved oxygen, conductivity, total dissolved solids, and temperature using appropriate, commercially-available multi-function meters. As funds allow, additional meters may be purchased to assess additional water quality parameters. Benthic macro-invertebrates (BMI) will also be studied using a macro-invertebrate collection net by identifying BMIs to taxa, and enumerating taxa for analysis.

The above water quality parameters were chosen for their ease and efficiency of collection and importance. More parameters could be collected but would impair the ability of collecting as much information about the Nome-area streams as possible within one summer field season.

**Session:** Watershed

M. ALTAWHEEL

**Creating a Community-Centric Assessment Tool for the Arctic: How to Address Relevant Systems and Scales**

*Mark Altaweel, Argonne National Laboratory*  
mraltawe@uchicago.edu

*Lilian Alessa, Resilience & Adaptive Management Group, UAA*  
*Andrew Kliskey, Resilience & Adaptive Management Group, UAA*  
Contact e-mail: afadk@uaa.alaska.edu

Rapid changes affecting the Arctic require that approaches be developed to address multiple issues at appropriate time and geographic scales. Tools need to be developed to allow communities, managers, policy makers, and scientists to better study land use, cultural influence, and environmental change in order to make effective decisions. This presentation attempts to show some preliminary results obtained from a modeling approach that integrates various forms of data in order to develop a new tool for addressing change in the Arctic. The test cases addressed represent small communities in Seward Peninsula where project members have been active in collecting data. Results demonstrate current long-term effects of cultural practices as well as possible outcomes made by community-based decisions.

**Session:** Climate Change, Water Resources and Humans in the Arctic

R. ASHENFELTER

**The Western Arctic Caribou Herd Working Group: An Interdisciplinary, Cross-Cultural, Stakeholder Approach to Caribou Management in NW Alaska**

*Roy Ashenfelter, Kawerak, Inc., WACH Working Group*

Contact e-mail: rashenfelter@kawerak.org

*Sue Steinacher, AK Dept. of Fish & Game, Caribou Trails*

Contact e-mail: susan.steinacher@alaska.gov

The WACH Working Group is a stakeholder group whose members include: representatives for 42 villages within the range of the herd, hunting guides, transporters, conservationists, the Anchorage Fish & Game Advisory Committee, Fairbanks hunters, and the Reindeer Herders Association. While not voting members of the group, the Alaska Department of Fish and Game, the Bureau of Land Management, the U.S. Fish and Wildlife Service, and the National Park Service serve in an advisory and supportive capacity to the group. This presentation will give an overview of the goals and objectives of the group, its history and early challenges, its current strengths and successes, and its future direction and vision.

Collectively, the Caribou Working Group promotes the gathering and sharing of traditional knowledge and local observations; discusses potential impacts of climate change and resource development; supports habitat monitoring and biological research on the herd; encourages student participation with the annual caribou collaring project and other caribou-related education programs; makes recommendations to organizations and agencies on the need to the preservation of the Western Arctic Caribou Herd and their habitat; and disseminates information on all these issues through its annual newspaper, *Caribou Trails* (sent to all residents within the range of the herd), and with interested individuals, organizations, and agencies statewide.

The Caribou Working Group is a way for local hunters and residents to become more involved in protecting the health and habitat of the herd and subsistence activities; for researchers to share and promote relevant research; and for land and resource management agencies to view a collaborative stakeholder group successfully undertaking cooperative planning and management of a shared resource.

**Session:** Ecology and Wildlife

## V. BARBER

### **Onetree Alaska**

*Valerie Barber, University of Alaska, SNRAS, Forest Sciences*  
Contact e-mail: [ffvab@uaf.edu](mailto:ffvab@uaf.edu)

*Jan Dawe, University of Alaska, SNRAS, Forest Sciences*

OneTree is designed to showcase the distinctive qualities of Alaska birch and the people and communities who use and value it. The project will demonstrate full utilization (e.g. zero waste) of a single tree and, through the array of products created, make tangible the art, science, utility and history connected to that tree. The project is community-based, and will depend on teams of business- and craftspeople, scientists, teachers, K-12 and university students who will work collaboratively on all aspects of the project. Communication, diversity, and inclusion are important aspects of the project. To provide for this inclusion and diversity, the project will be conducted in each of three population centers: Fairbanks, Palmer/Wasilla and one yet to be determined community. Teams will be created from community members at each locale. The teams will choose the tree to be harvested in their region and decide all aspects of its use. Outcomes of the project will include tree-based products and multimedia educational products, such as flyers and booklets, workshops, exhibits, and K-12 and adult education curricula. Eventually, common gardens will be planted near the tree's original provenance, so that seeds and rooted cuttings from the original "one trees" can be grown and monitored long-term. Through these objectives, the project aims to create a complete chain of custody—from the original tree in the landscape through the production of a range of goods, to the eventual long-term monitoring of the tree's progeny. The project is funded by USDA-CRSEES WUR through the University of Alaska Fairbanks-School of Natural Resources and Agricultural Sciences - Forest Products Program.

**Session:** Education

R. BARNHARDT

**Science Education Opportunities for Rural Alaska**

*Ray Barnhardt, Center for Cross-Cultural Studies, University of Alaska Fairbanks*  
Contact e-mail: ffrjb@uaf.edu

The workshop will provide information on current program opportunities and curriculum development initiatives related to science education in rural Alaska. Details of a new PhD program in Indigenous Studies will also be provided, along with information about other opportunities for advanced graduate study in science fields applicable to Alaska Native issues and rural contexts.

**Session:** Workshop, April 8

L. BENDER

### **Interdisciplinary Undergraduate Degrees at UAF**

*Laura Bender, Graduate School, UAF*

Contact e-mail: fnleb@uaf.edu

*Lawrence K Duffy, Graduate School, UAF*

Contact e-mail: fflkd@uaf.edu

Scholars have argued that learning and research performed in an interdisciplinary context is likely to be more creative. Also, interdisciplinary research is more likely to lead to applicable results. While UAF is recognized for its interdisciplinary research at the graduate level, it is not well known that UAF offers interdisciplinary degrees for undergraduates.

UAF's undergraduate interdisciplinary programs (BA, BS and BT) provide flexibility to students who have well-defined goals but do not fit into one of the established majors offered by UAF.

Students may submit a proposal for an interdisciplinary program after completing 15 credits at UAF as long as they have at least 30 credits remaining in the proposed degree program. The proposed curriculum must differ significantly from established degree programs at UAF and will require evidence that the necessary facilities and faculty are available to ensure an approximation of a normal undergraduate degree. All general requirements for the B.A., B.S. or B.T. degree must be met.

In developing an interdisciplinary proposal, the student should specify the degree (B.A., B.S. or B.T.), include an explanation of how the proposed program differs substantially from established UAF programs, and include a discussion showing that current UAF resources are adequate to meet the requirements of the proposed program. (A minimum of two disciplines is required for the interdisciplinary degree.) The student then obtains an advisory committee of at least three faculty members from the appropriate disciplines and holds at least one formal meeting with the full committee to review the proposal. Students interested in pursuing an undergraduate interdisciplinary degree can contact the Office of the Graduate School and Interdisciplinary Programs for help in finding faculty advisors and developing their curriculum proposal.

**Session:** Education

R. BENSIN

### **Solar Photovaltaics and Waste to Energy System**

*Robert Bensin, Bering Straits Development Company/Subsiderary of Bering Straits Native Corporation*

Contact e-mail: rbensin@beringstraits.com

On March 19, 2008 Bering Straits Native Corporation completed the installation and commissioned the 16.8 solar photovoltaic system on its corporate headquarters. It's the first of its size in rural Alaska. On the one year anniversary we have produced a total of 15.5MWH, saved about \$6000.00 and have reduced 17,000 lbs of carbon. The projected payback period on the investment is 12 years. We have a total of 96 panels, 48 on the face of the building at 90 degrees and 48 on the roof at 75 degrees. The panels have a manufactures warranty of 25 years with a life expectancy of 40 years. We only had to put our hands on the system one time since turning it on and that was to adjust the angle of panels to 75 degrees. This is to maximize on the angle of the sun change from summer and winter. Our best production is the fall and spring months. Due to colder temperatures the production of the panels reaches their peak percentages. We also benefit greatly from the reflected sun from the ice and snow covered Bering Sea.

It has only been in recent years that large scale solar has made profitable sense and when the mention of installing this system in Nome Alaska was presented we were told it would not work and it would never pay itself off. I look forward to sending those people the data on the system after a year of operation. When you take into consideration the round the clock sun in the midst of summer, the cold temperatures and reflected sunlight in winter, maintenance free operations, and the long life of the system you cannot disagree that solar dose work in Nome Alaska and is a sensible renewable energy.

Bering Straits Native Corporation is looking into the possible partnership of sales and service of the waste to energy system called the GEM manufactured by IST Energy. The system would best be suited for rural Alaska villages that have waste and energy problems. This would be all of them. Others that may benefit are large waste producing facilities like Universities, Schools and Hospitals.

**Session:** Energy/Small Business

M. BURTIS

**Educating Rural Alaskans in the Seward Peninsula Communities: A Personal Perspective**

*Melanie Burtis, University of Alaska Fairbanks, Northwest Campus*

Contact e-mail: melanie.burtis@uaf.edu

Melanie will present a discussion of the many issues encountered when delivering education to communities within rural Alaska. She will discuss distance education successes and setbacks; the process of obtaining funding; the challenges associated with education in rural communities at both administrative and instructional levels; the need for flexibility and understanding the importance of community in rural areas; travel difficulties and delights, and how being an educator in rural Alaska has changed her.

**Session:** Education

J. CHERRY

### **Permafrost Controls on Hydrological Processes in a Changing Climate**

*Jessica Cherry, International Arctic Research Center, UAF*  
Contact e-mail: jcherry@iarc.uaf.edu

*Larry Hinzman, International Arctic Research Center, UAF*  
*Bob Busey, International Arctic Research Center, UAF*

The effects of a warming climate on the terrestrial regions of the Arctic are already becoming apparent; some subsequent impacts to the hydrologic system are also becoming evident. It is expected that the effects and consequences of a warming climate will become even more evident within the next 10 to 50 years. The broadest impacts to the terrestrial arctic regions will result through consequent effects of changing permafrost structure and extent. As the climate differentially warms in summer and winter, the permafrost will become warmer, the active layer (the layer of soil above the permafrost that annually experiences freeze and thaw) will become thicker, the lower boundary of permafrost will become shallower and permafrost extent will decrease in area. These simple structural changes will affect every aspect of the surface water and energy balances. As the active layer thickens, there is greater storage capacity for soil moisture and greater lags and decays are introduced into the hydrologic response times to precipitation. When the frozen ground is very close to the surface, the stream and river discharge peaks are higher and the base flow is lower. As the active layer becomes thicker, the moisture storage capacity become greater and the lag time of runoff increases. As permafrost becomes thinner, there can be more connections between surface and subsurface water. As permafrost extent decreases, there is more infiltration to groundwater. This has significant impacts on large and small scales. The timing of stream runoff will change, reducing the percentage of continental runoff released during the summer and increasing the proportion of winter runoff.

The primary control on local hydrological processes in northern regions is dictated by the presence or absence of permafrost, but is also influenced by the thickness of the active layer and the total thickness of the underlying permafrost. As permafrost becomes thinner or decreases in areal extent, the interaction of surface and sub-permafrost ground water processes becomes more important. The inability of soil moisture to infiltrate to deeper groundwater zones due to ice rich permafrost maintains very wet soils in arctic regions. However, in the slightly warmer regions of the subarctic, the permafrost is thinner or discontinuous. In permafrost-free areas, surface soils can be quite dry as infiltration is not restricted, impacting ecosystem dynamics, fire frequency and latent and sensible heat fluxes. Other hydrologic processes impacted by degrading permafrost include increased winter stream flows, decreased summer peak flows, changes in stream water chemistry, and other fluvial geomorphological processes. Hydrologic changes witnessed include drying of thermokarst ponds, increasing importance of groundwater in the local water balance and differences in the surface energy balance.

**Session:** Climate Change, Water Resources and Humans in the Arctic

J. CHERRY

**Roundtable Discussion: The Bering Strait Research Consortium**

*Jessica Cherry, International Arctic Research Center and Institute of Northern Engineering, University of Alaska Fairbanks*

Contact e-mail: [jcherry@iarc.uaf.edu](mailto:jcherry@iarc.uaf.edu)

*Peter Schweitzer EPSCOR Office and Dept of Anthropology, University of Alaska Fairbanks*

Contact e-mail: [ffpps@uaf.edu](mailto:ffpps@uaf.edu)

*Invitees:* Trudy Anderson Sobocienski, Kawerak; Heidi Herter, NWC; Charlie Lean, NSEDC; Lee Haugen, NWC; Claudia Ihl, NWC; Vera Metcalf, Kawerak; National Park Service staff, and other interested community members

This workshop will start with a presentation describing the need for a new entity known as the Bering Strait Research Consortium (BSRC). This proposed consortium could serve as a central forum for communication of cultural, health, economic, and scientific research activities to the public, data exchange, research synthesis, and research support information. Individuals or institutions with an interest in the Beringia region are encouraged to participate in BSRC. Input on the organization, mission, and planning are solicited during this roundtable discussion. Interest in a consortium has grown out of the needs of stakeholders and researchers to coordinate their efforts and help communicate them to the general public and the larger research community. Coordination for the BSRC was enabled by the University of Alaska EPSCoR program, which has research integration and outreach at the core of its mission.

**Session:** Workshop, April 8

J. CHERRY

**Seward Peninsula Climate and Hydrology**

*Jessica Cherry, International Arctic Research Center and the Institute of Northern Engineering,  
University of Alaska Fairbanks*

Contact e-mail: jcherry@iarc.uaf.edu

*Larry Hinzman, International Arctic Research Center*

*Robert Busey, International Arctic Research Center*

This presentation will review analyses and trends of Seward Peninsula weather, climate, permafrost, and hydrology since instrumental observations began over 100 years ago. Results from recent digitization of early records will be included. Patterns of variability in the University of Alaska Fairbanks hydrometeorology network, Cooperative, and National Weather Service stations are strongly linked to distribution of seasonal sea ice in the Bering and Chukchi Seas, as well as large-scale modes of climate in the Pacific sector. The implications of this relationship are that future changes in sea ice thickness and distribution near the Seward Peninsula during winter could lead to additional winter warming via increased ocean heat fluxes. Increases in winter air temperature dominate recent climate trends throughout the Arctic and may lead to degradation of marginal permafrost such as that on the Seward Peninsula.

**Session:** Climate Change, Water Resources and Humans in the Arctic

T. CLAUSEN

**The Alaska Native Science & Engineering Program at UAF**

*Thomas P. Clausen, Department of Chemistry and Biochemistry, University of Alaska Fairbanks*  
Contact e-mail: [fftpc@uaf.edu](mailto:fftpc@uaf.edu)

There are many programs within the UA system designed to enhance the University experience for students from rural communities. One highly successful program is ANSEP (Alaska Native Science & Engineering Program) which has a presence at both UAA and UAF. ANSEP is part of a National Alliance that currently involves eleven states and is funded by the National Science Foundation, UA, and most importantly, by partnerships with the private sector. In the UA system, ANSEP has three subprograms: Precollege, Bridge, and Retention. The UAF ANSEP office focuses on the Retention program which is the focus of the presentation.

Currently the UAF ANSEP program has 52 students from across the State and majoring in diverse fields such as Physics, Fisheries, Geography, Biological Sciences, Mathematics & Computer Science, Chemistry & Biochemistry, and various Engineering disciplines. While most of students are Alaska Native, the program is not exclusive to rural or native students. Furthermore, the program is NOT remedial in nature and most students are enrolled in calculus-based courses.

The benefits of the ANSEP program are varied and include providing 1) help with courses, 2) a sense of community for students away from home, 3) professional networks that will serve students well beyond their UAF experience, 4) meaningful summer internship opportunities, and 5) several mechanisms for financial support over the academic year including stipends and monetary awards for academic performance and good citizenship.

Details about how students can apply to be part of ANSEP, what our expectations are of them, and how they benefit from the program will be presented.

**Session:** Education

## T. CLAUSEN

### **URM Alaska: UAF Undergraduate Research Opportunities in the Biological Sciences**

*Thomas P. Clausen, Department of Chemistry and Biochemistry, University of Alaska Fairbanks*  
Contact e-mail: [fftpc@uaf.edu](mailto:fftpc@uaf.edu)

*Marvin K. Schulte, Department of Chemistry and Biochemistry, University of Alaska Fairbanks*  
*Mary van Muelken, Department of Chemistry and Biochemistry, University of Alaska Fairbanks*

The University of Alaska Fairbanks (UAF) provides a unique opportunity for undergraduate mentorship. Continuous improvements in infrastructure and faculty recruitment have led to expansive research opportunities in a broad range of research in the biological sciences extending from Wildlife Biology and Ecology to Biophysics. UAF has a long history of undergraduate research and is often referred to as the 360 million acre plus campus since research opportunities extend far beyond the laboratory. As America's Arctic University, research projects often focus on research highly relevant to northern latitudes. Research opportunities for students at UAF are unlike anywhere in the nation.

While clearly a leader in research in the state of Alaska, undergraduate education remains an intense focus at UAF. Unlike many large research universities, undergraduate courses are led by experienced research faculty, not teaching assistants or part time instructors; class sizes are small (typically less than 20 students/professor); and undergraduate research is expected. It is a vibrant environment for students offering ample time for interaction with research faculty.

Combining a focus on undergraduate education (more typical of a private liberal arts college) with undergraduate research opportunities equal to any research university in the nation, UAF undergraduates are uniquely prepared for advanced scientific degrees. URM Alaska will enable more students, particularly those from less well represented racial/ethnic groups to enjoy the opportunities available at UAF. In particular, we will focus on increased recruitment from rural Alaska with a particular emphasis on the recruitment of Alaska Natives. While underrepresented at UAF, Native students provide a wealth of perspective and knowledge unique to their particular experiences and traditions. The many different native cultures within Alaska hold great potential for enriching the UAF experience for all of our students. While the advantages are great, there are also significant but surmountable challenges. To ensure success, we have developed a program combining a solid mentoring program, career services and a range of enrichment activities.

#### *Project Goals and Objectives:*

- 1: Increase enrollment and diversity of undergraduate students interested in pursuing research careers in Biology and Chemistry at the University of Alaska Fairbanks.
- 2: Improve the success of Alaska minority students in research careers through comprehensive mentorship and career guidance.

Students who have completed their sophomore studies in the biological sciences (including biochemistry / molecular biology) and who plan to continue their graduate studies are eligible to receive support including: stipends (up to \$12,000 per year); travel to national meetings to present research results (\$2,000/year); and research supplies (\$3,000/year). Up to two years support are possible. This support may be combined with additional financial assistance.

It is possible for the undergraduate research project supported by this project to transition into a graduate research project. It is also possible to pursue the graduate project at other institutions.

**Session:** Poster

L. CLOUGH

**Utilizing TEK and SEK to Delineate the Coastal Food Web of Kotzebue Sound**

*Lisa M. Clough, Department of Biology, East Carolina University*  
Contact e-mail: cloughl@ecu.edu

*William G. Ambrose Jr, Department of Biology, Bates College, Akvaplan-niva, Polar Environmental Centre, Norway*

*Jeffrey C. Johnson, East Carolina University*

*Alex Whiting, Kotzebue IRA*

*Stephen C. Jewett, IMS/SFOS, University of Alaska Fairbanks*

*David Griffith, East Carolina University*

In recent years there has been increasing interest in using both scientific ecological knowledge (SEK) and traditional or local ecological knowledge (TEK or LEK) to address environmental problems, particularly in the Arctic. We employed concurrent collection of TEK and SEK in coastal Kotzebue, Alaska, a town of approximately 3,500 people, located just above the Arctic Circle. One of our a priori hypotheses was: SEK and TEK will agree with regards to the structure of the Kotzebue Sound food web at higher, but not lower, trophic levels. We determined trophic position via SEK using isotopic analyses of tissues; and via TEK using network analysis of pile sort data. Our results indicate general agreement at both high and low trophic levels, with variation between TEK and SEK most evident for intermediate trophic positions. We postulate that the organisms found at intermediate trophic levels are most likely to have variable diets, and the discrepancy between TEK and SEK reflects: 1) local adaptations of middle trophic levels best first understood using TEK, 2) seasonal switches in feeding behavior such that SEK sampling in one season will give a different answer than TEK harvesting that occurs in a different season, and 3) non-harvested species may represent best guesses using TEK, and because of the variation in diet for middle trophic levels, thus show a large amount of variation. Commonalities between TEK and SEK far outweigh differences, yet each methodology offers unique perspectives to be included in fully developing food web models.

**Session:** Subsistence

D. COOPER

**Upper Goodhope: An Iñupiaq Reindeer Herder Site on the Northern Seward Peninsula**

*Doreen Cooper, R&D Consulting*

Contact e-mail: dccooper\_99840@yahoo.com

*Eileen Devinney, National Park Service*

Often controversial, reindeer herding was brought to the Seward Peninsula in 1892 by missionary Sheldon Jackson and the United States government. What began as a misguided attempt to transform the hunters to herders was transformed by the Lomen family in the 1920s to an industry that controlled hundreds of thousands of deer, herds that often contained “runaways” from Native-owned herds. In 1937, the federal government passed the Reindeer Act, making it illegal for anyone but a Native American to own herds of reindeer. The upper Goodhope reindeer corral and associated cabins date to this tumultuous period. Controlled by reindeer herders from Deering, under grazing permits issued to the Karmun family, the area was used sparingly during the 1940s and 1950s when wolf depredation decimated the once rich herds of the Seward Peninsula. In the 1960s and 1970s herders again brought large herds to the site. Archeologists and architects have recently documented the site’s features and conducted archival research on its origin and history. Artifacts and imprints left by the herders at the cabin begin to tell the story, but the Bering Land Bridge National Preserve now seeks to find people who might recall stories of this remarkable place that will shed light on questions such as: Who were the herders at Goodhope? How did the corral function? What role did herding activities play in the seasonal round of local residents? How may the cultural history of the site best be preserved and interpreted for generations?

**Session:** Poster

T. CRAFFORD

### **The Process for Permitting Mine Projects in Alaska**

*Tom Crafford, Alaska Department of Natural Resources, Office of Project Management and Permitting*  
Contact e-mail: tom.crafford@alaska.gov

Large hardrock mining projects have the potential for significant environmental impacts. Potential water quality impacts due to metal leaching + acidic rock drainage (ML/ARD) are a particular concern and must be addressed during the mine design and permitting. The State of Alaska employs an interagency team of technical professionals to evaluate mining development proposals. There is no single “permit to mine” but, rather, a project specific array of state and federal permits and authorizations that may total 50 or more. The permitting process for large mining projects that require major federal actions is largely controlled by the federal National Environmental Policy Act (NEPA) process for Environmental Impact Statements (EIS). NEPA requires the performance of baseline studies, specifies a sequence of steps to be followed, and includes multiple requirements for public notice and comment. The State works to coordinate its review, permitting, and public notice/comment requirements with the NEPA process to eliminate unnecessary duplication of effort and to facilitate public understanding and ability to comment. Mining projects must “design for closure”, have an approved reclamation plan, and post financial assurances for reclamation, monitoring, and care/maintenance. Environmental Audits by 3rd party environmental firms that assess both operator and regulatory agency performance and review financial assurances are conducted every 5 years (or sooner) as a condition for the required renewal of major permits.

**Session:** Mining

L. DAVIS

### **Consequences of Two Reindeer Herding Strategies in Northern Mongolia**

*Leslie Davis, Reindeer Research Program, University of Alaska Fairbanks*  
Contact e-mail: ftled@uaf.edu

*Greg Finstad, Reindeer Research Program, University of Alaska Fairbanks*  
Contact e-mail: ffglf@uaf.edu

*Meagan Flenniken, Cornell University*  
*Morgan Keay, The Itgel Foundation*

The Tsataan are a community of reindeer herders that have been politically and geographically isolated in the taiga and alpine tundra areas of Hovsgol Province in northern Mongolia. They are divided into two geographically isolated groups; a traditional and nomadic Western Taiga (WT) population, which is divided into subgroups of 2-8 families that herd 20-250 reindeer per group. Western Taiga herders tend to move every 5-6 weeks from high elevation grazing areas in summer to camps below tree line in winter. The Eastern Taiga (ET) population is subdivided into larger groups of 10-15 families, herd fewer reindeer and are more sedentary, moving only 4-6 times per year. Eastern Taiga herders will often graze their animals in lower elevations near villages or in areas that are more accessible to tourists. The two distinct populations present an opportunity to compare dichotomous management strategies and their effects on productivity of the respective reindeer herds. Collection of demographics and production data of the two reindeer populations was conducted in August 2006 and in April 2008.

The reproductive rates (calves/adult females; calves counted ca 3 months after calving) of reindeer in ET camps (0.88) did not differ significantly from WT camps (0.80). Calf mortality was calculated as the number of calves dead (counted ca 3 months after calving) divided by the number of calves born alive during the 2006 season. There was no significant difference in calf mortality rates between the two camps, but predation accounted for 50% of reported calf deaths in WT camps (n=14) where as no predation was reported for ET camps (n=8). Milk yield was significantly higher ( $p \leq 0.001$ ) in ET females ( $243.1 \pm 14.5$  ml/animal-1) than in WT females ( $140.2 \pm 22.4$  ml/animal-1).

The recruitment rates (yearlings/adult females) were higher in WT camps for both 2006 and 2008 although no significant difference ( $p \leq 0.094$ ;  $p \leq 0.071$ ) was found. Body Condition Score (BCS) was significantly higher ( $p < 0.0001$ ) for ET adult females and calves ( $2.7 \pm 0.4$ ;  $3.1 \pm 0.8$ ) than adult females and calves of WT camps ( $1.6 \pm 0.6$ ;  $1.9 \pm 0.5$ ) during August 2006. In April 2008, BCS in WT camps for adult females ( $2.2 \pm 0.4$ ) was significantly higher ( $p < 0.0001$ ) than adult females of ET camps ( $1.8 \pm 0.3$ ). There was no difference in BCS score of yearlings between the two camps.

The reversal in BCS rank of adult females from 2006 to 2008 may be a result of increased energy demands due to longer migrations of nomadic herders in the WT. The absence of calf predation seen in ET may be a result of higher human density surrounding reindeer groups and the close proximity to villages. Although stocking density and the quality of grazing areas may be responsible for differences in demographics and production, animal husbandry practices such as intensive and prolonged milking and early weaning of calves may have influenced the energy balance of reindeer under the different management strategies.

**Session:** Reindeer Herding

J. DOLLIVER

**COASST Program Training**

*Jane Dolliver, University of Washington*

The University of Washington is expanding their COASST seabird monitoring program to the Bering Strait region! COASST volunteers collect data on beach-cast carcasses of marine birds to establish the baseline pattern of bird deposition on North Pacific beaches. Data collected helps address important marine conservation issues and protect marine resources. Reserve your training spot by calling COASST at 206-221-6893 or emailing [info@coast.org](mailto:info@coast.org).

**Session:** Workshop

L. DUFFY

**Alaska Basic Neuroscience Program**

*Lawrence Duffy, Department of Chemistry and Biochemistry University of Alaska Fairbanks*  
Contact e-mail: fflkd@uaf.edu

*Mary van Muelken, Department of Chemistry and Biochemistry University of Alaska Fairbanks*  
Contact e-mail: fyabnp@uaf.edu

The mission of the Alaska Basic Neuroscience Program (ABNP) is to expand, facilitate and stimulate neuroscience research and education in Alaska and the Arctic. Using interdisciplinary research methods, students and faculty study the basic mechanisms of behavioral, cellular and molecular aspects of diseases important to northern people. The ABNP manages the Specialized Neuroscience Research Program which is funded through the National Institute for Neurological Disorders and Stroke (NINDS) and the National Institute of Mental Health (NIMH) via the U54 Cooperative agreement funding mechanism. Research foci include: the mechanism neurological diseases related to health disparities (stroke, SIDS); neuroprotection strategies; environmental health; nutrition intervention; pre-natal nicotine exposure and development; nicotinic receptor modulation; drug design and development/subtype selective nAChR modulators; synaptic mechanisms of cholinergic neurotransmission; mechanisms of OCD and neuroinflammation, oxidative stress and neural plasticity. ABNP partners with the Fairbanks Economic Development Corporation, Fairbanks Memorial Hospital, South Central Foundation, Alaska Berry Growers Association and the School of Natural Resources and Agricultural Sciences. Academically, a neuroscience emphasis may be earned in Biochemistry and Molecular Biology or supported through an interdisciplinary degree. Courses and topics include neurochemistry, neurobiology, membrane biochemistry and biophysics.

**Session:** Poster

L. DUFFY

**Mining, Metals and Baseline Monitoring: The Environmental Health of Reindeer and Muskox**

*Lawrence K. Duffy, Department of Chemistry and Biochemistry, University of Alaska Fairbanks*

Contact e-mail: fllkd@uaf.edu

*Claudia Ihl, University of Alaska Fairbanks Northwest Campus*

Contact e-mail: ftci@uaf.edu

Reindeer and muskox are terrestrial herbivores used for commercial and subsistence food products. The bioavailability of metals can be impacted by mining development and metals such as mercury (Hg) need to be monitored to establish a baseline. Besides mining, the exposure of arctic herbivores is influenced by plant species composition, fire regime, melting and flooding events, and thus impacting Hg bioavailability in the food chain. Industrial development in Asia is also projected to increase the atmospheric global pool of Hg from increased coal combustion. Reindeer, a domesticated representative of caribou, and muskox can be used as terrestrial biomonitoring for metal exposure. In this study total mercury concentrations were measured in the hair of muskox and compared to reindeer on the Seward Peninsula, Alaska. Muskox showed lower THg levels in quivet than guard hair. THg quivet was mean THg 37.7 ng/g (n=2). The overall muskox THg mean for hair samples was 38.0 ng/g. THg in muskox hair samples from Deering tended to be lower than from Nome. The reindeer hair from St. Lawrence Islands and the Noyakuk Range had THg means close to that of the muskox. Reindeer herds had mean Hg hair levels of 14.6 ng g<sup>-1</sup> (Davis herd), 83.4 ng g<sup>-1</sup> (Gray herd) and 40.3 ng g<sup>-1</sup> (Noyakuk herd). Reindeer on St. Lawrence Island had an average of Hg of 43.0 ng g<sup>-1</sup>. The Hg levels observed in this study indicate that Hg levels in Seward Peninsula herbivores are low at this time and pose no risk to the health of muskox or human subsistence harvesters.

**Session:** Ecology and Wildlife

## C. EISCHENS

### **Plenary Session: The North Pacific Research Board and the Bering Sea Project**

*Carrie Eischens, North Pacific Research Board*

Contact e-mail: [carrie.eischens@nprb.org](mailto:carrie.eischens@nprb.org)

*Francis Wiese, North Pacific Research Board*

The North Pacific Research Board (NPRB) was created by Congress to develop and implement a meritorious science program focusing on the fisheries and marine ecosystems in the North Pacific, Bering Sea and Arctic Ocean. Specifically the Board was directed to address pressing fisheries management issues and to be responsive to marine ecosystem information needs. Since 2002, NPRB has invested over \$33 million dollars in 200 projects through an annual Request for Proposals (RFP) which solicits research projects focusing on a variety of topics including oceanography, lower trophic level productivity, fish and invertebrates, fish habitat, marine mammals, seabirds, humans, and other prominent issues such as marine disease, contaminants and climate change.

In addition to research projects funded through the annual RFP, NPRB also supports Integrated Ecosystem Research Programs (IERP) which are regionally integrated, large scale investigations into the structure and function of an ecosystem in order to understand how the various ecosystem components are influenced by each other, by natural variability and by human activities.

Through a partnership between NPRB and the National Science Foundation, the Bering Sea Program (also known as BEST-BSIERP) was launched in 2007 to investigate the eastern Bering Sea shelf ecosystem and how it may respond to climate change and loss of sea ice. This six year, \$52 million dollar study, involves over 90 federal, state, university and private institution scientists, many from Alaska, Washington, Oregon and British Columbia. This research program examines a wide range of issues in the Bering Sea – from atmospheric forcing and physical oceanography to commercial and subsistence fish and marine mammal species to human and communities – including the attendant economic and social impacts of a changing climate. NSF funded researchers are studying atmosphere, ocean physics and lower trophic levels, including physical and biological sampling around sea ice and on the ocean floor; primary production near sea ice; nutrients and stratification; and energy transfer through zooplankton. NPRB funded research emphasizes forage fish, commercial fish species such as pollock, Pacific cod, and arrowtooth flounder; as well as northern fur seals, walrus, whales, thick-billed murre and black-legged kittiwakes. Foraging patterns of marine mammals and seabirds are being studied in detail near the Pribilof, Bogoslof, and St. Lawrence Islands. Local and traditional knowledge research to understand how climate change is impacting coastal communities and to compare conceptual views of the ecosystem between traditional and natural science points of view is also taking place in Akutan, St. Paul, Togiak, Emmonak, Savoonga and on Nelson Island. An innovative ecosystem modeling activity ties the program components together and will allow a better understanding of how the ecosystem components of the Bering Sea shelf interact in a changing environment.

**Sessions:** Plenary

## M. ERICKSON

### **Renewable Energy Roundtable**

*Mitch Erickson, Nome Chamber of Commerce*

Contact e-mail: nomechamber2@gci.net

The Renewable Energy Roundtable is designed to be an opportunity for people and businesses that have installed renewable energy systems (solar, wind, etc) to discuss their own particular project, covering items such as; why did you choose this particular system, what was the decision making process, is it meeting your expectations, what would you do different, would you recommend the same product for other, etc. This will be an open discussion session.

### **PANEL MEMBERS**

*Rob Bensin, Bering Straits Native Corporation, Nome:* Has installed a 17 kW array of PV solar panels on the Bering Straits Building (Old Federal) in an effort to cut their electric energy costs

*Gary Hart, Nome:* Mr. Hart has installed a Southwest Windpower “Whisper 200” horizontal wind turbine for the sole purpose to provide thermal heating. He has also installed a “Heliodyne” flat panel solar hot water system for space heating, located on the South side of the home. Home has a fuel oil boiler, hot water baseboard heating system. First wind and solar combination project for thermal heating.

*Fred Sagoonick, Shaktoolik Native Corporation (SNC), Shaktookik:* SNC has installed two Southwest Windpower “Skystream 3.7” horizontal axis wind turbines to provide electricity for the store and corporate office. The turbines are rated at 1.9 kW continuous and 2.6 kW peak. The tower heights are 40’ and 80’. Excess energy is “net metered” back to the grid.

*Bering Straits Native Corporation & Sitnasuak Native Corporation:* The JV has installed 18 Entegriety EW 15 wind turbines this summer on corporate land. The turbines are rated at 50 kW that have the ability to produce 1 megawatt of wind energy that will be hooked to the Nome grid.

*Jim Adams:* Installed a Southwest Windpower “Skystream 3.7” to provide electricity for his home. Excess energy will be put back into the grid.

*Mitch Erickson:* Installed “Apricus” 60 tube evacuated tube solar hot water panels for home heating. Two 30 tube units are located on the East side of the house to take advantage of morning sun. System is hooked up to create both space heating and domestic hot water.

Other owners of renewable systems will also be allowed to participate as a panel member.

**Session:** Workshop, April 9

D. EVENSON

**Overview of Research Tools Used for the Management of Yukon River Chinook Salmon Fisheries**

*Dani Evenson, Alaska Department of Fish and Game Division of Commercial Fisheries*

Contact e-mail: dani.evenson@alaska.gov

This session will explore the challenges of Chinook salmon fisheries research and management in the Yukon River. The salmon fisheries of the Yukon River drainage are managed to achieve escapement goals and to provide for consumptive uses. Subsistence fishing opportunity has the highest priority. Due to the size and complexity of the drainage and the geographic distribution of its fisheries, management for individual stocks or populations is not possible. Salmon fisheries throughout the drainage harvest Canadian-bound stocks that are over a thousand miles from their spawning grounds. Management of the fisheries are complex due to the gauntlet nature of the fishery with harvest of multiple stocks occurring at different times and locations throughout length of the drainage. Allocation issues exist between lower-river and upper-river fishers in Alaska. Lastly, important allocation and conservation issues exist between the governments of U.S.-Alaska and Canada-Yukon Territory within the context of the Yukon River Annex of the Pacific Salmon Treaty. During the fishing season, management is based upon in-season run strength assessment information including: (1) abundance indices from test fishing, (2) sonar counts of fish passage, (3) escapement assessment, (4) commercial and subsistence catch data, (5) catch per effort data from monitored fisheries, and (6) genetic mixed stock analysis.

**Session:** Fisheries

## G. FINSTAD

### **Reindeer Herding on the Seward Peninsula**

*Greg Finstad, University of Alaska Fairbanks Reindeer Research Program*  
Contact e-mail: ffglf@uaf.edu

The people of Northwestern Alaska have had a long relationship with local *Rangifer* populations. Caribou were present on the Seward Peninsula and were harvested as a significant food source by the Inupiat for hundreds of years before the influx of Europeans. However, during the mid-1800's many whaling ships began to over-winter in protected areas such as Point Hope, Port Clarence and Golovnin Bay to avoid having to push through the pack ice to reach the Chukchi Sea and Arctic Ocean in spring. During the winter months the whalers traded with Natives, introduced firearms, and hired them to supply meat to inhabitants of the newly established settlements. The introduction of technology to increase the effectiveness of caribou harvest without corresponding harvesting regulations contributed to declining caribou numbers. In the late 1890's there were virtually no caribou to be found on the Seward Peninsula.

The apparent depletion of available subsistence resources caught the attention of Captain Michael Healy who suggested to Sheldon Jackson, commissioner of Education in Alaska, the introduction of domestic reindeer to Alaska from Russia. Swayed by intense lobbying by Jackson, Congress appropriated funds beginning in 1891 to purchase 1280 reindeer (*Rangifer tarandus tarandus*) from Russia for importation to Alaska.

Reindeer were introduced to provide a predictable and dependable food source, to generate revenue and provide for human cultural enrichment. Reindeer are domestic animals so they are amenable to human herding, so both numbers and grazing distribution can be manipulated. Through the early years the reindeer industry was unstable largely because management decisions were governed by politics and exploitation. Introduction of range management and modern techniques of animal husbandry to the Seward Peninsula reindeer industry during the 1970's and 80's led to a sustainable animal production system. Most herds were demonstrating excellent growth and velvet antler and meat production and prices were on the rise while reindeer producers were promoting the construction of slaughtering abattoirs and value added processing. Demand for both velvet antler and meat was greater than the herders could produce; the market was in place for an expanding industry.

However, during the 1990's the reindeer industry suffered a setback when over 75 % of the reindeer industry was lost. The Western Arctic Caribou herd changed its migratory patterns, over-running the reindeer ranges and decimating the herds. However, reindeer herders are now using science and technology to survive the caribou crisis and to rebuild the industry.

The reindeer industry in Alaska is changing rapidly as herders are adopting new technologies and altering management strategies in response to rapidly changing environmental and economic conditions. Although the present state of the industry is at a downturn, research and education applied through innovative and adaptive management will likely generate an upturn and may prove to be the critical component to reinvigorating the industry.

**Session:** Reindeer Herding

G. FINSTAD

**Meat-Cutting Workshop**

*Greg Finstad, University of Alaska Fairbanks Reindeer Research Program*  
Contact e-mail: [ffglf@uaf.edu](mailto:ffglf@uaf.edu)

Learn about cutting and cooking reindeer meat in this special workshop! You'll learn how to cut a reindeer carcass, which cuts to use for various reindeer dishes, and the best ways to cook the cuts. The workshop will cover how muscle is converted to meat, and some of the do's and don'ts of meat production. Learn how long to age and roast reindeer and moose meat, and some of the nutritional differences between the meat from these animals

**Session:** Workshop, April 9

R. FOSDICK

**Kawerak Reindeer Herders Association: Status of Reindeer Herds on the Seward Peninsula**

*Rose Fosdick, Kawerak Reindeer Herders Association*

Contact e-mail: rfosdick@kawerak.org

For over 100 years reindeer and reindeer herding have been a part of life for people of the Seward Peninsula. The herd owners have their own association and the members meet annually. During the annual meeting they select officers, stay informed on the latest in reindeer husbandry, listen to reports on reindeer research results, make decisions, hear each other report on their own efforts. This presentation contains a brief history, current practices and an update on current issues and an estimate of the population of reindeer on the Seward Peninsula.

**Session:** Reindeer Herding

R. FREDERICKSEN

**Fundamentals of Mining**

*Rick Fredericksen, Alaska Department of Natural Resources, Division of Mining, Land, and Water*  
Contact e-mail: rick.fredericksen@alaska.gov

This presentation will provide an overview of mining fundamentals and discuss the mining “life cycle” which extends from initial grass roots exploration through progressively advanced exploration, resource and reserve delineation, development, operation and closure. Acquisition of mineral rights (e.g., claim staking), economic considerations, types of mining, and mineral processing will be discussed. Current Alaska mines will be used as examples of modern mining practices.

**Session:** Mining

R. GAL

**Archaeological Investigations at Iyat (Serpentine Hot Springs), Seward Peninsula**

*Robert Gal , U.S. National Park Service*

Contact e-mail: bob\_gal@nps.gov

*Jeanne Schaaf, U.S. National Park Service*

*Steven L. Klingler, U.S. National Park Service*

Iyat (Serpentine Hot Springs) is located within the Bering Land Bridge National Preserve and is a 'cultural landscape' listed on the National Register of Historic Places. Burch describes a variety of nonempirical phenomena that significantly influenced Arctic Alaska Eskimo use of the landscape. Oral history and stories indicate that within the past two centuries, the use of Iyat was constrained by nonempirical phenomena or by its status as a 'demilitarized zone' at the nexus of several societal boundaries. NPS archaeological surveys of the Iyat area suggest that use of the Iyat area may have been influenced by the area's special characteristics for several millennia.

**Session:** Anthropology and Social Sciences

M. GOLUB

**An Introduction to the Rural Electric Vehicle Utilization Project (RevUp)**

*Michael Golub, Small Business Founder, Partner with UAF-Bristol Bay Campus*  
Contact e-mail: fourak@gmail.com

Rural Electric Vehicle Utilization Project (RevUp) proposes to sell electric vehicles that have been converted in a hands-on workshops at rural campuses to local residents desiring affordable, energy-efficient transportation. RevUp is a nonprofit business that converts non-running vehicles in good condition for sale in rural Alaska communities with limited road networks.

RevUp collaborates with the university, which provides community-based facilities and instructional support to conduct courses on the conversion and maintenance of electric vehicles. At the end of each course, RevUp sells the converted electric vehicle to a member of the community who understands the many advantages of this product.

There are several advantages to electric vehicle conversion: (1) It diverts old vehicles in good condition from becoming abandoned eyesores. Old cars have potential to contaminate ground water with hazardous waste. (2) It increases the efficiency and lifespan of existing vehicles. Electric vehicles are simple to maintain because they have very few parts. Parts that do not exist include: engine, fuel tank, muffler, cat, fuel pump, oil pump, radiator, thermostat, alternator, and starter. (3) It reduces community reliance on fossil energy. Although the source of electricity is generated from a power plant using imported diesel, electric cars provide an incentive to utilize electricity produced locally from the sun or wind rather than rely on expensive fuel from outside the community. (4) It decreases motorcar fuel redundancy. An electric car's motor does not require engine preheating; it uses the same amount of power to recharge its batteries, so there is no waste. As the charging does not require attention, it takes a few seconds for an owner to plug in and unplug their vehicle. Many electric car drivers prefer recharging at home, avoiding the inconvenience of visiting a fuel station, which exposes them to carcinogenic benzene.

Michael Golub has fabricated seven electric vehicles in the last few years. One vehicle, a 1986 Toyota pickup truck, has been driven more 7,000 miles year-round without any running or maintenance issues. Other vehicles converted successfully include a snowmobile and a ride-on lawnmower. The range of electric cars depends on the number and type of batteries used, and the performance demands of the driver. Batteries in electric cars must be periodically recharged.

Electric vehicles show a minor reduction in greenhouse gases (GHG) when compared with gasoline cars, even when burning mixture of coal and petroleum products to generate electricity. However, when the source of electricity is renewable there are no emissions. Two recent vehicles, the 1990 Subaru Wagon in Dillingham and the 2004 Arctic Cat F7 contain LiFePO<sub>4</sub> batteries. These batteries promise up to 3,000 cycles and contain a small amount of Lithium. They also do not use Lead Acid Batteries that suffer from cold weather performance and poor lifecycle.

**Session:** Energy/Small Business

L. GOUGH

**The Regional Geochemistry of Soils and Willow in a Metamorphic Bedrock Terrain and Its Possible Impact on Moose in the Seward Peninsula**

*L. Gough, U.S. Geological Survey*

Contact e-mail: lgough@usgs.gov

*P. Lamothe, U.S. Geological Survey*

*R. Sanzolone, U.S. Geological Survey*

*L. Drew, U.S. Geological Survey*

Contact e-mail: lgough@usgs.gov

*J. Maier, University of Alaska Fairbanks*

Contact e-mail: ftjak@uaf.edu

In 2005 we sampled willow leaves (mostly *Salix pulchra*) and A-, B-, and C-horizon soils at 10 locations along a transect near the Quarry prospect and 11 locations along a transect near the Big Hurrah mine for the purpose of defining both the spatial element variability and the regional geochemistry of willow and soil over Paleozoic metamorphic rocks potentially high in Cd. Willow, a favorite browse of moose, has been shown by various investigators to bioaccumulate Cd. Moose in this region show clinical signs of teeth wear and breakage, are declining in population for unknown reasons, and a trace element imbalance in their diet has been proposed as a possible cause. Cadmium, in high enough concentrations, is one dietary trace element that potentially could produce such symptoms.

We report both the trace element summary statistics for willow and soils as well as the results of an unbalanced, one-way, hierarchical ANOVA (general linear model, GLM) which was constructed to measure the geochemical variability in willow (and soil) at various distance scales across the Paleozoic geologic unit high in bioavailable Cd. The two locations were separated by approximately 80 km, sites within a location were approximately 0.5 km apart, and duplicate soil samples within a site were separated by 0.05 km or slightly less. Results of the GLM are element specific and vary from having very little regional variability to having most of their variance at the top (greater than 80 km) level. For willow, a significant proportion of the total variance occurred at the “between locations” level for: ash yield, Ba, Cd, Ca, Co, Ni, and Zn. For soils, all three soil horizons were similar in that most of the variability in the geochemical data occurred at both the “between locations” and the “among sites at a location” GLM levels.

Cadmium in soils showed most of its variation among sites (separated by 0.5 km) at each location across all soil horizons and not between the two locations. When one looks at Cd distribution across the landscape this becomes apparent and may be due to variation in soil mineralogy, especially the amount of graphite in soil which has been associated with Cd. Although sampled on the same geologic unit, the geochemistry of soils was demonstrated to be uniform with depth but highly variable between locations separated by 80 km. This exploratory study establishes the presence of elevated levels of Cd in willow growing over Paleozoic bedrock and further work is needed to definitively link these high levels of Cd to the health of moose.

**Session:** Ecology and Wildlife

J. GROVES

**Developing High Voltage Direct Current Transmission Technology for Rural Alaska: Status and Applications**

*Joel D. Groves, PE, Project Manager, Polarconsult Alaska, Inc.*

Contact e-mail: joel@polarconsult.net

The isolation and small size of Alaska villages make affordable power generation difficult. Diesel-electric plants have been the preferred solution, but soaring energy and transportation costs are now devastating the economies and long term viability of many villages.

High Voltage Direct Current (HVDC) transmission utilizing single-wire earth return (SWER) presents an opportunity to dramatically reduce the costs of rural interties compared to conventional three- or four-wire alternating-current (AC) ties.

This old concept coupled with new technology has the potential to revolutionize energy in rural Alaska by dramatically lowering the cost of transmission, enabling communities to connect together and achieve the economies of scale necessary to make many renewable and local energy resources affordable to develop. It will also enable these communities to reach out farther to nearby hydro, geothermal, and wind sites, reducing their dependence on diesel fuel.

With funding from the Denali Commission, Polarconsult Alaska, Inc. has partnered with Alaska Village Electric Cooperative, Inc. to assess the feasibility and develop preliminary designs for HVDC SWER systems scaled and optimized to the needs of rural Alaska transmission. The proposed system is optimized to the technical and logistical constraints of rural Alaska.

The presentation will discuss current project status, future efforts, technical functionality of the proposed HVDC SWER system, possible applications of the technology in Alaska, existing HVDC and SWER installations around the world, and the promise and implications of this breakthrough technology for rural energy in Alaska.

**Session:** Energy/Small Business

M. HENRY

### **Reintroduction of Reindeer to the Seward Peninsula**

*Merlin Henry, Reindeer Herders Association, Kawerak Inc.*

*Greg Finstad, Reindeer Research Program, University of Alaska Fairbanks*

Contact e-mail: ffglf@uaf.edu

*George Aguiar, Reindeer Research Program, University of Alaska Fairbanks*

Contact e-mail: fsgaa@uaf.edu

Many Seward Peninsula reindeer herders have lost their herds due to changing migratory patterns of the Western Arctic Caribou Herd. Some wish to re-establish their herds but, the possibility of caribou returning to their rangelands calls for increased control of their animals. Use of enclosures and supplemental feeding has been suggested as a way to periodically control animal movements or sequestering them from migratory caribou. Free-ranging reindeer would be moved into the enclosure when caribou move into the area and fed a supplemental ration if to be held for an extended time.

In January of 2006 a reindeer herder of Koyuk, AK acquired one adult female, 9 female calves and one male calf from an active herder. The reindeer were transported to the vacant Koyuk range by aircraft and released into the enclosure where they were fed a formulated conversion pellet. The pellet, produced at the University of Alaska Fairbanks, was composed of 45% barley, 45% brome hay and 10% lichen.

All animals were consuming pellets by the third day with no apparent metabolic difficulties. They quickly socialized to humans and habituated to intensive husbandry practices. The animals developed strong site fidelity and remained in the general area when released for grazing. The animals were allowed to freely graze during summer and early fall after which they were placed back in the enclosure. The adult animal left the area during summer and never returned after being chased by a bear. The animals were then fed a balanced diet made up predominately of barley and brome hay which they consumed at a rate of 1.7 kg animal<sup>-1</sup> day<sup>-1</sup>. The females were weighed in October (17 mo. of age) and were significantly ( $p < .01$ ) heavier ( $77.9 \pm 1.9$  kg) than females ( $63.3 \pm 1.7$  kg) of the same age from the Agricultural and Forestry Experiment Station, University of Alaska Fairbanks.

The reindeer will be managed primarily in a free ranging system but the enclosure will be used on a need basis to house reindeer in a controlled environment to avoid commingling with caribou. Data also suggests the body condition of the animals is greatly increased with a strategy of free grazing and supplemental feeding.

**Session:** Reindeer Herding

H. HERTER

### **Alaska King Crab Restoration and Rehabilitation**

*Ben Daly, Alaska Sea Grant*

*Heidi Herter, Alaska Sea Grant Marine Advisory Program, UAF School of Fisheries and Ocean Sciences*

Contact e-mail: [heidi.herter@uaf.edu](mailto:heidi.herter@uaf.edu)

The Alaska King Crab Research and Rehabilitation and Biology (AKCRRAB) Program was created in 2006 as a partnership among the University of Alaska Fairbanks, Alaska Sea Grant, the Alutiiq Pride Shellfish Hatchery (APSH), NOAA Fisheries, and several community-based groups to begin the necessary research to assess the feasibility of stock enhancement for king crabs in Alaska.

Commercial harvest of Alaska king crab was for decades active and lucrative. However, many stocks declined drastically more than 20 years ago and have not rebounded, even in the absence of fishing. Work is being done to study the early life history of red and blue king crab species to develop methods and determine feasibility of hatchery rearing.

In April of 2008, 12 ovigerous (egg bearing) female blue king crabs were collected from Little Diomedes, Alaska for rearing in the Alutiiq Pride Shellfish Hatchery in Seward, Alaska. The AKCRRAB project currently has two primary phases for crab larvae. The first phase focuses on hatchery scale cultivation of red and blue king crab larvae and evaluates effects of stocking density, diet, and other water parameters on growth and survival. The second phase focuses on hatchery scale cultivation of juvenile red and blue king crab and evaluates effects of stocking density, diet, substrate type, and other culturing parameters.

In March of 2009, 800 nine-month-old juvenile blue king crabs from Little Diomedes were sent from the Alutiiq Pride Shellfish Hatchery in Seward to the University of Alaska Southeast (UAS) in Juneau for further research led by Dr. Sherry Tamone of UAS and Dr. Ginny Eckert of the University of Alaska Fairbanks School of Fisheries and Ocean Sciences, Juneau Center.

**Session:** Fisheries

H. HERTER

**Workshop: Applied Fisheries and Marine Research in the Bering Strait**

*Heidi Herter, Alaska Sea Grant Marine Advisory Program, UAF School of Fisheries and Ocean Sciences*

Contact e-mail: heidi.herter@uaf.edu

The goal of the workshop is to increase applied fisheries and marine research in the Bering Strait region through identification of regional research priorities and improved interagency collaboration. The Bering Strait is a large, dynamic, sparsely populated region, with a culturally and commercially important fisheries/marine ecosystem facing a changing climate. While our region is ecologically rich with largely intact habitat, we are challenged by a lack of baseline information and few people to cover a large area. The WAISC applied fisheries and marine research workshop is designed to build upon current regional knowledge and projects in fisheries, watershed monitoring, and subsistence and include all researchers, marine resource users, agencies, and other organizations working in fisheries and marine research.

There are two objectives for this workshop:

- 1) Build a fisheries/marine science network in the Bering Strait to across agencies, urban/rural, nearshore/marine, user-groups, etc. for future collaborations.
- 2) A written summary of regional priorities for fisheries research for important fished species.

**Session:** Workshop, April 7

C. IHL

**Muskox Hunting Traditions and Practices Across the Arctic**

*Claudia Ihl, University of Alaska Fairbanks Northwest Campus*

Contact e-mail: [ftci@uaf.edu](mailto:ftci@uaf.edu)

I will present ideas and preliminary findings of a new project on the subsistence use of muskoxen and the status of muskoxen in Native tradition and hunting lore in northwestern Alaska and across the Arctic. In northern and western Alaska we have currently a unique opportunity to document the newly emerging traditions among Native people regarding the ecology, hunting and use of muskoxen. This project aims to compare these emerging traditions to existing traditions in areas of the Arctic that have a more continuous record of muskox hunting reaching back decades, and to ancient, now extinct muskox hunting practices documented in archaeological records and/or Native stories or legends. I will propose a research project documenting and comparing these traditions that involves the cooperation of Native hunters and villages from the very beginning.

**Session:** Ecology and Wildlife

B. JACKSON

**Vertical Wind Energy – Is it an Option for Reducing Residential Home Energy Costs?**

*Brian Jackson, Western Community Energy in Partnership with NSEDC*

Contact e-mail: [bjackson@westerncommunityenergy.com](mailto:bjackson@westerncommunityenergy.com)

This is an experimental project funded by Norton Sound Economic Development Corporation (NSEDC): The goal of this project is to see if wind energy can be a cost effective method of providing thermal heat as well as electricity to a residential location. Two 10 kW vertical axis wind turbines will be installed at two test sites, the King Island Native Community building in Nome and the Unalakleet Native Corporation building in Unalakleet. The vertical turbines do not need a large tower like the horizontal axis turbines. If proven effective, can the turbines be reduced in kW capacity and still provide the same benefits? If so, they can be attached to each household in the region. This is cutting edge technology being funded by NSEDC.

**Session:** Energy/Small Business

W. JONES

**Norton Sound Fisheries Research and Development Marine Research Projects**

*Wesley W. Jones, Fisheries Research & Development, NSEDC*  
Contact e-mail: wes@nsedc.com

Norton Sound Fisheries Research and Development is a department of Norton Sound Economic Development Corporation. Since 2005 NSFR&D has been active conducting cooperative fisheries surveys in the Northern Bering Sea/Bering Straits area and Norton Sound. Work includes trawl, pot and camera sled surveys. Information collected is being used for many purposes including identifying commercially important species, identifying habitat to be protected and monitor important subsistence species.

Main subjects to be covered are the expansion of the Triennial Norton Sound Red King Crab Surveys, Northern Bering Sea Trawl Survey, St Lawrence Island Camera Sled Survey and new species within the region.

**Session:** Fisheries

K. KEITH

**Fisheries Research at NSEDC**

*Kevin Keith, Norton Sound Economic Development Corporation*  
Contact e-mail: kevin@nsedc.com

The Norton Sound Economic Development Corporation (NSEDC) is doing more fisheries research than any other non-governmental entity in the Norton Sound region. This talk will be an overview of NSEDC and our various fisheries projects. Much of our research is focused on salmon studies and increasing opportunities for salmon harvest. Our salmon work includes enumeration projects on various rivers (3 weirs, 1 counting tower and 1 sonar counting site), studies of juvenile Coho salmon, fertilization of Salmon Lake, and a mist incubation/eyed egg planting project. We have been fertilizing Salmon Lake and studying the results since 1997 in an effort to increase the Sockeye salmon run on the Pilgrim River. We have had successful returns of salmon planted as eyed eggs in Hastings Creek, and have expanded this project to plantings on Anvil Creek, Nome River, Snake River, and Solomon River. Outside of our salmon research, we do Red King Crab tagging, herring surveys, trawl surveys, and camera sled work. We also recently initiated a Clean Water Project that focuses on removing debris from the beaches of the communities in the region. In this overview, we will be presenting background on each of these projects, some results, and some directions for our future research.

**Session:** Fisheries

S. KENT

### **Norton Sound Subdistricts 5 & 6 Chinook Salmon Stock Status and Assessment**

*Scott Kent , Alaska Department of Fish and Game Division of Commercial Fisheries*

Contact e-mail: scott.kent@alaska.gov

Historically, Shaktoolik and Unalakleet area residents have relied heavily on Chinook salmon for subsistence purposes. Until 2000, runs of Chinook also contributed heavily to small-scale commercial salmon fisheries which are the foundation of cash economies in the area. Shaktoolik (Subdistrict 5) and Unalakleet (Subdistrict 6) Subdistricts salmon stocks are managed as one unit based on data collected from stock assessment projects in the Unalakleet River drainage. Since 2000, ADF&G (the department) has had difficulties meeting escapement goals despite an almost complete cessation in commercial fishing, and the implementation of severe restrictions to subsistence and sport fisheries. As a consequence, Subdistricts 5 & 6 Chinook salmon were designated a stock of yield concern by the Alaska Board of Fisheries in 2004 and the BOF continued this designation in 2007. Precipitous declines in estimated escapements and harvests despite specific measures aimed at conserving Chinook salmon have raised concerns about the current productivity capacity of these stocks. Exact causes for the declines are unknown, but available age data shows a trend toward fewer older and hence larger Chinook salmon being caught in the department's test fishery since 2000. Continued removal of the larger, and more fecund females could limit a stock's ability to rebuild itself to historical levels of abundance. However, previously collected age, sex, and length data may contain inaccuracies due to mesh-selectivity and site biases. Furthermore, drainage-wide escapement estimates are based on only 2 years of radiotelemetry data collected a decade ago. This presentation provides a brief synopsis of 1) current inseason management strategies; 2) ongoing projects and people involved in obtaining baseline biological information from Subdistricts 5 & 6 Chinook salmon; and 3) recommendations for future research and/or stock assessment projects that will resolve issues with data uncertainty and provide more reliable estimates of abundance and unbiased age class information, particularly from the spawning escapement.

**Session:** Fisheries

M. KLINK

**Corporate Social Responsibility and Community Stakeholders: Lessons from Northern Norway**

*Matthew Klick, Institute of Social and Economic Research\**

Contact e-mail: matthew.klick@gmail.com

This project uses stakeholder evidence from semi-structured interviews to answer the following research question: How effective was a “socially responsible” approach to industrial development in a new, Arctic host community? Specifically, this project analyzes the outcomes of StatoilHydro “corporate social responsibility” (CSR) initiatives in Hammerfest, Norway, where the Snøhvit (Snow White) natural gas project began production in 2007. By identifying key, local stakeholders and qualitatively observing pareto-improving trades between stakeholders and industry, it is observed that CSR initiatives resulted in a broader accounting of social costs and benefits. Arctic countries are increasingly developing petroleum and other natural resources for export. Small communities are therefore increasingly playing host to large energy projects with the potential for dramatic cultural, social, environmental, and economic upheaval, but also economic growth and increased human capital. The importance of this study for rural communities in Western Alaska, and throughout the Arctic for that matter, is how the needs, desires, and potential costs to local stakeholders were better accounted for by industry, and resulted in a more mutually beneficial outcome than a status quo in which a progressive CSR policy was not implemented. Separately, this project demonstrates that CSR was a cost-effective investment for industry as well. An important addendum, however, is that some stakeholders – the Native Sámi reindeer herders in this case study - continued to be marginalized in the stakeholder-industry dialogue, and therefore their situation remains unsatisfactory. This also has important implications for Alaska communities facing future hard rock mining, oil and gas, or other resource-extraction industries and corporations.

\*This is the result of work completed over two years as an MS student in Economics at UAF, independent of ISER. I currently work at ISER.

**Session:** Energy/Small Business

A. KLISKEY

**Climate Change and the people of North West Alaska**

*Andrew (Anaru) Kliskey, Resilience & Adaptive Management Group, UAA*  
Contact e-mail: afadk@uaa.alaska.edu

Alaska has been referred to as the “canary in the mine” with respect to the effects of climate change on earth. The effects of recent warming around the globe are not uniform with warming in the average air temperature particularly pronounced in Alaska. The effects of this warming pattern have distinct consequences for the climate, hydrology, ecology, and soils of North West Alaska yet some of the most pronounced changes and effects are those affecting the people living in North West Alaska. Contending and responding to change is not new to people in North West Alaska where communities have a long-standing tradition of adapting to past climatic and social changes.

For the past five years our interdisciplinary group of University of Alaska researchers has been talking with people in Seward Peninsula communities to understand the intersections between humans, hydrology, and climate change. I will reflect on some of the key changes affecting people of North West Alaska based on the experiences they have conveyed to us and our own observations while working on Seward Peninsula. I will also examine the role of adaptation in different communities’ responses to climate change and consider these adaptive responses in the context of other affected communities around the globe.

**Session:** Plenary

L. LANG

## **Beaver Creek National Wild River: Economic Valuation of Recreational Activities**

*Lumir Lang, University of Alaska Fairbanks*  
lumirlang@hotmail.com

### *Problem Statement:*

This research examines Beaver Creek National Wild River (NWR) of Interior Alaska.

Recreational activities are in focus of the economic valuation. Benefit Transfer Method is used in the theoretical estimation section using database of studies concerning values of recreational activities in USA. Survey, conducted in summer of 2008, is used to examine the recreational activities at Beaver Creek NWR in the field part of the research. Upon conclusion of the present values of the recreational activities, scenarios a developed to comprehend the future values of recreational activities of Beaver Creek NWR.

### *Objectives:*

Beaver Creek NWR offers unique recreational opportunities. Primitive, remote and solitary recreational activities are the main characteristics of the float at Beaver Creek NWR. The research examines the primary activities (non-motorized boating, hunting, hiking, wildlife viewing, camping and fishing) with respect to their economic value based on the maximum Willingness to Pay (WTP) standards. Due to the possible development of the adjacent area for oil exploration/extraction, the research offers scenarios of possible future welfare change in the quality and quantity of the recreational experience at Beaver Creek NWR.

### *Data and Methods:*

1) Benefit Transfer Method using database of Loomis (2005, <http://www.fs.fed.us/pnw/data/RecValues.htm>) is used to measure the WTP welfare measures of recreational activities of Beaver Creek NWR. Function transfer based on the Meta-analysis function is developed using SAS 9.1 ordinary least square regression model.

2) Survey was implemented during the summer of 2008 (from August 1st to September 30th) at selected locations, where the users of Beaver Creek NWR are frequently present. Thirty two filled out surveys were collected and analyzed to obtain the characteristics of the users of Beaver Creek NWR and to estimate the welfare measure of the maximum WTP for the recreational activities.

### *Results:*

The maximum WTP levels based on the Meta-Analysis Regression for recreational activities per user/day of Beaver Creek NWR lie between \$124.14 and \$152.62 (95% confidence interval, 2008 dollars). The survey results indicate comparable maximum WTP levels for recreational activities per user/day to be in \$124.99 to \$153.25 value range (2008 dollars). The survey detected many genuine information and socio-economic characteristics of the users of Beaver Creek NWR. Developed scenarios of the future welfare change project that the quality of the recreational experience may be impaired together with the significant increase of the volume of users at Beaver Creek NWR.

*Keywords:* Benefit Transfer, Survey, National Wild River, Interior Alaska.

**Session:** Watershed

J. LEWIS

**Successful aging through the eyes of Alaska Natives: The Health and Wellbeing of Alaska Native Elders in Bristol Bay**

*Jordan P. Lewis, University of Alaska Fairbanks, Resilience & Adaptation Program, Department of Psychology*

Contact e-mail: j.lewis@uaf.edu

How do Alaska Native elders subjectively define successful aging? A qualitative, exploratory research design was utilized with Grounded Theory to gather data from Alaska Native elders in select Bristol Bay communities. This study does not rely on experimentation, but rather careful observation and description of phenomenon through face-to-face interviews. Data was collected through the use of the Cultural Consensus Model (CCM), which assumes that cultural knowledge is shared and systematically distributed.

30 in-person interviews with Alaska Native elders living in one of six villages throughout the Bristol Bay region (Dillingham, Manokotak, Perryville, Nondalton, Naknek, Togiak). Each interview averaged between 40 to 60 minutes and focused on the elders experiences of growing older in rural communities in Bristol Bay and what they believe is required to age successfully in their own community.

Alaska Native elders are critical to the social and cultural values of villages. There is very little research on Alaska Native elders and how they subjectively define a successful older age. The lack of a minority definition risks using a generic definition and portraying them as aging less successful than their non-minority counterparts. This research explores the concept of successful aging from an Alaska Native perspective and what it means to age well in Alaska. The Cultural Consensus Model (CCM) was used to gain a sense of the cultural beliefs about aging from Alaska Native elders. Research findings indicate that a set of cultural beliefs exist about successful aging, health status is related to successful aging, passing down knowledge is critical to becoming an elder, and aging successfully is based on personal responsibility and cognitions. The findings also indicate that poor aging focuses on not being active, not being able to handle alcohol, and giving up on oneself. Most elders stated that reaching a certain age (e.g. 65) does not determine their status as an elder, but rather the wisdom and experiences they gain throughout life.

**Session:** Public Health

K. MAHER

### **Valuing Non-Timber Forest Product Resources**

*Kimberley Maher, IGERT University of Alaska Fairbanks*  
Contact e-mail: [fskam@uaf.edu](mailto:fskam@uaf.edu)

Non-timber forest products (NTFPs) are resources such as berries, mushrooms, firewood, and birch bark that are gathered from the landscape throughout Alaska. NTFPs are harvested for subsistence, cultural, personal, and commercial purposes. Similar types of resources such as fish and game have an established management system with licensing and permits whereas NTFPs in Alaska just recently begun receiving management attention. Elsewhere NTFP management is far more regulated, such as Washington State where permits are needed for activities such as transporting commercially harvested huckleberries.

Because of different uses and motivations for participating in NTFPs harvesting activities, no single valuation system can capture the whole picture. This talk will examine current methods of documenting value of NTFPs using examples from on-going interdisciplinary research in Interior Alaska which can then be extended to other areas of Alaska. A non-market economic analysis is currently underway using data from a 2003 resource user survey. This analysis demonstrates that one-third of households in Alaska's Tanana Valley picked wild blueberries and one-quarter of households harvested firewood for personal or subsistence use during 2003. While quantifying NTFP harvest can describe part of what harvesting is taking place, it does not capture the whole story. In addition to the non-market economic analysis, qualitative interviews will be conducted to better capture people's motivations for harvesting NTFPs and the value that these resources contribute to people's lifestyles. Through these methods, resource managers will have more information to consider when deciding to develop and implement new management systems for NTFPs.

**Session:** Ecology and Wildlife

## C. MCLAUGHLIN

### **The Development of High Penetration Wind/Diesel Systems to Address Growing Demand from Isolated Village Communities**

*Carrie McLaughlin, Northern Power Systems*

Contact e-mail: cmcLaughlin@northernpower.com

The use of hybrid power generation systems for small, remote villages utilizing wind turbines and diesel engines has been studied extensively for years, but until recently the economics and cost of energy for these systems has limited their practical implementation. Today, with an energy and social crisis hovering over all communities in Alaska, interest in wind-diesel power systems is re-emerging in earnest. In fact, the high price of oil is fueling strong interest in high-penetration wind-diesel solutions, where the wind turbines installed in these remote grids can provide a large percentage, in some cases up to 100%, of the required power versus the traditional low penetration system that have been prevalent to date. This significantly reduces the amount of diesel fuel that must be purchased, transported and stored in these isolated communities.

However, high penetration wind-diesel system design brings its own set of technical challenges. These include system frequency and voltage regulation and reactive power support when the system is running on wind power with the diesel engines shut down. In the past wind-diesel systems have required significant custom engineering for each site, including thermal systems to use excess wind energy and to maintain diesel plant heating loops. The valued use of excess wind energy is often a key component in making the economics of a high-penetration project work. Operating and maintaining technically sophisticated power systems in remote villages with limited local technical talent also presents challenges.

This paper will study the market needs and specific technical challenges of high penetration wind-diesel system design for remote, isolated grids and offer real solutions to address those challenges. It will highlight recent technology developments in the areas of power conversion, system control, and short-term energy storage that are particularly applicable to high penetration hybrid systems. This paper will show the results of several wind diesel penetration systems in AK and what their performance has been to date. Northern Power Systems has long been a leader in the development of renewable energy solutions for remote regions and harsh environments. The company has conducted numerous feasibility studies of remote wind-diesel systems and has installed a number of these power systems in some of the world's most desolate locations.

**Session:** Energy/Small Business

## C. MIDDLECAMP

### **Uranium and U**

*Cathy Middlecamp, Department of Chemistry, Integrated Liberal Studies Program, University of Wisconsin-Madison*

Contact e-mail: [chmiddle@wisc.edu](mailto:chmiddle@wisc.edu)

Uranium is a radioactive element found widely dispersed on our planet. Few elements have shaped – and continue to shape – human history as much as uranium has. For example, uranium has been mined for several different purposes, each of which has had interesting consequences and/or outcomes. The process of extracting uranium ore from the earth and refining it was (and continues to be) controversial, having adversely affected both the miners and the land. And today, as a fuel for nuclear reactors, uranium is part the debate on energy production and sustainable development. This talk will explore some of the different connections between uranium and communities of people.

**Session:** Public Health

F. MURRAY

**Issues for the Tubutuluk River Watershed**

*Frederick Murray, Elim IRA*

Contact e-mail: buster\_murray@yahoo.com

My comments are about mining, freshwater quality and watersheds, and public health. In the spirit of the theme, my vote (hands down) would go to geothermal energy. Despite its cost, geothermal technology would be the best way to go. It is the most steady source, also the cleanest. As for mining, and its benefits, for gold, this activity has been ongoing, for a while now, and maybe some new minerals may be explored soon. Uranium is the mineral I would want everyone to study up on. Despite its potential in the area, to me there is no real benefit from this mineral. Other than a small amount of energy that is derived from Boulder Creek exploration, the contamination, and the cost of its maintenance will be very high. The contamination effects last several lifetimes. Many types of cancer evolve. The effects of this mining activity is widespread, the land, water, and air is affected for a very long time. I think each community needs to study the pros and cons of development in all areas of their abilities, I mean like mineral exploration, energy study alternatives, and start up new fish hatcheries for a renewable resource. Thank you.

**Session:** Watershed

J. OMELAK

### **Alterity, Anthropology, and Cognitive Imperialism**

*Jack Omelak, University of Alaska Fairbanks graduate student; Kawerak Inc. Natural Resources-Subsistence Program*

Contact e-mail: jomelak@kawerak.org

Recently, interdisciplinary studies have sought to create a more holistic understanding of ecosystems by incorporating local perspectives. Many funding agencies, striving to produce more accurate results, or simply collect baseline data, have begun to study the social and economic processes of indigenous groups, as well as attempting to incorporate local ecological knowledge into resource management strategies.

Unfortunately, research, especially within ethnographic fieldwork, creates a defined sphere in which individuals interact and attempt to communicate and provide information. While post-modern American anthropology has sought to further understand the processes and effects of communication, the discipline could benefit greatly by attempting to understand the similarities of cultural processes employed by individuals and groups as well as the effects of generalized tendencies within exchanges between researchers and local experts.

The presentation will focus on the historical power relationships as well as some of the fundamental social paradigms that continue to influence and shape spheres of interaction between researchers and their informants.

What reflexive processes occur during researcher-informant exchanges, and how have the effects of power relationships shaped the understandings of historically underrepresented groups?

There are many processes which affect communication and the creation and transmission of knowledge. Historic power relationships, the effects of colonialism, and the social conditions of underrepresented groups continue to shape and define interactions between researchers and the “others” they study. Further investigation is needed into understanding the repercussions when worldviews are used to further western academic paradigms and the values that underlie them. Even more crucial in objective information gathering is continuing to work towards understandings of separating worldview from paradigm when the two have become indistinguishable.

**Session:** Anthropology and Social Sciences

O. ORMSETH

**The Arctic Fishery Management Plan**

*Dr. Olav Ormseth, Alaska Fisheries Science Center, National Marine Fisheries Service*

Contact e-mail: [olav.ormseth@noaa.gov](mailto:olav.ormseth@noaa.gov)

In February 2009, the North Pacific Fishery Management Council adopted a new fishery management plan for federal waters of Alaska waters north of Bering Strait. The plan closes this entire area to commercial fishing, and outlines the steps required to develop new fisheries. There were two main challenges in creating this document: 1) the lack of reliable data regarding the abundance, distribution, and life history characteristics of Arctic fish and invertebrate species; and 2) the construction of a fishery management plan for an area where no commercial fishery currently exists, which created some interesting legal difficulties. I will review the main points of the plan and the data that were used to support it, and discuss the implications for the development of Arctic fisheries.

**Session:** Fisheries

D. PARKER

**Glacial Lake Sockeye Salmon Restoration Project**

*David G. Parker, United States Department of the Interior, Bureau of Land Management, Fairbanks, Central Yukon Field Office*

Contact e-mail: dave\_parker@ak.blm.gov

One goal of the Glacial Lake/Salmon Lake sockeye salmon (*Oncorhynchus nerka*) cooperative restoration project was to describe the sockeye run at Glacial Lake, 25 miles Northwest of Nome. From 2000 to 2005, the Bureau of Land Management documented adult abundance and run timing at the alpine lake, and from 2003 to 2005, smolt outmigration timing and strength were also recorded. The weir count data have been used to ground truth ADF&G aerial escapement estimates. Adults were sampled for age-sex-length data, and fin clips were collected for genetic analysis. Smolt were sampled for age, length, and weight data. In 2005, the sockeye spawning grounds in the lake were mapped with GPS. Additional field work included collection of zooplankton, streamflow, and other hydrographic and limnological data. Initially, funding was provided by the Norton Sound Salmon Disaster Initiative for enforcement of anti-snagging regulations on the Sinuk River during the peak of the sockeye return. Public relations work was undertaken to inform the local community about the restoration and enforcement effort through radio and newspaper ads, and annual updates to a kiosk display at the Sinuk River Bridge. Sockeye outmigration begins with few Age 3 smolt outmigrating first after lake surface water temperatures warm to 10° C, followed by the dominant Age 2 fish outmigrating through the end of June, with fewer Age 1 smolt departing throughout July. Smolt data suggests density-dependent growth. Adult escapement ranged from a minimum estimate of 1,047 fish in 2002, to record escapements of 8,115 in 2004 and 11,135 fish in 2005. Favorable Bering Sea conditions are most likely responsible for the plentiful sockeye escapements. Escapement was dominated from 2000 to 2003 by Age class 2.3, or six year old fish, but age class 2.2 became as numerous in 2004 and 2005. These five year old, earlier returning fish were mostly females.

**Session:** Poster

J. PARRISH

**Frozen fowl: Coastal Observation and Seabird Survey Team (COASST) Surveys in Alaska**

*Julia K. Parrish, School of Aquatic and Fishery Sciences, University of Washington*  
Contact e-mail: jparrish@u.washington.edu

*Jane E. Dolliver, School of Aquatic and Fishery Sciences, University of Washington*  
*Penelope Chilton, School of Aquatic and Fishery Sciences, University of Washington*

The Coastal Observation and Seabird Survey Team (COASST) is a unique citizen science program that trains participants to survey beaches monthly and collect data in a standardized, rigorous manner. This highly accurate and independently verifiable data set creates the baseline against which a variety of factors, including anthropogenic factors, can be assessed. Since its inception in 1999, COASST has grown to over 500 people surveying 300 beaches, including over 60 in Alaska. When do birds die? In Alaska, the breeding season is a consistent peak, whereas in the lower 48, peaks occur post-breeding, during the winter, and in the very early spring at the onset of migration back to breeding colonies. How many birds wash up? The highest encounter rates occur in the Bering Sea and Aleutian Islands: at sites with or near large breeding colonies; but these rates are still much lower than what happens on the outer coast of the lower 48 (California-Washington). Occasionally mass die-offs occur in Alaska, littering beaches with hundreds to thousands of carcasses; but the reasons for these events remain a mystery. What species wash in? Beaches in Alaska are dominated by two locals: gulls and fulmars, and one long-distant migrant: shearwaters.

**Session:** Fisheries

## S. PETRAS

### **Environmental Health Care Toolkit: Promoting Environmental Health and Justice in Alaska**

*Sarah B. Petras, MPH, Alaska Community Action on Toxics*

Contact e-mail: sarah@akaction.org

*Colleen Keane, Alaska Community Action on Toxics*

The Environmental Health Care Toolkit is a model for tribal and rural health programs that integrate environmental health concerns with patient care. The Toolkit is tailored for Community Health Aides in Alaska and designed to promote proper diagnosis, treatment and prevention of health effects associated with environmental contaminants. This unique project is a community-based, culturally relevant, and collaborative effort to restore environmental health and justice for Alaska Natives. Through a lecture and facilitated discussion, participants will gain an understanding of the Toolkit background and materials, community-based participatory research model, and scientific evidence on health effects of environmental exposures.

#### **LEARNING OBJECTIVES**

This session will promote participants' awareness of the role of environmental exposures in a wide range of health problems. Specifically, it will cover environmental health research and health care delivery in the context of Alaska's unique rural health care system. Each presenter will provide examples from her environmental health work with Alaska Community Action on Toxics and share experiences from collaborating communities through a slide show, as well as facilitate a discussion and community environmental exposure mapping exercise among participants. Participants will receive materials included in the Environmental Health Care Toolkit, such as the Environmental Health History and Assessment Form, a guide of additional resources, and example fact sheets included in the Toolkit. By the end of the session, participants will be able to:

1. Identify sources of exposure to environmental contaminants (such as hazardous waste, military waste, mining and other industrial sites, oil and gas development, and household toxics) and possible health effects of these exposures;
2. Identify challenges when dealing with environmental exposure issues;
3. Apply community-based, culturally relevant, and collaborative principles to promote environmental health and justice at the local level.

**Session:** Workshop, April 7

## B. PINGREE

### **Critical Mass: The NorthWind 100® Wind Turbine in the YK Delta Region of Alaska**

*Brett Pingree, Northern Power Systems*

Contact e-mail: bpingree@northernpower.com

Over the last several years Northern Power, in concert with its partners STG,

Incorporated and AVEC, has worked steadfastly towards achieving a critical mass of NorthWind 100 wind turbine installations in the Western regions of Alaska. This paper describes the experience that Northern and its partners have accrued in penetrating the Alaska market with its fleet of cold climate NW100s.

Areas discussed include the business decisions and actions taken to get the NW100 optimized, installed, and sustained. Why is integrating wind such a great decision for these diesel communities? What was the overall strategy to get a foothold in this market? What are the results to the customer of achieving critical mass? Keys to achieving critical mass in remote regions are the right products, early project success, building strong local partners, training local technicians, and commitment to service.

One turbine was installed in Kotzebue in 2001. Then six NW100s were installed in Toksook Bay and Kasigluk, AK in fall 2005 and summer 2006. In 2007/2008 six more turbines were installed in villages in Hooper Bay and Savoonga and in spring of 2009 seven more will be installed in Chevak and Gambell.

This paper emphasizes the business strategy used to install turbines in this region and ensure the sustainability of the market and how this positively affects the customers, the culture and the region. We will rely on availability and performance data from actual sites to support the thesis.

**Session:** Energy/Small Business

## A. POKRZYWINSKI

### **Delivering High School Science Classes at a Distance**

*Andrea Pokrzywinski , Lower Kuskokwim School District*

Contact e-mail: andreaupnorth@gmail.com

Many small village schools in Alaska lack a certified science teacher. This leaves many teachers who have less than a minor in science to struggle with delivering science classes. Finding a teacher who is certified in Math, Science, Language Arts, and Social Studies is almost impossible. But, according to No Child Left Behind, that is what a small school with 12 students in its high school would have to do. The Lower Kuskokwim School District has developed a creative solution to this challenge. They have hired a certified Science Teacher to deliver high school classes by videoconference to 22 village schools. The district is in its 7th year of delivering Math and Science instruction by video technology.

Many Science teachers scratch their head at the idea of delivering a hands-on science course by video conference. This presentation will outline tools and strategies for teaching inquiry based science at a distance.

**Session:** Education

J. RAYMOND-YAKOUBIAN

**The Impact of Fuel Prices on Subsistence in Northwest Alaska**

*Julie Raymond-Yakoubian, University of Alaska-Fairbanks and Kawerak Inc.*

Contact e-mail: jraymond-yakoubian@kawerak.org

This paper offers data on the impact of rising fuel prices on subsistence practices in the Bering Strait region of Alaska. Data was obtained during the summer of 2008 over the course of approximately 30 interviews in communities throughout the region. The high price of gasoline in Bering Strait area villages has led to changes in the day to day practices associated with obtaining subsistence foods. These changes have had consequent impacts in other areas of rural residents' lives such as sharing and exchange networks, diet and stress levels. Resident's thoughts and views on the situation, as well as an analysis of the circumstances, are presented.

**Session:** Subsistence

S. ROLF

### **Rebels to the Pebble**

*Stacey Rolf, Dillingham student*

*Chelsey Kasayulie, Dillingham student*

*Kathy McLinn*

Contact e-mail: [kathy.dlgsd.org@uaf.edu](mailto:kathy.dlgsd.org@uaf.edu)

Environmental dialogs often neglect to include the youth voice. In Dillingham, Alaska, youth joined together to create the Rebels to the Pebbles in response to the proposed Pebble Mine. Through their own creativity and motivation, these youth entered into the discussion. They held a public forum with a panel discussion, led a parade, took a survey of Dillingham students, held demonstrations, created billboard displays, conducted a mock trial, and were interviewed by NPR.

The Rebels to the Pebble believe in three things:

1. Youth have a responsibility to stand up for what is right.
2. Native Alaskans have a responsibility to stand up for what is right.
3. And the proposed Pebble mine poses too much of a risk to the ecosystem in the Bristol Bay.

They are learning as they go but they are determined to educate themselves and others and to take action against any threat to their culture and way of life. The Rebels to the Pebble can explain why youth should have a voice at the table, why Native Alaskans have rights, why the Pebble Mine is too risky to them, some of their adventures along the way, and their plans for the future.

**Session:** Watershed

M. ST. MARTIN

**Population Ecology of Reindeer (*Rangifer t. tarandus*) on St. George Island**

*Michelle St. Martin, School of Natural Resources and Agricultural Sciences, University of Alaska Fairbanks*

Contact e-mail: ftmls@uaf.edu

*Greg Finstad, Reindeer Research Program, University of Alaska Fairbanks*

Contact e-mail: ffglf@uaf.edu

*Norman Harris, School of Natural Resources and Agricultural Sciences, University of Alaska Fairbanks*

*Kris Hundertmark, Institute of Arctic Biology, University of Alaska Fairbanks*

*Christine Hunter, Institute of Arctic Biology, University of Alaska Fairbanks*

In 1980, 15 reindeer (*Rangifer t. tarandus*) were re-introduced to St. George Island located in the Bering Sea. The population grew steadily and peaked in 2005 at roughly 450-500 animals. In June, 2008 the population was estimated to be 320 ( $\pm 5$ ) animals (120( $\pm 5$ ) adult cows, 47 adult bulls, 33 yearling cows, 32 yearling bulls, and 88 calves). The calf: cow ratio was 56:100, and the bull:cow ratio was 33:100 suggesting the population had the potential for a rapid population increase.

Since the introduction, little management of the range used by reindeer has occurred. Land managers and stakeholders need to consider the ecology of reindeer on the island when making management decisions. Inventory of the species of forage consumed by reindeer is critical for the identification and monitoring of grazing areas used by reindeer. The seasonal diet of reindeer on the island was estimated by microhistological analysis of fresh fecal samples collected monthly during 2007 and 2008.

Lichens dominated the diet (56.9%) during the spring/summer months followed by forbs (13.1%), grasses (11.9%), and mosses (7.2%). There were also differences in diet composition between sexually segregated groups. Female dominated groups had a much more diverse diet than the male group. Female diets in May contained twice the shrubs and mosses, three times the grasses, and five times the sedge/rushes than the male group. In June, the diet of males consisted almost exclusively on lichens (80.4%), while lichens made up 31% of the diets of females. Differences in species composition of forage found in disparate grazing areas may have accounted for the differences in diets of sexual segregated groups.

**Session:** Reindeer Herding

L. SCHWARZBURG

**Special Delivery: Transporting Iñupiat Mothers and Babies in Northwest Alaska, A Call for a Traditional-Knowledge Based Public Health Policy Analysis and Evaluation**

*Lisa Schwarzburg, University of Alaska Fairbanks*

Contact email: [lisa@schwarzburg.org](mailto:lisa@schwarzburg.org)

In 1973, a Public Health measure was instituted in Alaska Native Villages to insure the safety of mothers, infants, and medical personnel during delivery. There are no written documents of the policy, a fluid understanding of protocols existing between each of the individual Alaska Native Health Care Regional units, and the Alaska Native Medical Center's (ANMC) Labor and Delivery unit.

Today, maternal deaths are rare in this population, and neonatal mortality rates for Alaska Natives tend to be as low or lower than other races in US and Alaska. The policy continues, however—spurred on by economic, social and cultural forces influencing the behavior of the participants. Some authors, along with the World Health Organization, even implicate loss of community-based maternal care (with prenatal mother-education) in explaining negative post-neonatal trends among indigenous populations of the world.

The Alaska Native Tribal Health Consortium (ANTHC) and South Central Foundation (SCF) could benefit from the accounting of their program with a formal evaluation. A holistic, mother-centered analysis is called for to inform the stakeholders with empirical, evidence-based outcome measures. Borrowing from discourse analysis of medical anthropology, scientifically based policy analysis, and Traditional Knowledge frameworks, this can be accomplished.

*Research questions:* What are social constructs of birth among the Northwest Alaska Iñupiat? What methodology can be devised for the women and families involved to assess the economic, social, and cultural influences and impacts of this policy on their community? What outcomes (intended and actual) of the policy will be revealed as a result of such an assessment?

*Methods/Data:* A model of the evolution of Social Construct of Birth within this population, with special attention paid to economic, social, and cultural dynamics involved; methodology for performance measure; and participant-designed assessment tool will be produced as follows:

*Anticipated Results:* A Performance Measurement System will be put in place in the ANTHC Division of Health Statistics as an ongoing, adjustable assessment tool.

Footage of all stages of this transport process will be collected. The final product will also be edited to produce a film short that can serve as documentation of the study.

**Session:** Public Health

P. SCHWEITZER

**People, Knowledge, and Water: Ethnographies of Freshwater Use from the Seward Peninsula**

*Peter P. Schweitzer, Department of Anthropology, UAF*  
Contact e-mail: ffpps@uaf.edu

*Elizabeth Marino, Department of Anthropology, UAF*

Anthropology and other social sciences only recently seem to have started to pay more attention to freshwater. In the Arctic, the situation is even spottier: neither the impact of the availability of freshwater on natural resources, subsistence strategies, and cultural practices, nor the cultural significance of freshwater has received adequate treatment. Likewise, detailed descriptions of water use in the North – from drinking to washing to gold mining – are notably absent. Thus, the interdisciplinary project “The Intersection between Climate Change, Water Resources and Humans in the Arctic” focused on the residents of the Seward Peninsula and was a first attempt to get a better understanding of these aspects of circumpolar realities. This presentation will report on research activities and findings from the above-mentioned project. The anthropological component of the project focused on the role of freshwater in the daily lives of the inhabitants of the Seward Peninsula. As usual, ethnographers first and foremost talked and listened to what community members had to say about freshwater. The preliminary results show a surprising variation regarding community vulnerability to future changes in the local hydrology. This is not only due to ecological parameters but also tied to cognitive orientations, to the ways people “listen” to their environments.

In addition to regional variations regarding freshwater knowledge and vulnerabilities to hydrological change, topics to be discussed include infrastructure and technological modernization and how they effect water consumption and water knowledge; as well as the joys and frustrations of interdisciplinary work. In the end, it is about the social construction of perceptions of the environment. Obviously, one’s engagement with the environment influences one’s perception of the environment. At the same time, engagement and perception are fundamentally impacted by cognitive orientations and social values. In the end, what people know about (fresh)water has a lot to do with social and cultural choices.

**Session:** Climate Change, Water Resources, and Humans in the Arctic

R. SEIFERT

### **Can Rural Alaska Get Off the Energy Rollercoaster?**

*“It is difficult to dismount from a tiger” - Ancient Chinese Proverb*

*Richard D. Seifert, Energy and Housing, Cooperative Extension Service, University of Alaska Fairbanks*

Contact e-mail: ffrds@uaf.edu

Just a quick look at a graph of the price of a barrel of oil over the last year will convince anyone that the rollercoaster analogy is all too easy to understand. With most of rural Alaska in crisis for several years now over energy prices and options, what can we offer as positive steps or insight to the situation? Alternatives, conservation, education and subsidy have been the main responses, and they are all positive. Are they working? Are some of the attempts helping more than others? And are there any options we haven't tried which may turn out to have saving grace?

In this paper, I will attempt to document the effects of these various options and review their contributions. In addition, I will try to objectively assess the progress of each, and then suggest further efforts which may help to alleviate the energy stresses in rural Alaska and help communities dismount from the tiger of oil dependence.

Here are a few of the topics I want to go over to evaluate the effects and wisdom of maintaining or increasing their various efforts or influences on rural Alaska energy issues:

1. PCE: its cost, reductions of availability; how much is needed for stability?
2. The state weatherization and rebate program: what has it accomplished in rural Alaska and what can we anticipate from future activities under this program?
3. What about renewable: wind integration for electric utilities, interties, exotic options.
4. What does the future portend? Is self-sufficiency possible? What will oil prices do?

Much of this information and evaluation will unfold between now and the time of the presentation. I intend to continuously build the presentation on events as they unfold. This is especially true of the rebate and weatherization results, which are really just developing and cannot be fully evaluated yet. Other elements which I mentioned as topics of review and investigation will be more forthcoming.

**Session:** Energy/Small Business

R. SEIFERT

**Retrofit of Existing Homes for Improved Energy Efficiency**

*Richard D. Seifert, Energy and Housing, Cooperative Extension Service, University of Alaska  
Fairbanks*

Contact e-mail: ffrds@uaf.edu

UAF Cooperative Extension Service presents this workshop on weatherization, how to retrofit windows, walls, roofs and retrofit materials. This course is more timely than ever!

Registration required. Includes manual.

To register: Call 443-2320. Register early, Space is limited.

**Session:** Workshop, April 6

G. SHEFFIELD

**Bowhead Whale Feeding in the Northern Bering Sea Near Saint Lawrence Island**

*Gay Sheffield, Alaska Department of Fish and Game*

Contact e-mail: [gay.sheffield@alaska.gov](mailto:gay.sheffield@alaska.gov)

*J. C. George, North Slope Borough, Department of Wildlife Management*

We studied feeding of bowhead whales taken by Alaska Natives at Saint Lawrence Island in the northern Bering Sea during the spring (April-May) and fall (November) migrations from 1972-2008. Our objectives were to: 1) identify the proportion of harvested whales that had been feeding based on historical harvest records and 2) describe the prey identified from the stomach and/or intestinal contents of eight whales harvested during 2005-2008.

Harvest records (1972-2008) were reviewed for information on feeding status during the spring. Six whales (30%) harvested during the spring had evidence of feeding. Three whales (100%) harvested during the fall had been feeding shortly before death. The sample sizes for feeding status between seasons is small and we recommend caution when interpreting these results. However, there are indications there may be a seasonal difference in the proportion of whales feeding as has been determined in bowhead whale diet studies in the Beaufort Sea.

Of note, there was no difference ( $P=0.73$ ) in the proportion of bowhead whales feeding in the Bering Sea (30%;  $n=20$ ) and the Beaufort Sea (34%;  $n=91$ ; Lowry et al. 2004) during the spring migration.

Five whales harvested during spring (2007-2008) provided the first spring prey data from the northern Bering Sea since 1982. Copepods occurred most frequently and were identified in 87% of the whales sampled.

The three whales harvested during late November 2005 provided the first prey data from bowhead whales during their fall migration into the northern Bering Sea. Euphausiids dominated the diet samples of whales sampled during late November. Euphausiids were not present in any whales sampled during the spring. The sample sizes for diet samples are small and we recommend caution when interpreting these results.

The data we document are consistent with bowhead whale feeding behavior observed by Alaska Native whalers from Saint Lawrence Island. Bowhead whales feed near Saint Lawrence Island during spring and fall migrations.

**Session:** Subsistence

J. SMITH

## **Alaska's Freshwater Management Regime: Decentralized Capacity-Building and Adaptation for Future Changes**

*Jedediah R. Smith, University of Alaska Fairbanks graduate student*

Contact e-mail: fsjrs22@uaf.edu

Watershed partnership activity indicates a growing capacity to identify and address challenges related to changes in freshwater systems at a local and regional scale. However, watershed partnership role in institutional management decisions is unclear. Alaska is experiencing rapid environmental change as the direct result of global warming, and its interaction with land, water, and natural resource development. The potential cost for assessing changes across the vast landscape of the state is high. Some of these impacts, such as erosion affecting rural communities, are more salient and documented. Other changes, such as permafrost affecting surface waters, are less predictable. Further, since statehood 50 years ago, Alaska has undergone rapid community and economic development that has brought an inequitable distribution of infrastructure, and consequently regulatory ability to address changes. In other words, Alaska is not experiencing blanket change, but rather changes that vary on a bioregional scale. The cumulative impacts on individuals and communities demonstrate a need for a cohesive management regime that is responsive to changes at the watershed level.

The watershed basin as a scale for management may be a more appropriate fit for allocation and regulatory decisions that carry impacts outside of administrative boundaries. Partnerships that include diverse stakeholders from within the basin theoretically increase compliance with pollution regulations. Watershed partnerships can potentially form a cohesive policy community, reduce conflict, and address local concerns efficiently. Regulatory agencies that recognize watershed partnerships as legitimate nodes of entry into the public process may be able to reduce transaction costs and conflict of regulatory, allocation and development decisions at an administrative level.

Alaska's 10 watershed partnerships grew out of the proliferation of similar partnership activity in Lower 48 states during the mid 1990s. Alaska's partnerships address specific needs within their geographic and economic regions. For example, the Yukon River Intertribal Watershed Council has built a robust water quality monitoring program that utilizes tribal funding resources, traditional ecological knowledge networks, and a close relationship with the US Geological Survey to bridge the use of science and Traditional Ecological Knowledge within the basin and enhance knowledge and observation of changes. Similarly, the Anchorage Waterways Council has a volunteer network of water quality monitors and an extensive outreach and community education focus that has been instrumental in increasing non-point source pollution compliance. The Tanana Valley Watershed Association is currently in the process of developing a riparian management plan for the Fairbanks-North Star Borough that would establish a set of mutually agreed upon rules intended to protect property owners from flood and erosion damage and enhance fish habitat in waterways that have been affected by urban development.

Such partnerships are noticeably absent from the northern and northwestern portions of the state where populations are lower. However, partnership presence in regions of higher populations or where development poses significant risk to freshwater resources suggests these entities may also be appropriate vehicles for influencing management decisions across administrative boundaries.

A review of more than 300 newspaper articles since statehood has uncovered focusing events that have contributed to current water policies. Semi-structured interviews with current state and federal agency regulators, watershed partnership executives and facilitators have also helped identify regional concerns, as well as access issues related to policy process.

Elinor Ostrom's Institutional Analysis and Development framework is used to analyze institutional arrangements, Alaska's Clean Water Act regulatory permitting process, which transcends many of the state's social and ecological water issues. The focusing events identified in newspapers, such as floods, village water delivery system vulnerabilities, and placer mine permitting and water quality issues provide a map to connect Alaska's policy development over time. Watershed partnership activity demonstrates the growing capacity for a new comprehensive and cohesive water management regime for Alaska.

**Session:** Watershed

T. SMITH

**Norton Sound Salmon Restoration and Enhancement – Results of Management Efforts Under the Norton Sound/Bering Strait Regional Comprehensive Salmon Plan 1996-2010**

*Tim Smith, Nome Fishermen's Association*

*Contact e-mail: timsmith@gci.net*

Salmon restoration and enhancement in Norton Sound is guided by the Norton Sound/Bering Strait Regional Comprehensive Salmon Plan 1996-2010 (RSP). The RSP established commercial harvest targets and identified methods for increasing the harvestable surplus of salmon stocks. The RSP was developed and revised by a Regional Planning Team (RPT), made up of members appointed by the Commissioner of the Alaska Department of Fish and Game (ADFG). The RPT includes 3 voting members from ADFG and 3 voting members representing salmon users in the Norton Sound and Bering Strait region, an area encompassing watersheds north of the Yukon River Delta to the Bering Strait. The RPT also includes ex-officio members representing organizations having a stake in salmon harvesting and management.

The 1981-1995 average Norton Sound commercial salmon harvest was 7,865 chinook, 242 sockeye, 54,872 coho, 133,971 pink and 113,643 chum salmon; 310,593 total. The plan's 2010 target harvest was 20,000 chinook, 10,000 sockeye, 90,000 coho, 1,250,000 pink and 200,000 chum salmon; 1,570,000 total. The plan calls for supplemental production using a central incubation facility to restore and enhance salmon stocks and achieve harvest goals. It identified the Community Development Quota [CDQ] program administered for 15 Norton Sound communities by Norton Sound Economic Development Corporation (NSEDC) as a primary funding source.

NSEDC made salmon restoration and enhancement a priority and reported spending \$5.3 million on restoration and enhancement projects during 2000-08. In addition, the Norton Sound Salmon Research and Restoration Program; a federal program administered by the State of Alaska, spent \$4.9 million on salmon research and restoration projects during 2002-2007, ADFG, the US Bureau of Land Management [BLM] Kawerak Incorporated and the Nome Fishermen's Association (NFA) spent additional funds in an effort to increase Norton Sound Salmon harvests. Total expenditures for Norton Sound salmon restoration and enhancement during 2000-08 exceeded \$17.4 million or \$2.2 million per year. The total ex-vessel value of the commercial harvest to the fishermen during 2000-08 was \$2.4 million or \$267,574 on average annually. 2000-08 expenditures on salmon enhancement and restoration exceeded the gross income to commercial fishermen by \$15 million dollars. Salmon restoration and enhancement cost about \$19 per fish harvested commercially. Salmon enhancement and restoration projects included instream incubator boxes, lake nutrification, a conventional hatchery near Nome and experimental mist incubation and eyed-egg implanting.

During 2008, ADFG reported Norton Sound commercial salmon fishermen harvested 83 chinook, 60 sockeye, 120,293 coho, 75,384 pink and 25,124 chum salmon; 220,944 total. The number of salmon harvested in 2008 was 1.3 million fish short of the target goal and only 71% of the 1981-1995 average harvest which was considered disastrously low and led to several state and federal disaster declarations. This paper examines the restoration and enhancement projects that were conducted under the RSP and discusses why despite large expenditures of money, these efforts were unsuccessful in achieving the plan's modest harvest objectives.

**Session:** Watershed

D. SOLIE

**Introducing Inuktitut Symbols into Bush Physics for the 21st Century. A Distance Delivery Physics Course to Bridge the Gap in Rural Alaska and Across the North**

*Daniel Solie, Science Education, Geophysical Institute, University of Alaska Fairbanks*

Contact e-mail: [ffdjs@uaf.edu](mailto:ffdjs@uaf.edu)

*Vanessa Spencer, University of Alaska Fairbanks*

Bush Physics for the 21st Century is a UAF distance delivery, college-level physics course, with a lab, targeting rural and Alaska Native students (high school and older), in small village as well as urban schools. This course follows the pedagogical philosophy of Alan Dick's "Village Science", with a rigorous and mathematical focus on the basic physics of life in Bush Alaska. A key goal of the course is to prepare the students for university level science and engineering courses.

Connecting abstract mathematical symbols and equations to real physical objects and problems is one of the most difficult things to master in physics. For all students, this requires hard cognitive work. Greek symbols are traditionally used in equations, however, to strengthen the visual/conceptual connection with symbol and encourage an indigenous connection to the concepts we have introduced Inuktitut symbols instead. (For example: Newton's Second Law ( $F=ma$ ) is represented as  $F = mV$ , where  $V$  represents acceleration.) This new symbol set has just been introduced, but student response has thus far been positive. We are currently piloting this course through the UAF Interior-Aleutian Campus with the expectation of a full year course beginning Fall 2009 (pending funding).

**Session:** Education

## S. STEPHENS

### **MapTEACH: Integrating Science, Technology and Traditional Knowledge Through Place-Based Education**

*Sidney Stephens, University of Alaska Geography Program*

Contact e-mail: [ffssl@uaf.edu](mailto:ffssl@uaf.edu)

*De Anne Stevens, Alaska Division of Geological & Geophysical Surveys*

*Katie Kennedy, University of Alaska Geography Program*

*Patty Burns, Alaska Division of Mining, Land, and Water*

MapTEACH is a hands-on education program for middle and high school students in Alaska focused on understanding the local landscape from multiple perspectives and on learning to make and use computer-based maps of scientific, cultural and personal significance. The program emphasizes the integration of geoscience, local landscape knowledge, geography and geospatial technology (GPS, GIS and remotely sensed imagery), and it draws upon the combined expertise of teachers, education researchers, remote sensing specialists, geoscience professionals, Native elders, and others with traditions-based knowledge. Participants work directly with local experts and scientists to authentically emulate scientific activities at a novice level, using real data in a real-world setting. Students and teachers have access to locally and culturally relevant geospatial IT curriculum facilitated by web-served imagery, geographic information systems data, analysis tools, and field resources. Program materials are designed around a menu-based model in which users (teachers and/or informal educators) can select those portions of the curriculum that are most useful for their classroom objectives.

One of the key elements of MapTEACH is its place-based approach, in which students have the opportunity to collect field data around their own home communities to investigate and map issues of local concern. Past student projects have included trails, local place names, river erosion, and places of personal or community significance. Maps are generated digitally using AEJEE (ArcExplorer Java Edition for Education), a free GIS (Geographic Information System) program that can be used on both Macs and PCs and which emulates ArcGIS, the industry standard in professional GIS programs. Students learn how to make attractive, informative paper maps using their data, and how to enhance their interactive computer maps by linking to documents, web sites, and digital photos, videos and recordings.

Introducing students and teachers to science and geospatial technology in culturally responsive and stimulating classroom and field settings enhances community understanding of landscape processes in Alaska. It also fosters appreciation of state-of-the-art technology tools and data sets that can be applied to informed community planning and decision making.

Go to [www.mapteach.org](http://www.mapteach.org) for more information about MapTEACH activities and curriculum.

**Session:** Education

S. STEINACHER

**Is Your Research Reaching Your Rural Audience?**

*Sue Steinacher, Wildlife Information Specialist, Alaska Department of Fish & Game*  
Contact e-mail: [susan.steinacher@alaska.gov](mailto:susan.steinacher@alaska.gov)

This presentation will offer some successful strategies for more effectively reaching a rural audience with your research or management concerns. Agencies and researchers try but often fail to meaningfully engage with a rural, non-local audience, and yet meaningful collaboration with rural residents is increasingly important, particularly with the environmental and social changes occurring because of a warming climate. There are some simple thought processes and actions one can take to better cross this divide that will increase the reach of your work, and enrich the lives of rural residents.

**Session:** Plenary

L. STUART

**Telling Stories of Climate Change in Alaska with Distance Learning**

*Laurie Stuart, The Alaska SeaLife Center*

Contact e-mail: [lauries@alaskasealife.org](mailto:lauries@alaskasealife.org)

The Alaska SeaLife Center is currently developing an eight-part curriculum series on climate change, with a focus on Alaska's marine ecosystem and our unique experiences. To vitalize these lessons, we would like to invite Alaska classrooms to take part, not only as students, but as active participants in the lessons. We envision Alaska students connected with classrooms outside of Alaska, presenting anecdotes and supporting evidence about climate change in Alaska. We need Alaska classes who are interested in learning more about climate change, who would enjoy gathering stories from their communities, and who are willing to prepare presentations on their local findings for classes in other schools. This program is grant-supported and development is well underway. We anticipate this program starting in the 2009/10 school year. With this presentation, we would like to begin dialogues with rural Alaska teachers about the challenges and benefits of such a distance learning program for and with their students.

**Session:** Education

## D. SZUMIGALA

### **Mineral Deposits of Western Alaska**

*Dave Szumigala, Alaska Department of Natural Resources, Division of Geological & Geophysical Surveys*

Contact e-mail: david.szumigala@alaska.gov

Alaska is richly endowed with natural resources. Among that endowment are more than 7,300 metallic mineral occurrences stretching from Alaska's northern coast to the southern tip of southeastern Alaska. The mineral deposits can be divided into two broad categories: placer deposits formed by stream or other water-borne surficial processes and lode (hard-rock) deposits found in bedrock. Approximately 1,900 placer deposits and 5,400 lode occurrences occur in Alaska. Placer mining from 1880 to the present has produced approximately 24.4 million ounces of gold, 740,000 ounces of platinum, 7.3 million pounds of tin, and lesser amounts of other commodities such as mercury, tungsten, copper, chromium, and titanium. Historic lode production from Alaska includes 15.7 million ounces of gold, 250 million ounces of silver, 9.2 million tons of zinc, 1.9 million tons of lead, 700,000 tons of copper, 65 million tons of coal, 1.3 billion tons of sand and gravel, and lesser amounts of mercury, antimony, barite, gypsum, uranium, tungsten, and other commodities.

Approximately 2,400 mineral deposits occur in western Alaska. Most of the occurrences are lode deposits, with approximately 850 placer occurrences. Placer gold mining in the Nome mining district on the Seward Peninsula, with over 5 million ounces of gold production, is the most widely known historic mining activity in western Alaska, but both lode and placer mining has occurred across the region for over 125 years. For example, the Kolmakof mercury deposit near Aniak on the Kuskokwim River was discovered by Russian traders in 1838 and first mined in 1881, making it one of Alaska's earliest mineral discoveries. The Red Dog Mine near Kotzebue is the world's largest zinc producer.

A wide variety of commodities are present in mineral occurrences in western Alaska. These commodities include familiar metals like gold, copper, lead, zinc, silver, tin and mercury, as well as less familiar metals and semi-metals like indium, molybdenum, uranium, thorium, antimony, niobium, and tantalum. Potentially economic deposits occur in a wide range of rock types, geologic settings, and mineralization styles.

Western Alaska remained an active area for the mineral industry during the past several years. During 2007, the last year with reported information, the mineral industry spent \$236 million on exploration and \$139 million on mineral development projects. Two of the most advanced exploration-stage projects in Alaska, the Donlin Creek gold and the Pebble copper, gold, and molybdenum projects, occur in southwestern Alaska. Mineral production from western Alaska in 2007 was valued at approximately \$2.4 billion. Metal production from the Red Dog Mine accounted for more than 70 percent of the total value of Alaska's mineral industry in 2007.

**Session:** Mining

R. THOMAS

**Basic Norton Sound energy resources and development based on combining traditional methods, modern science, and economic policy.**

*Robin Thomas, Commercial Fisherman*

Contact e-mail: rcthom@gci.net

There is a very sustainable and traditional renewable energy source in Norton Sound, which has been taken for granted and largely ignored as a thing of the past. This source is well fed and insulated Norton Sound inhabitants creating physical strength and warmth from resources harvested from within the region.

With modern science and equipment, the value of this energy source and the efficiency of harvesting the energy may be enhanced greatly. Some of the modern science may include alternative energy sources such as solar greenhouses for hydroponics gardening, digital communications and navigation, dehydration units for low cost preservation of food including meat, fish, fruit and vegetables. Fertilizers for gardening may be made from fish by-products and composting. Vessel construction may utilize modern sail and electric propulsion.

Due to the current global economic tsunami, it is not feasible to become too dependent on outside resources to meet these basic energy needs. Imported clothing made from petrochemicals and processed foods are inferior, expensive, less available and more perishable than locally produced products made from local industry which in turn stimulate Local Economic Multipliers (LEM).

Elements: Harvesters; fishers, hunters, herders, farmers. Processors and products. Consumers. Science. Conservation. Community participation. The elements needed to fulfill the vision of this abstract idea of an egalitarian economy are hinged on local harvest, production and distributions of food and quality clothing. This type of local industry is not a new concept and only in the last century with the advent of industrialization and cheap oil have we deviated from traditional community trade-and-share economics.

Issues: Diminishing resources, energy costs, individualism, corporatism, community involvement, and relative values. While local resources are very diversified the marine harvest continues to be a major player in yield and renew ability of the resource

Traditionally, local clans shared their wealth within the community and the weak were taken care of. Successful harvesters had status within the community and were respected. With the advent of individualized capitalism and corporatism, much of the resources are now exported for personal gain while less fortunate community members such as widows, single mothers, elders, mentally ill, handicapped and substance abusers rely more on government-issued food and charity programs or disability checks.

Solutions: Science applied to food harvest, production and distribution.

Marine harvesters may utilize wind energy and manpower to operate customized vessels to bring in larger harvests. Processing waste may be converted into fertilizer by cooking with steam produced by bio fuel gasification.

Hydroponic horticulture may be applied for faster growing seasons in controlled environments, producing more yield than conventional dirt farming. Dehydrated products from local horticulture projects may be combined with local marine harvests as a renewable, economical, non perishable, energy source for the well insulated Norton Sounder.

**Session:** Energy/Mining

## V. WAGHIYI

### **Partnership for Community Environmental Research and Science Training: ACAT, UA, and Alaska BioPREP**

*Vi Waghiyi, Alaska Community Action on Toxics*

*Sue Hills, Alaska Idea Networks of Biomedical Research Excellence (INBRE)*

Contact e-mail: [shills@ims.uaf.edu](mailto:shills@ims.uaf.edu)

*Pam Miller, Alaska Community Action on Toxics*

*Frank Von Hippel, University of Alaska Anchorage*

ACAT is a statewide organization established in 1997 and dedicated to achieving environmental health and justice. The mission is: to assure justice by advocating for environmental and community health. We believe that everyone has the right to clean air, clean water, and toxic-free food. We work to eliminate the production and release of harmful chemicals by industry and military sources; ensure community right-to-know; achieve policies based on the precautionary principle; and support the rights and sovereignty of Indigenous peoples.

Community participants have been trained in collection methods and toxicology in classes taught by University researchers. A new program at UA, Alaska Biomedical Partnership for the Research and Education Pipeline (Alaska BioPREP) may be the perfect partner to offer more in-depth training for students and community members in genetics, effects of toxic substances, detection of toxics and environmental sampling. Goals of BioPREP include increasing understanding of biomedical science and increasing the number of Alaskans who attend college, graduate and professional schools to conduct biomedical research on Alaska issues.

Alaska Community Action on Toxics and the University of Alaska are collaborating to offer a university credited course through the Northwest Campus in Nome entitled Community Based Environmental Research: A Field Sampling Institute. The overall goal for the course is to provide students with the knowledge and capability to conduct environmental sampling and to learn the significance of environmental contaminants on human and environmental health. Students work with instructors in the field and classroom to understand how environmental contaminants are generated and transported and their effects on human and environmental health.

This course explores the significance of environmental contaminants that are globally transported and generated from local sources (i.e. past and current use mining sites, formerly used defense sites, local dump sites) on community health in the Arctic, specifically in the Norton Sound Region. The classroom component focuses on explaining why the chemicals are present, the impact of the contaminants to human and environmental health, describe how environmental sampling can be useful to and empower communities, and detail the proper steps needed to collect the environmental samples described in the field component and explain what happens during the analysis of each sample. The field component focuses on three types of environmental sampling—sediment core (to measure contaminants in soil and have the ability to date the deposition of the contaminants), stickleback collection (to determine if endocrine disrupting chemicals are present in water bodies and the aquatic food web), and semi-permeable membrane devices (which mimic fish membranes to measure the hydrophobic contaminants present in a water body). In the summer of 2009, Alaska Community Action on Toxics and the University of Alaska will offer a community-based research course for tribal environmental coordinators, village leaders, teachers, and others concerned about environmental health. This course will also include stream assessments and use of geographic information system (GIS) mapping components.

**Session:** Public Health

B. WARREN

**Community Responses to Energy Crisis in Alaska: An Opportunity for Innovation and the Expansion of Adaptive Capacity?**

*Rebecca Warren, Natural Resources Management, University of Alaska Fairbanks*  
Contact e-mail: becky.warren@uaf.edu

The energy crisis with which rural Alaska communities have been grappling for years has expanded into a statewide crisis that affects population centers along the Railbelt as well as dispersed villages in rural Alaska. This shift in spatial extent has highlighted preexisting vulnerabilities, triggering a heightened level of political and social interest in energy provision and consumption. This analysis of existing community and cross-scale institutional responses will contribute to the dialogue concerning the complex dynamics of the energy crisis and resultant cross-level decision-making that affect rural Alaska communities.

As new energy technologies are rapidly developed and deployed, the social, cultural, political, and economic dimensions of sustainable energy development must be explored and addressed. While state agencies and federal development programs have historically focused on a uniform approach to energy production for rural Alaska, place-based management approaches that incorporate local knowledge and site-specific ecological data will be critical to addressing Alaska's diverse contexts. Understanding this complexity is essential to the process of policy formation and expansion.

This presentation will highlight three existing cross-scale responses to rural energy needs. Northern Sustainable Shelter is a cross-scale, collaborative effort to develop and construct culturally-appropriate, affordable, and energy-efficient housing in Anaktuvuk Pass and the North Slope. The Chinik Wind Group is the self-organizing endeavor of four small communities in the Yukon-Kuskokwim Delta to develop sustainable wind power. The Alaska Wood Energy Development Task Group is a statewide, biomass development organization that uses a formalized, interactive process to assess community needs and develop appropriate solutions. In addition to an institutional analysis that evaluates the structure, scope, and effectiveness of these responses, this study considers the extent to which energy responses in rural Alaska indigenous communities create the social space and institutional structures needed to flexibly respond to directional change.

By providing insight into the institutional arrangements that support, incentivize, and inhibit efforts to both respond to current energy needs and expand long-term adaptive capacity in rural Alaska, this presentation will be a valuable component of the discussions at WAISC. This project is in the early stages of development. The presentation will include research questions, methods and preliminary results.

**Session:** Poster

D. WHITE

**Understanding our Water Resources in a Future Climate**

*Dan White, Institute for Northern Engineering, University of Alaska Fairbanks*  
Contact e-mail: ffdmw@uaf.edu

*Lilian Alessa, Resilience & Adaptive Management Group, University of Alaska Anchorage*  
*Andrew Kliskey, Resilience & Adaptive Management Group, University of Alaska Anchorage*  
Contact e-mail: afadk@uaa.alaska.edu

*Larry Hinzman, International Arctic Research Center, University of Alaska Fairbanks*

The climate is always changing. Warming and cooling periods have influenced precipitation and evapotranspiration patterns across the earth throughout its history. Recent warming has caused significant concern about water resources, particularly in the Arctic and other permafrost regions. The southern boundary of permafrost cuts across the Seward Peninsula. As permafrost changes, so do the water resources. While permafrost can have dramatic effects on water distribution across the landscape, so can gradual changes in precipitation and evapotranspiration. While the amount of precipitation impacts water available on the landscape, so does the timing of the precipitation. Water that falls as snow and accumulates over the winter will contribute to streamflows well into summer as the snow melts. An increase in winter rainfall, or a shortening of the winter season can impact the ability of snow to store water into summer. In addition, a longer summer season means that more water will evaporate and be transpired by plants for a longer period of time. This increase in evapotranspiration can reduce the amount of water that recharges groundwater aquifers or that accumulates in streams and lakes. In this presentation, we will discuss these potential changes to water resources on the Seward Peninsula and what it means to our drinking water supplies.

**Session:** Climate, Water Resources, and Humans in the Arctic

L.WILSON

**Sockeye Salmon Studies in Salmon Lake, Limnology and Fishery Investigations Relative to a Nutrient Addition Program**

Lorna Wilson, UAF School of Fisheries & Ocean Sciences, Alaska Department of Fish & Game – Commercial Fisheries

Contact e-mail: l.wilson@uaf.edu

Using data on nutrients, plankton, sockeye smolt age, weight and length and adult age and length from Salmon Lake, Alaska, we examine the impact of fertilization on the lake's oligotrophic state, the growth and productivity of juvenile sockeye salmon (*Oncorhynchus nerka*) and overall sockeye salmon population production. The lake was fertilized from 1997-2001, 2004 and 2006-2008 to enhance sockeye salmon production. To assess the effect of fertilization on the lake's oligotrophic state, nutrient and chlorophyll a concentrations were measured at four sampling stations. To assess smolt production, incline plane traps were installed in Pilgrim River below the outlet of Salmon Lake, smolt age, weight and length samples were taken and mark-recapture experiments were conducted to estimate smolt abundance. Adult age, escapement and return estimates were used to estimate return per spawner and smolt to adult survival. The nitrogen concentration in the lake was significantly higher during fertilization than pre-fertilization. The phosphorus concentration was significantly higher during fertilization than before fertilization, and was significantly lower post fertilization than during fertilization. Chlorophyll a was significantly lower during fertilization than post-fertilization. The zooplankton Cyclops' size was significantly higher before fertilization than during and after fertilization in the lake basin fertilization occurred. Return per spawner increased variably with total zooplankton biomass. Plots of smolt to adult survival and the ratio of age 1 smolt to age 2 smolt suggest a positive relationship with age 1 smolt length. The mark-recapture experiments were subject to many violations of assumptions, the greatest being within-stratum consistency. The proportion of age 1 to age 2 smolt is increasing, shown in both the smolt samples and in the adult samples, that suggests an increase in the growth of fry in the lake. Further studies and sockeye population data from future years are required to fully evaluate the effect of fertilization on the production of adults.

**Session:** Fisheries

S. WINGERT

### **Squaw Creek: Monitoring a Subarctic Alaska Stream**

*Sarah Wingert, University of Alaska Fairbanks Bristol Bay Campus*  
Contact e-mail: [bnsaw@uaf.edu](mailto:bnsaw@uaf.edu)

*Todd Radenbaugh PhD, University of Alaska Fairbanks Bristol Bay Campus*

Squaw Creek, in Dillingham Alaska, is the site of a community-based water quality monitoring project, which aims to highlight changes occurring in aquatic ecosystems due to climate change and watershed development, foster community partnerships on all levels, and use place-appropriate education to enhance local science curriculum. Squaw Creek is also a restored salmon stream monitored by UAF Bristol Bay Campus' Environmental Science Lab, U.S. Fish and Wildlife Service and Alaska Department of Fish and Game for water quality and aquatic life. It has been the focus of water quality and stream ecology classes at the middle school, high school and college level.

Squaw Creek watershed contains a combination of residential and industrial developments, though a major portion remains pristine wet tundra and birch/willow/alder forest. Beginning in 2007, weekly water quality measurements were taken between June and September at four sites along the creek. Parameters measured include water temperature, pH, dissolved oxygen, conductivity and turbidity; one sample per season was analyzed for metal content. Results demonstrate that average values at all sites are within EPA water quality standards.

In addition to water quality monitoring, Squaw Creek is the site of a salmon restoration project. Each summer, a fish passage weir with an underwater video camera is installed at the most downstream site to monitor fish passage into the creek from Nushagak Bay. The weir camera has detected and recorded silver and pink salmon escapement and indicates that the number of salmon returning has increased. The weir has also documented the passage of starry flounder (*Platichthys stellatus*), stickleback (*Gasterosteus sp.*), rainbow smelt (*Osmerus mordax*), river otter (*Lontra canadensis*), and beaver (*Castor canadensis*). To investigate fine-scale species composition within the creek minnow traps were baited and set weekly during summer months. Traps yielded Coho fry, Alaska blackfish (*Dallia pectoralis*), slimy sculpin (*Cottus cognatus*), Burbot (*Lota lota*), giant sea lice (*Saduria entomon*), and caddis fly larvae (*Trichoptera sp.*).

As the Squaw Creek Water Quality Monitoring Project continues to develop we will test for nutrients and metals. Next summer we will use aquatic macro-invertebrate indices as an additional tool to observe ecosystem health. The goal of the Squaw Creek Water Quality Monitoring Project is to develop Squaw Creek into a community resource for research, education and recreation.

**Session:** Watershed

S. YAMIN-PASTERNAK

**Vodovozka and Vodovod: A Love Story? Local Concerns and Infrastructure for the Chukotka Freshwater Systems**

*Sveta Yamin-Pasternak, Johns Hopkins University*

Contact e-mail: ftsy@uaf.edu

*Oksana Yashchenko, Park “Beringia,” Provideniya, Chukotka*

At different points of the Soviet period, every Chukotka settlement made a transition to a centrally organized water delivery system. In former times, household members were tasked with the chore of fetching water or ice according to their individual capabilities and needs. With the arrival of the municipal services, every village received a water truck – known colloquially as vodovozka – which was operating on a set schedule, delivering water to residences in predetermined quantities. Although generally used and appreciated by communities, vodovozka did not replace entirely the need for self-reliance in procuring water directly from the natural source. In turn, the recently constructed plumbed housing, serviced by central pumping system – vodovod – did not eliminate the necessity of either self-procured or the vodovozka-delivered water. Nowadays, interruptions in the delivery schedule, outages, or poor water quality continue to occur regularly, due to weather, technical malfunctions, and other obstacles. Additionally, neither vodovozka nor vodovod are available beyond the village limits, where many residents have their seasonal structures, used to conduct subsistence activities. Together, all of these factors make the knowledge, use, and preservation of freshwater sources essential for the community resilience. This paper relates a preliminary ethnographic exploration of the freshwater systems in contemporary Chukotka. It also gives an overview of a historical shift from the individually managed water acquisition, to the three gradients of infrastructure – self-delivery, vodovozka, and vodovod – that we find today. By outlining the range of concerns and coping strategies documented in the communities of Sireniki, Enmelen, Nunligran, NovoeChaplino, and Provideniya, the author hopes to gain constructive feedback that will help in developing further research on the freshwater systems in Chukotka.

**Session:** Climate Change, Water Resources, and Humans in the Arctic

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