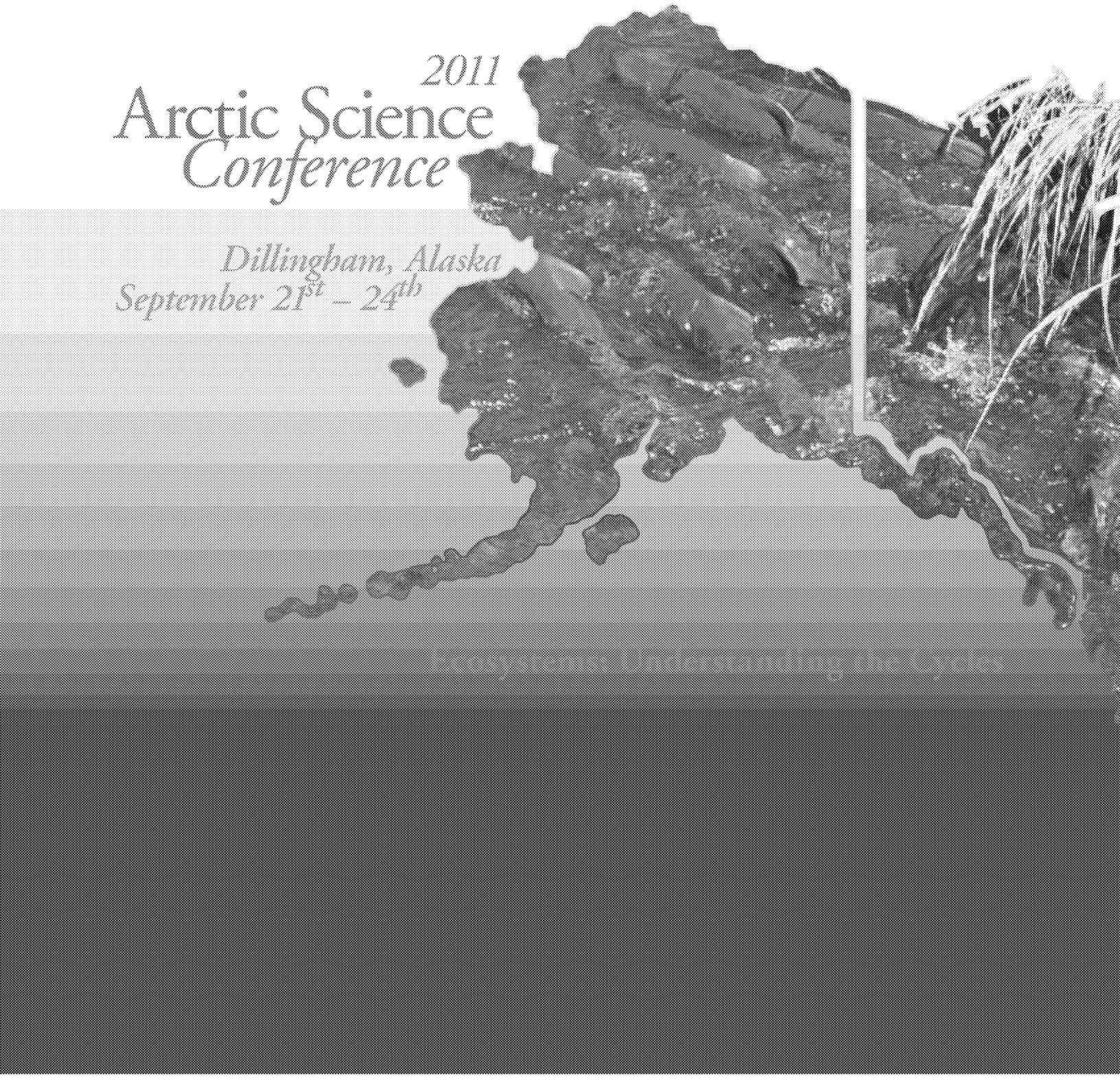
2011 Arctic Science Conference

Dillingham, Alaska
September 21st – 24th



2011 Arctic Science Conference

Ecosystems: Understanding the Cycles

Dillingham, Alaska
September 21st – 24th, 2011

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We thank the following sponsors for their support and the contributions that have made the 62nd Annual Arctic Science Conference possbile:

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www.uaf.edu/bbesl

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The Arctic Science Conference is an annual meeting that is organized and supported by the Arctic Division of the American Association for the Advancement of Science (AAAS). The locations and themes of the conference vary from year to year, although the themes and locations are always related to the Arctic and the scientific endeavors of the Arctic Division AAAS members and their colleagues. It is a continuing goal of this conference that it be open and accessible to all scientific scholars who are working on Arctic, Alaskan, Canadian, northern or Antarctic issues, and to communicate their interests and discoveries at the event. This year's conference was organized by:

Conference Organizers

Conference Chair
Todd Radenbaugh, Assistant Professor Environmental Science, University of Alaska Fairbanks Bristol Bay Campus (UAF BBC), www.uaf.edu/bbesl

Conference Coordinator
Barb Krekel-Greene, Visions Event and Meetings Management, www.visionsus.com

Conference Advisor
Lawrence Duffy, Executive Secretary, Arctic Division, AAAS, www.arctic.aaas.org

Publication Design
Annie Duffy, Duffy Infodesign, www.duffyinfodesign.com

Arctic Division AAAS Officers

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Todd Radenbaugh, Department of Environmental Science, University of Alaska Fairbanks Bristol Bay Campus

Past President
Lilian Alessa, The Resilience and Adaptive Management Group, University of Alaska Anchorage (UAA)

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Area 2 Representative (Alaska, north of 63 degrees)
Maribeth Murray, Deptartment of Anthropology, UAF

Area 3 Representative (Yukon, Northwest Territories, and Nunavut)
Eddy Cormack, Institute of Ocean Science, Saanichton Canada

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General Information

Registration Desk
The Arctic Division AAAS registration staff will provide assistance with program information, audio and visual aids for sessions, and other administrative needs. The registration desk will be open:

Wednesday, Sept. 21st from 5:00 p.m. to 8:00 p.m.
Thursday, Sept. 22nd from 8:00 a.m. to 5:00 p.m.
Friday, Sept. 23rd from 8:00 a.m. to 1:30 p.m.

Conference Fees

Full Conference:	$275
Single Day:	$100
Student:	$90
Student Single Day:	$30

*All registrations include lunch on the days registered.

Badges
Each participant should obtain a badge at the registration desk prior to attending any of the sessions.

Coffee and Registration Area
Coffee will be available inside the session meeting rooms.

List of Participants
A list of pre-registered conference participants will be available at registration.

Poster Sessions
Posters will be on display according to the following schedule:

Thursday, Sept. 22nd from 6:00 p.m. to 7:00 p.m.

Authors are requested to be present to discuss their material at 6:00 p.m. on Thursday or designate another time when they will be available.

Lunch
The conference has scheduled lunch break on each day at which time each attendee can eat lunch.

5:00 p.m. – 8:00 p.m. **Registration**

6:00 p.m. – 8:00 p.m. **Arctic AAAS Social (Windmill Grill)**

Thursday, September 22nd, 2011

8:00 a.m. **Registration and Coffee Service Begins**

8:45 a.m. **Conference Welcome (Dillingham Middle School Gym)**

9:00 a.m. – 9:45 a.m. **Plenary Speakers**

"The Future of Science Education in Alaska"
Paul Layer - Dean CNSM, Director ESTES, Department of Geology and Geophysics

"The Conservation of Change"
Philip Loring - Research Assistant Professor, Institute for Northern Engineering, Affiliate Faculty, Center for Cross Cultural Studies, UAF

"Salmon Returns to Bristol Bay"
Ed Farley - Research Scientist, Alaska Fisheries Science Center, NOAA Fisheries, Ted Stevens Marine Research Institute, Juneau

9:40 a.m. – 10:00 a.m. **Break**

10:00 a.m. – 12:00 p.m. **Mining in Western Alaska Panel Discussion**
Al Teich, Moderator
Panelists:
- Tom Crafford, Director, DNR Office of Project Management & Permitting
- Bryce Edgmon, AK Representative (D-37)
- Ed Farley, Fisheries Biologist, NOAA
- Rick Halford, Dillingham resident and former Alaska State Senate President
- John Shively, CEO of the Pebble Partnership
- Tiel Smith, Land and Resource Manager, Bristol Bay Native Corporation

12:00 p.m. – 1:00 p.m. **Lunch**

1:00 p.m. – 3:00 p.m. **Technical Sessions (UAF Bristol Bay Campus)**

Arctic Ecosystems — Todd Radenbaugh, Chair
Presenters: Dan Dunnaway, Doug Limpinsel, Todd Radenbaugh, Sayde Ridling, and Melanie Smith

Arctic Species — Patrick Walsh, Chair
Presenters: Sergey Bychkov, Tim Sands, Patrick Walsh, and Kendra Zamzow

3:00 p.m. – 3:20 p.m. **Break**

3:20 p.m. – 5:00 p.m. **Technical Sessions (UAF Bristol Bay Campus)**

Drumbeats — Elisa Bruns, Chair
Presenters: Elisa Bruns, Kevin Jernigan, Greg Finstad, Tom Marsik, Suzanne Nolan, and Todd Radenbaugh

US Russian Fishing Panel Discussion: "Community Involvement in Salmon Management: Successes, Mistakes, and Solutions"
Panelists:
- Diana Ananieva, Representative, Ust-Bolsheretsk Salmon Council/Russian Association of Indigenous Peoples of the North

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- Sergei Bychkov, Executive Director, Kamchatka Protected Areas Association, Russia
- Izetta Chambers, Marine Advisory Program, Sea Grant
- Victoria Sharakhmatova, Indigenous/Subsistence-use/Salmon-conservation expert of Kamchatka, Russia

5:00 p.m. – 5:30 p.m. **Break**

5:30 p.m. – 6:00 p.m. **Poster Display and Exhibition Set Up (Dillingham Elementary School Gym)**

6:00 p.m. – 7:00 p.m. **Poster Session (Dillingham Elementary School Gym)**

7:00 p.m. **Dinner (Dillingham Elementary School)**
Welcome address: Senator Gary Stevens, District R - Alaska Senate President
Keynote address: Robin Samuelsen, CEO Bristol Bay Economic Development Corporation

Friday, September 23rd, 2011

8:00 a.m. **Registration and Coffee Service Begins**

8:00 a.m. – 9:40 a.m. **Technical Sessions (UAF Bristol Bay Campus)**

Mining 1 — Tim Troll, Chair
Presenters: Sue Flensburg, Dudley Reiser, Tim Troll, and Carol Ann Woody

Interdisciplinary Science — Lawrence Duffy, Chair
Presenters: Heather Allen, Annie Duffy, Lawrence Duffy, Carol Gering, Chris Lott, and Brian Himelboom

9:40 a.m. – 10:00 a.m. **Break**

10:00 a.m. – 12:00 p.m. **Technical Sessions (UAF Bristol Bay Campus)**

Mining 2 — Tim Troll, Chair
Presenters: Dave Albert, Lawrence Duffy, and Kendra Zamzo
Followed by discussion.

Subsistence Science — Ted Krieg, Chair
Presenters: Sarah Evans, Ted Krieg, Julie Raymond, Stephanie Schmit, and Victoria Sharakhmatova

Rural Education Panel — Chris Lott, Moderator
Panelists:
- Elisa Bruns, USDA Program Manager, USDA Drumbeats Consortium
- Greg Finstad, Assistant Professor of Range Ecology and Program Manager, Reindeer Research Program
- Carol Gering, Associate Director, UAF Center for Distance Education
- Kevin Jernigan, Assistant Professor of Ethnobotany, UAF Kuskokwim Campus
- Tom Marsik, Asstistant Professor of Sustainable Energy, UAF Bristol Bay Campus
- Suzanne Nolan, VTS Program Head, Veterinary Science Certificate Program, UAF Interior-Aleutians Campus
- Todd Radenbaugh, Assistant Professor Environmental Science, Director Bristol Bay Environmental Science Lab, UAF Bristol Bay Campus

12:00 p.m. – 1:00 p.m. **Lunch**

1:00 p.m. – 2:40 p.m. **Technical Sessions (UAF Bristol Bay Campus)**

Citizen Science — Jodie Anderson, Chair
Presenters: Jodie Anderson, Rachel Boschma-Wynn, Jordan Lewis, Yoko Kugo, Tom Moran, and Julie Raymond Yakouiblan

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	Sustainable Energy — Tom Marsik, Chair Presenters: Chet Chambers, Mike Golub, Tom Marisk, Jason Meyer, and Jim Norman Followed by discussion.
2:40 p.m. – 3:00 p.m.	**Break**
3:00 p.m. – 5:00 p.m.	**Technical Sessions (UAF Bristol Bay Campus)**
	Fish — Mark Lisac, Chair Presenters: Lisa Campion, Jesse Coleman, Mark Lisac, and Christine Woll
	Natural Resources — Kendra Zamzow, Chair Presenters: Peter Bechtel, Leo Pedersen, Melanie Smith, and Kendra Zamzow
5:00 p.m. – 6:00 p.m.	**Solar Energy Tour**

Saturday, September 24th, 2011

2011 Arctic Science Conference Field Trips — Explore the Cultural & Physical Geography of the Dillingham Area

Trip 1 — "Short" Version (Half Day):

9:00 a.m.	**Meet at UAF Bristol Bay Campus**
9:15 a.m.	**Peter Pan Cannery Tour with Mike Davis**
10:00 a.m.	**Kanakanak Beach Tour with Todd Radenbaugh and Mike Davis** • Subsistence set-net for salmon demo • Coastal erosion in Nushagak Bay • Stratigraphic section of Nushagak glacial sediment in the bluffs • Kanakanak historic village site with traditional native Yup'ik sod houses (barabaras)
12:00 p.m.	**Short trip ends and participants can go back to hotel to prepare for 1:30 pm Pen Air flight leaving Dillingham**

Continue on to Trip 2 — "Long" Version (Full Day):

12:00 p.m.	**Bag lunch with visit to Alaska Volcano Observatory Acoustic Array with Todd Radenbaugh**
1:00 p.m.	**Snake Lake Mountain Hikes and berry picking with Tom Marsik and Adam Kane. Two hikes may be available depending on participants needs and interests:** • Easy hike up China Cap mountain — takes about 1 hour total • Challenging hike up Snake Lake Mountain — takes about 3 hours total
4:00 p.m.	**Driving tour to the Aleknagik' Lake and Village**
5:00 p.m.	**Return to Dillingham**

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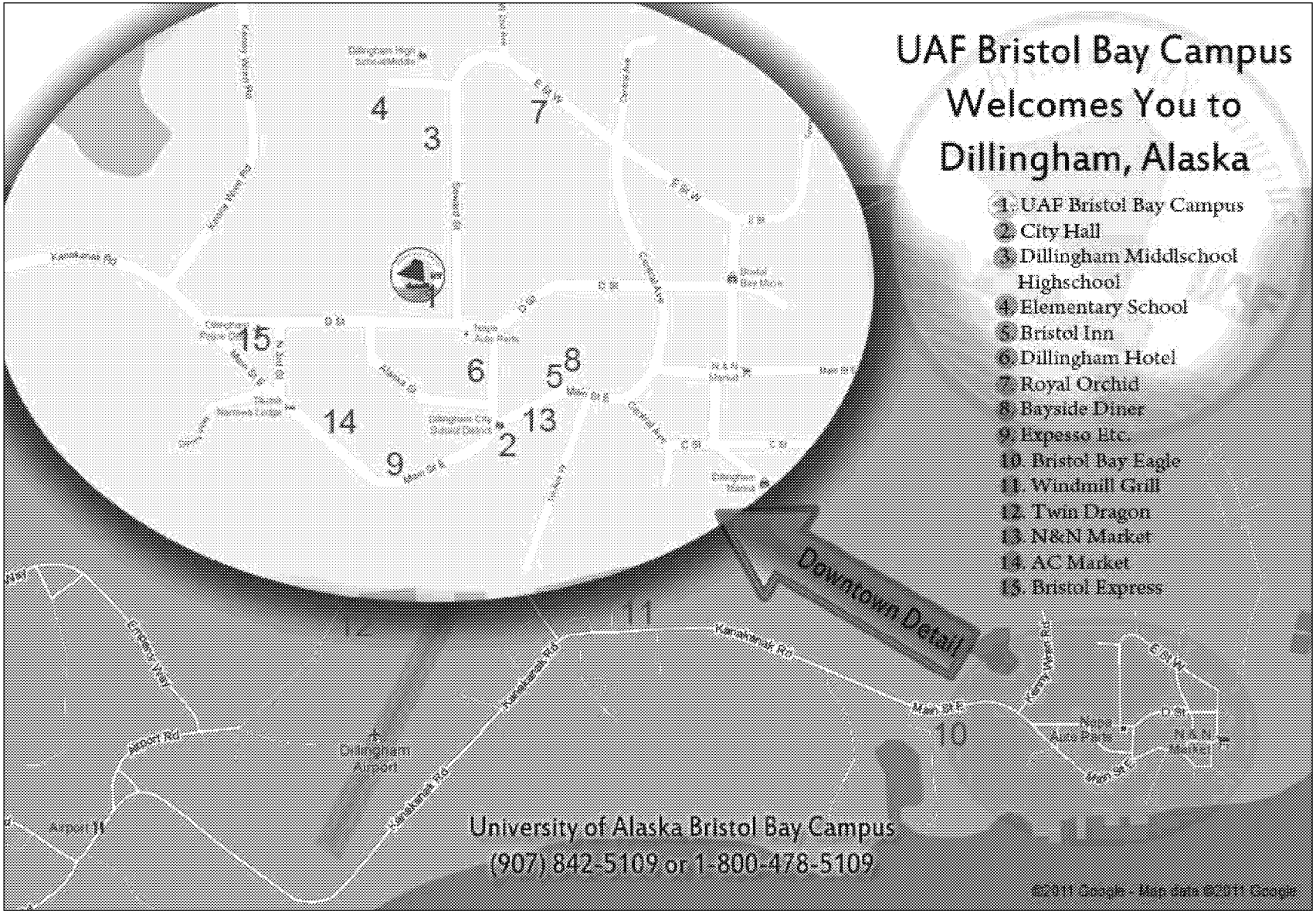

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* Arctic Division AAAS Meeting History *

The Arctic Division of the American Association for the Advancement of Science (AAAS) has a long and illustrious history. Founded in 1951 as the Alaska Division, the Arctic Division was established to foster scientific communication in the then rather isolated Arctic territory. The name was changed to Arctic Division in 1982 to reflect the membership's growing interest in high latitudes outside of Alaska. Most of the Division members reside in Alaska and Canada's Yukon, Northwest Territory, and Nunavut, but any AAAS member who has an interest in the Arctic or Antartic may join. More information about the Arctic Division AAAS can be found online at www.arctic.aaas.org.

Previous Arctic Division AAAS Meetings

No.	Dates	Year	Location	Chair	Theme
1	Nov. 9 - 11	1950	Washington, D.C.	John C. Reed	Science in Alaska
2	Sept. 4 - 8	1951	Mt. McKinley National Park	Laurence Irving, UA Biology Dept.	Science in Alaska
3	Sept. 22 - 27	1952	Mt. McKinley National Park	Laurence Irving, UA Biology Dept.	Science in Alaska
4	Sept. 28 - Oct. 3	1953	Juneau	Christian T. Elvey, UA Geophysical Inst.	Science in Alaska
5	Sept. 7 - 10	1954	Anchorage	Hugh A. Johnson, US Dept. of Agriculture	Science in Alaska
6	Jun. 1 - 4	1955	College	Neil W. Hosley, Univ. of Alaska	Science in Alaska
7	Sept. 27 - 30	1956	Juneau	Troy L. Pewe, US Geological Survey	Science in Alaska
8	Sept. 10 - 13	1957	Anchorage	Victor P. Hessler, Univ. of Alaska	Science in Alaska
9	Sept. 2 - 5	1958	College	Robert L. Rausch, Arctic Health Res. Cntr., US Public Health Svc.	Science in Alaska
10	Aug. 25 - 28	1959	Juneau	Norman J. Wilimovsky, Univ. of British Columbia	Science in Alaska
11	Aug. 30 - Sept. 2	1960	Anchorage	Roger R. Robinson, US Bureau Land Mgmt.	Science in Alaska
12	Aug. 28 - Sept. 1	1961	College	John P. Hannon, Arctic Aeromedical Lab	Science in Alaska
13	Aug. 22 - 26	1962	Juneau	James W. Brooks, AK Dept. of Fish and Game	Science in Alaska
14	Aug. 22 - 30	1963	Anchorage	Allan H. Mick, AK Agricultural Exp. Sta.	Science in Alaska
15	Aug. 31 - Sept. 4	1964	College	Charles J. Eagan, Arctic Aeromedical Lab	Science in Alaska
16	Aug. 30 - Sept. 1	1965	Juneau	Richard M. Hurd, Inst. Northern Forestry	Science in Alaska
17	Aug. 29 - Sept. 2	1966	Anchorage	William Davis, Alaska Methodist Univ.	Science in Alaska
18	Aug. 28 - Sept. 1	1967	College	Peter R. Morrison, UA Inst. of Arctic Biology	Science in Alaska
19	Aug. 26 - 30	1968	Whitehorse	Richard Hill, Dept. of Indian Affairs	Science in Alaska & Northern Development
20	Aug. 24 - 27	1969	College	Victor Fisher, UA Inst. Social & Econ. Res.	Change in the North: People, Petroleum & Environment
21	Aug. 16 - 19	1970	College	T. Neil Davis, UA Geophysical Inst.	Change in the North: UA Physical Environment
22	Aug. 17 - 19	1971	College	Laurence Irving, UA Inst. of Arctic Biology	Adaptation for Northern Life
23	Aug. 15 - 17	1972	Fairbanks	Gordon S. Harrison, UA Inst. of Social & Econ. Res.	Science and Policy in the North
24	Aug. 15 - 17	1973	Fairbanks	Gunter E. Weller, UA Geophysical Inst.	Climate of the Arctic
25	Oct. 18 - 20	1974	Anchorage	William Davis, Alaska Methodist Univ.	Behavioral Sciences in the North
26	Aug. 11 - 15	1975	Fairbanks*	Donald W. Hood, UAF Inst. of Marine Science	Third International Conference on Port & Ocean Engineering Under Arctic Conditions (POAC)
27	Aug. 4 - 7	1976	Fairbanks	George C. West, UAF Inst. of Arctic Biology	Resource Development: Processes and Problems
28	Sept. 22 - 24	1977	Anchorage	David M. Hickok, UA Arctic Environ. Info. & Data Center	Science Information Exchange in Alaska
29	Aug. 15 - 17	1978	Fairbanks	Donald H. Rosenberg, UA Alaska Sea Grant	Alaska Fisheries: 200 Years & 200 Miles of Change
30	Sept. 19 - 21	1979	Fairbanks	Daniel B. Hawkins, UAF Geophysical Inst.	Science for Alaska
31	Sept. 17 - 19	1980	Anchorage	E. Lee Gorsuch, UAA Inst. od Social and Econ. Res.	Agenda 80S
32	Aug. 25 - 27	1981	Fairbanks	John Bligh, UAF Inst. of Arctic Biology	Life Sciences in the Service of Alaska
33	Sept. 16 - 18	1982	Fairbanks	Vera Alexander, UAF Inst. of Marine Science	Science in the North
34	Sept. 28 - Oct. 1	1983	Whitehorse	Arthur Pearson, Rampart Dev. Corp.	Alaska/Canada North: Neighbours in Science
35	Oct. 2 - 5	1984	Anchorage	John Davies, UAF Geophysical Inst.	Science in Public Policy
36	Sept. 27 - 29	1985	Fairbanks	Robert G. White, UAF Inst. of Arctic Biology	Technology and the Scientist
37	Jun. 8 - 13	1986	Vancouver**	Richard Bushey, Yellowknife, NWT	All Disciplines

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No.	Dates	Year	Location	Chair	Theme
38	Sept. 24 - 26	1987	Anchorage	Thomas Morehouse, UA Inst. of Social and Econ. Res.	Alaska's Resources, Alaska's Future
39	Oct. 7 - 10	1988	Fairbanks	Neal B. Brown, UAF Geophysical Inst.	Science Education
40	Sept. 14 - 16	1989	Fairbanks	Francis Williamson, UAF Inst. of Arctic Biology	Global Change
41	Oct. 8 - 10	1990	Anchorage	Thomas Newbury, US Minerals Mgmt. Svc.	Circumpolar Perspectives
42	May 16 - 18	1991	Fairbanks***	Neal B. Brown, UAF Geophysical Inst.	Circumploar Modeling of Climate Change
43	Sept. 8 - 12	1992	Valdez	Kenneson Dean, UAF Geophysical Inst.	Environmental Change: Natural and Man-Made
44	Sept. 15 - 18	1993	Whitehorse	Arthur Pearson, Rampart Dev. Corp.	Circumpolar Information Exchange: Shrinking the Circumpolar Community
45	Aug. 25 - 27 Aug. 29 - Sept. 2	1994	Anchorage Vladivostok	Rosa Meehan, US Fish and Wildlife Serv.	Bridges of Science Between North America and the Russia Far East
46	Sept. 19 - 21	1995	Fairbanks	Robert G. White, UAF Inst. of Arctic Biology	Landscapes
47	Sept. 19 - 21	1996	Girdwood	Jack Kruse, UA Inst. of Social and Econ. Res.	Shaping an Unpredictable Future: Science and Communities
48	Sept. 24 - 27	1997	Valdez	R. Ted Cooney, UAF Inst. of Marine Science	Arctic Science and Resource Management: Exploring the Issues
49	Oct. 25 - 28	1998	Fairbanks	Syun-ichi Akasofu, UAF Geophysical Inst.	International Cooperation in Arctic Research: Detecting Global Change and its Impacts in the Western Arctic
50	Sept. 19 - 22	1999	Denali National Park & Reserve	Claus-M.Naske, UAF History Dept.	Science in the North: 50 Years of Change
51	Sept. 21 - 24	2000	Whitehorse	Joan Eamer, Yukon Science Inst.	Science and Community Crossing Borders - Arctic Science 2000
52	Sept. 12 - 15	2001	Anchorage****	Don Spalinger, AK Dept. of Fish and Game	2001 Arctic Science Odyssey: Exploring New Technologies and Methodologies for Arctic Science Management
53	Sept. 18 - 21	2002	Fairbanks	Terry Whitledge, UAF Inst. of Marine Science	Connectivity in Northern Water: Arctic Ocean, Bering Sea, and Gulf of Alaska Interrelationship
54	Sept. 21 - 24	2003	Fairbanks	John C. Eichelberger, UAF Geophysical Inst.	Extreme Events: Understanding Perturbations to the Physical and Biological Environment
55	Sept. 14 - 16 Sept. 26 - Oct. 1	2004	Vladivostok - 1 Anchorage - 2	Craig E. Dorman, VP Research UA Statewide System	1 - Bridges of Science 2 - Human Dimensions of the Arctic Environment
56	Sept. 27 - 29	2005	Kodiak	Scott Smiley, Fishery Industrial Technology Center, UAF	Consequences of Arctic and Sub-Arctic Environmental Variation
57	Oct. 2 - 4	2006	Fairbanks	John Walsh, Center for Global Change and Arctic Systems Research, UAF	State of the Arctic: Current State of the Arctic Observations and Evaluations of Arctic Change
58	Sept. 24 - 26	2007	Anchorage	John Kelley, School of Fisheries and Ocean Sciences, UAF	Partnering for Northern Futures: Science, Policy, Education, and Learning in the International Polar Year
59	Sept. 15-17	2008	Fairbanks	S. Craig Gerlach, UAF Anthroplogy Dept.	Growing Sustainability Science in the North: Science • Policy • Education • Legacy In the International Polar Year
60	Sept. 14-16	2009	Juneau	Brian Edmonds, UAF Dept. of Chemistry and Biochemistry	Impact of Environment on Human Health: Interdisciplinary Science and Education
61	Sept. 13-15	2010	Anchorage	Lillian Alessa, Chair, UAA Resilience and Adaptive Management Group	Water: Integrating Health, Habitat and Economy

*Arctic Division co-sponsored the International Port and Ocean Engineering Under Arctic Conditions (POAC) Conference
**Joint with the Pacific Division
***Yukon College cancelled; conference moved to Fairbanks
****Not held due to the tragic events of Sept. 11, 2001 at the World Trade Center and the Pentagon

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2011 Arctic Science Conference Abstracts

Abstracts are listed alphabetically according to presenter.

1. A Framework for Assessment of Ecological Risk to Wild Salmon Associated with Large-scale Mining in the Nushagak/Kvichak Headwaters of Bristol Bay

David Albert and David Trim • dalbert@tnc.org

Ecological risk assessment (ERA) has become an essential tool for evaluating impacts to biological receptors associated with wide range of human activities. We applied ERA methodology to develop a framework for analyzing potential risks to salmon that may result from large-scale mining and associated facilities in the Nushagak / Kvichak headwaters. This framework includes consideration of key ecological functions that support all freshwater life-stages of salmon (i.e., in-migration, spawning, incubation, rearing, out-migration). Potential risks included physical factors such as loss or alteration of habitat associated with water withdrawals and road construction, and chemical factors such as metals contamination, pipeline spills, acid mine drainage, and large-scale pollution events. While it is not possible to predict future conditions with certainty, this conceptual framework provides a systematic approach to evaluate the potential scope and severity of a range of risk factors, as well as potential effects on ecological systems that support salmon, as a tool to inform decision-making and risk management.

2. Forget the Ifs...Let's Focus on the Whats and Hows

Heather Allen • hlallen2@alaska.edu

College mathematics serves the role of gatekeeper in achieving a college degree, particularly for those students requiring math remediation. Byrk and Treisman (2010) suggest that "remedial math has become an insurmountable barrier for many students, ending their aspirations for higher education" (p. B19). The negative correlation between math remediation and degree completion is a big concern for students, faculty, and college administrators (George, 2010; Hall & Ponton, 2005; McGlaughlin, et. al, 2005). Investigating postsecondary developmental mathematics teaching objectives is of great importance simply on the basis of the large percentage of modern college students in need of assistance. Depree (1998) suggests "problem solving and the development of conceptual understandings are now critical components of current mathematics curricula" (p. 2). Surprisingly, current literature demonstrates a notable lack of articles involving the actual teaching methods of developmental mathematics educators at the postsecondary level. This study identified and classified stated objectives found in professional journals which often serve as guidelines for teachers in developmental mathematics. A mere 51 articles produced a meager 174 statements concerned with teaching objectives in postsecondary developmental mathematics in the 45-year span from 1965 to 2009. The biggest body of research investigated during the course of this study focused on assessing the effectiveness of existing developmental mathematics programs, new course designs, or the characteristics of the developmental student. Researchers must focus less on if developmental mathematics programs are successful at postsecondary institutions and more on what classroom practices makes a program successful and how to implement those practices uniformly.

3. Using Citizen Scientists to Conduct Sentinel Potato Virus Studies in Alaska

Jodie Anderson and Jeff Smeenk • jmanderson@alaska.edu

Seven non-commercial producers collaborated with UAF researchers in a sentinel potato study to grow five varieties of certified clean potato seed in replicated plots in communities around the state of Alaska. During the 2009-2011 growing seasons, a member of the UAF research team visited each research site and the plots were inspected for any visual signs of infection. During the site visits, aphids were collected for later identification in four locations. No research site visit resulted in any visual signs of potato viruses and all aphids collected (n = 60) were from non-potato plant sources as no inspected potatoes had aphids. Aphids were identified to the genus level by the Alaska ARS entomology team as Euceraphis (n = 11), Macrosiphum (n = 38), and Myzus (n = 11). Five of the seven community research collaborators harvested the 200 certified seed potatoes that were sent out in early June 2009 (one producer lost their plants to an early frost and the second did not harvest due to unanticipated flooding). The study protocol was to collect random tubers from every fifth plant and send the collection to the Matanuska Experiment Farm where the tubers were stored in walk-in coolers. In March 2010, the stored tubers were planted in a greenhouse for winter grow-out. Samples were ELISA tested by Agdia, Inc for the presence of five different viruses: PotLV, PLRV, PVA, PVX, and the suite of Potyvirus. A total of 342 tubers were planted for the grow-out and 320 composite leaf tissue samples were sent out. 100% of the samples tested negative for all five assays.

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4. Enhancing Utilization of Fish Processing Byproducts

Peter Bechtel • bechtel@sfos.uaf.edu

Fish processing byproducts are the parts that remain after valued products such as fillets and roe are removed. Fish harvested from Alaska waters provide over half of the total wild fish harvested and processed for human consumption in the USA. Major byproducts from commercial fish processing plants include heads, viscera, frames and skin. In Alaska large amounts of pollock, salmon, cod and flat fish are harvested and processed annually, resulting in over 1 million metric tones of byproducts. Alaska fish byproducts have several advantages because they are derived from sustainable fisheries where all fish are harvested and processed for human consumption. Most, but not all, of Alaska fish processing byproduct is currently utilized, and the major use is as the raw material for making fish meals and oils. The value of fish byproducts has increased because fish meal and oil prices have increased during the past decade. There is interest in extracting more of the oil from byproducts such as salmon heads, which are good sources of oils rich in omega-3 fatty acids and other components. Low cost methods are being developed for extraction and purification of oils from salmon heads and livers of other fish species. Studies are also under way to increase utilization and value of byproduct protein by developing low cost drying and stabilization methods. A variety of different products made from livers, stomachs and other tissues are being evaluated as food and feed ingredients. Other studies include uses of byproducts as fertilizers, fuels and high value proteins such fish skin gelatins. This presentation will discuss studies being conducted by the USDA Agricultural Research Service in collaboration with the University of Alaska Fairbanks at the Fishery Industrial Technology Center in Kodiak AK and others, with the goal of increasing the utilization of fish processing byproducts.

5. A Regional Training Program for Medical and Allied Health Providers in the Arctic

Rachel Boschma-Wynn, Rebecca Porter, Alexandra Edwards, Bridget Hanson, and Mark Johnson • rvboschmawynn@alaska.edu

Fetal Alcohol Spectrum Disorders (FASDs) is the term used to describe a wide range of physical, behavioral, or developmental abnormalities that can affect a person whose mother drank alcohol while pregnant. FASDs are not limited by race or ethnicity and any woman who uses alcohol while pregnant can have a child with an FASD. As climatic and environmental changes continue to impact the cultural practices and lifestyles of Arctic peoples, individuals in northern communities now face a growing number of health concerns, including FASD. In the state of Alaska, FASD has been identified as one of the largest health concerns and health disparities with an estimated prevalence rate of 16.3 per 1,000 live births (Alaska FAS Surveillance Project, 2010). Prevention and intervention efforts to date have been complicated by a lack of medical care, a situation that is common throughout the circumpolar north. In many rural communities, health care is sparse or non-existent, and rural providers are often poorly supported and have few opportunities for continuing education (International Arctic Science Committee, 2010). In 2008, the University of Alaska Anchorage (UAA) became one of five university-based regional training centers (RTCs) funded in a three-year cooperative agreement by the Centers for Disease Control and Prevention (CDC). The objective of the RTC was to develop, implement, and evaluate a new training program for medical and allied health students and practitioners regarding the prevention, identification, and treatment of FASDs. The Arctic FASD RTC, working alongside a community advisory panel, designed and currently delivers locally-tailored trainings with information specific to the needs of individuals in the rapidly-changing Arctic environment. As of July 2011, the RTC has provided training to 2,409 practitioners, students, and community members using a culturally-relevant, collaborative, and strength-based approach to promote the prevention," "identification, and treatment of individuals experiencing an FASD. This presentation will provide an overview of the Arctic FASD RTC, including currently available process and outcome data. In addition, findings will be presented on how to overcome barriers to integrating FASD prevention and intervention into existing service systems in order to promote cost-efficient, sustainable prevention and early intervention strategies to improve the health and well-being of residents of the circumpolar north.

6. The Protected Areas of Kamchatka: Goals, Challenges, and Solutions

Sergey Bychkov

The Kamchatka Protected Areas Association seeks to coordinate and develop the work of the peninsula's protected areas. Sergey Bychkov, executive director of the KPAA, will present the history of the many protected areas on Kamchatka, the goals for these areas, and the challenges and solutions that accompany those goals.

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7. Drumbeats: Place Based Science Education Certificate Programs for Rural Alaska

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The Drumbeats Consortium is a collaborative effort of five rural campuses from the University of Alaska Fairbanks (UAF) College of Rural and Community Development (CRCD) and is part of the USDA Alaska Native/Native Hawaiian Serving Institutions (AN/NH) grant program. With the assistance of USDA grant funding, the consortium has developed four place-based science certificate programs which are offered through UAF and have been instrumental in improving the availability of math and science education throughout rural Alaska. These programs combine western empirically-derived science principles and concepts with the indigenous knowledge base and practices of the Alaska Native population. A major goal of the Drumbeats Consortium is to retain local talent and natural leaders in their respective communities in rural Alaska, slowing the exodus of residents seeking greater educational and employment opportunities. An expected progression is that students who complete these programs will seek further education or gain employment in associated vocational fields. Such efforts lead to opportunities for local employment which will lead, in turn, to improved infrastructure and quality of life in rural Alaska.

8. Arctic Fisheries: Current and Future Status of the Arctic States Management

Lisa Campion • Ex. 6 PII

The ever-changing climate of the Arctic is at odds with the management of the fisheries resources in this vast ocean. The eight Arctic states need to look at the current and expected status of the Arctic fisheries to determine where the current fisheries management framework needs to go to keep up with the melting Arctic. In the past, humans have harvested, trawled and discarded ocean fish until the fishery collapses. These actions plus recent changes in the sea ice and climate change means the Arctic fisheries status is unknown. Sea ice, as an essential element within the Arctic, directly and indirectly affects ecological processes. Therefore, as sea ice coverage changes, significant implications on ecological processes may occur that could open areas for commercial fishing that were previously closed in the Arctic. To prevent overfishing or environmental degradation of the last frontier of fisheries, Arctic states need to proactively approach their fisheries management frameworks instead of being one step behind. Arctic states realized the importance of proactive decision-making when they initiated international discussions to conserve and manage future fisheries in the Arctic Ocean at the 2009 International Arctic Fisheries Symposium. Besides this discussion, the U.S. Senate adopted a resolution for the U.S. to lead international negotiations for an agreement to manage Arctic fisheries. However, overfishing of Arctic cod already occurs in Norway and may in other Arctic countries in the near future unless the Arctic states adopt proactive approaches to fisheries management. To understand how the Arctic states can act proactively, this presentation will examine the current status of Arctic fisheries along with the international and regional legal frameworks managing the Arctic Fisheries.

9. Passive Office: An Experiment in Energy Efficient Construction

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The UAF Bristol Bay Campus recently designed and built an experimental structure largely based on the Passive House Standard. It is designed to maintain a comfortable, year round temperature relying primarily on passive solar gain, body heat and "waste" heat provided by lights and appliances. The Passive Office will be used as an educational model for cold climate, energy efficient building techniques. Data is being collected to determine the building's energy performance.

10. Sustainable Energy Education in Alaska

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The consumption of high amounts of fossil fuels in Alaska poses economical, environmental, and other issues. A transition towards more sustainable practices requires human capital educated in the area of energy efficiency and renewable energy. This presentation provides an overview of sustainable energy educational activities in Alaska. Both academic and non-academic levels are included. Existing programs as well as those in development are mentioned. The end of this presentation focuses on specific sustainable energy educational activities of the UAF Bristol Bay Campus.

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11. Using Aerial Imagery and Fish Capture Data to Estimate Juvenile Pacific Salmon Abundance

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Cataloging and monitoring of freshwater rearing habitat is critical for developing ecosystem-based management goals for Pacific Salmon in Alaska. However, in remote areas of the state this process becomes logistically and financially difficult. Remote sensing methods may be useful in quantifying habitat and detecting change over time. In order to work towards ecosystem-based management in Bristol Bay, this project explored novel approaches to habitat monitoring in the Togiak National Wildlife Refuge (TNWR), Alaska. In 2010, TNWR began to test the ability of using aerial photography in the visible light, near infrared and thermal range to detect and quantify instream habitat in two small study areas in the Kulukak River basin. In addition, multiple-removal electrofishing was used to estimate juvenile salmon abundance in a sample of the habitat types detected through the aerial photography. Estimates of juvenile abundance by habitat type were combined with estimates of surface area of habitat by type to determine juvenile salmon density and total population abundance by species and habitat type for the two study areas. In this presentation, I will elaborate on the quality of the estimates obtained, discuss possible sources of error, and provide suggestions for incorporating these methods into future freshwater salmon habitat monitoring plans in southwest Alaska.

12. Working Towards Ecosystem-based Management in the U.S. Arctic Waters

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Ecosystem-based management (EBM) offers a promising management tool for addressing cumulative impacts from multiple stressors in the U.S. Arctic. Arctic Ocean ecosystems are experiencing rapid environmental change, such as changing sea ice conditions, reducing important habitat for Arctic species such as the walrus and presenting challenges to traditional subsistence practices. At present the Arctic is largely lacking major in-situ anthropogenic stressors, but because of the changing environmental conditions, there is increased interest in industrial activities such as offshore oil/gas development, tourism, fisheries, and vessel activity. Environmental analyses in the US claim to examine the effects of cumulative impacts, yet in practice the impact for each activity within each sector (e.g., a fishery management plans) and often times within each sector by each company (e.g., seismic testing, exploration plans) is examined on its own. Threats from human activity or environmental change may act independently on species and habitats, but many impacts may be additive and/or synergistic. Currently, stock assessments do not account for all risk-factors. The human role in the ecosystem is often ignored or minimized, as is input from sources such as local and traditional knowledge. We propose that one possible solution is scenario planning similar to that used by the Intergovernmental Panel on Climate Change that would provide modeling tools to examine stress-thresholds in Arctic ecosystems, and project when those might be crossed. In this presentation we examine what the EBM concept promises for the Arctic, provide some examples how EBM might make a difference to single sector and single species management, and discuss how it might be implemented in practice.

13. Land, Environment, and People in the North — Developing an Online Course

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In 2010 an effort was made to create an online version of a subsitance, land management, and science course so that it could be delivered to a larger group of students. "Land, Environment, and People in the North", or LAS 493, was created with the help of UAF's Center for Distance Education and is now being offered to both graduate and undergraduate students. Textbook and course development process will be discused. Also, although still in the early stages of the first semester, feedback and early findings will be shared. Also, plans for future development will be touched upon.

14. University of Alaska Science Education in Rural America: SENCER-related Learning Outcomes and Attitudes in Chemistry Courses for Non-majors

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A comparative study using the SENCER capacious topic approach was piloted to examine participants' self-assessments of their science learning gains and attitudes towards chemistry. In this comparison, we report the results of the SALG survey at the University of Alaska Fairbanks (UAF) and Heritage University (HU), Washington. University students consistently claimed the greatest learning gains (post-course survey) for the same areas that they claimed the greatest understanding in the pre-course survey. This result was observed in relation to the topics of "ph" and "periodic table". The topic of dyes discussed in Chem 100 at HU was not discussed in the UAF Chem 100x class. The UAF course was used as an internal validation of the comparison.

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15. Vulnerability and Stewardship: Monitoring the Legacy of Mining in the Arctic

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Sustainability of the Arctic and subarctic must be understood in terms of the interactions within vulnerable ecosystems and the goal of long-term stewardship for the land and its people. Frameworks for sustainable development have been developed where optimums replace maximums. Mitigation of past environmental stressors is often required and pollution monitoring is essential for risk assessment. Herbivores and plants can be used as biological monitors, or sentinels, of exposure. In the Arctic, legacies of mining activity can be used as case studies demonstrating the complexity of system disturbance. Musk oxen (Ovibos moschatus) are distant relatives of sheep and have roamed the Arctic for a million years. Some scientists are concerned that some muskox populations in the more southern ranges could be impacted by climate change and increased exposure to contaminants. Muskox feed on plants on hilltops and upper slopes where shrubs are increasing at the expense of grasses and lichens. Changes in plant species composition, changes in fire regime and occurrence of flooding events add complexity to past mining development. Total Hg (THg) bioavailability in this study was monitored by analyzing the hair of grazing muskox at several sites to initiate development of a THg baseline for the Seward Peninsula region. In 2009 muskox mean THg hair levels of 29.3 ng g-1 for the western base of Mineral Mountain, 28.6 ng g-1 for Nature Hill and 23.0 ng g-1 for the camp at Deering are reported. The means for THg level at Anvil were 35.2 ng g-1 at the top, 31.8 ng g-1on the southwest slope and 29.9 ng g-1 at the base. No differences in the THg levels were observed in relation to muskox gender. At both Anvil and Mineral Mountain, qiviut THg was lower than guard hair (32.9 ng g-1 versus 44.8 ng g-1)

16. Calorie Counting of Nushagak Bay Estuarine Animals in Southwest Alaska.

Dan Dunaway and Todd Radenbaugh • Ex. 6 PII

Nushagak Bay is a freshwater estuary in Southwest Alaska. Bristol Bay Environmental Science Lab has been sampling this estuary and measuring the caloric energy of common species for food web analysis. During the summers of 2007 through 2011, a small 3 meter otter trawl was to collect samples of fish and invertebrates at selected stations. Hauls lasted 15 minutes at speeds of 1.4 m/sec at depths ranging from 1.5 to about 15 meters. Salinity, temperature, pH, dissolved oxygen, conductivity, turbidity, weather conditions and tide stage data were collected. Common fish species included rainbow smelt, blackline pricklebacks, stickle backs, starry flounder, juvenile salmon, and sculpins. Invertebrates captured included: bay shrimp, moon jellies, macoma clams, amphipods (two species) and Saduria isopods. In 2010 new stations were added to the south and a number of previously uncaptured species were sampled there such as sea stars, urchins, anemones, pandalid shrimp, cod and sole. For caloric analysis, subsamples of each species were dehydrated, ground to powder and pelletized. Gross heat of combustion (GHOC) in calories per gram (cal/g) were calculated using a . Parr semimicro calorimeter. Two to 5 replicate determinations have been conducted on species collected. A total of 170 determinations (including replicates) have been completed for year 2007 while 218 have been done for the 2010 season. The samples from 2011 are in the preparation stage. Calories of species ranged from a low of 2886.926 cal/g (n=3) for the sea star Henricia sp. to a high of 5869.26 cal/g (n=4) for ninespine stickleback Pungitius pungitius. Between years, the average caloric values of species included rainbow smelt (Osmerus mordax) 4911.8 cal/g (n=42) in 2007 vs. 4796.45 cal/g (n=16) in 2010; Bay shrimp (Crangon sp) 4145.27 cal/g (n=24) in 2007 vs. 4225.31 cal/g (n=27) in 2010. The mean values for the amphipod Gammaracanthus aestuariorum sampled in 2007 were 5352.19 cal/g, (n=20) vs.

17. Early life history of Alaska blackfish (Dallia pectoralis) from Cook Inlet Basin, Alaska

Dona Eidam and Carolyn Knackstedt • Ex. 6 PII

The Alaska Blackfish (Dallia pectoralis) is a small freshwater mudminnow endemic to Beringia. Alaska blackfish occur on the Chukotka Peninsula of Eastern Russia, across Western Alaska, Central Alaska in the Yukon River drainage, and on the North Slope. First introduced to Southcentral Alaska in the 1950s, Alaska blackfish are believed to inhabit most Cook Inlet Basin waters. The species exhibits extreme hardiness from an ability to breathe atmospheric air and also legendary cold-tolerance. Alaska blackfish life history is poorly described, and only one study from 1965 documents successful artificial fertilization and early rearing of blackfish from Lake Aleknagik in Bristol Bay. Here we describe an in vitro fertilization of blackfish collected from Rabbit Slough in Cook Inlet Basin. We document embryo and larval development and describe our methods used to rear juvenile blackfish.

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18. Togiak Spawn-On-Kelp Project
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This project was initiated by a request for information from the Division of Commercial Fisheries, Alaska Department of Fish and Game and the Togiak Traditional Council. For several years the Division of Commercial Fisheries in Dillingham has attempted to collect harvest and use data including harvest locations for herring spawn-on-kelp in the Togiak District of Bristol Bay. This information is useful in determining areas that are important for the harvest of herring spawn-on-kelp by residents of Togiak and Twin Hills. Residents of Togiak have related to Department of Fish and Game staff that they do not participate in the Togiak herring commercial fishery as they once did due to a concern about abundance of herring for subsistence uses. What is not well understood is the amount of herring spawn-on-kelp that is harvested by local residents, the areas where the harvest takes place, and the factors that influence decisions residents make regarding participation in both the commercial herring fishery and the subsistence spawn-on-kelp fishery. Data collected as part of this project could inform managers of important harvest areas for subsistence uses of herring spawn-on-kelp. Findings from this project could lead to a proposal for the 2012-2013 Board of Fisheries Bristol Bay meeting that would protect an area of the Togiak District for subsistence uses of herring spawn-on-kelp. This proposal would be generated by the Division of Commercial Fisheries and the Division of Subsistence.

19. Bristol Bay Sockeye Salmon Early Marine Ecology: what have we learned from 10 years of research in the Bering Sea
Edward Farley, Jr.

For the past 10 years, scientists from the Auke Bay Laboratories conducted fisheries and oceanographic surveys in the eastern Bering Sea during mid-August to September to address hypotheses related to eastern Bering Sea productivity and factors affecting distribution, relative abundance, size, fitness, and overwinter survival of juvenile salmon. The results of the research suggest that spring and summer sea temperatures can affect productivity at lower trophic levels, as well as distribution and migration pathways of juvenile Bristol Bay sockeye salmon, as well as their diet, size, and energetic status during their first year at sea. These and other indices will be provided to highlight the early marine ecology of juvenile sockeye salmon along the eastern Bering Sea shelf.

20. Where the Rubber Meets the Road: Education on the Fly in Rural Alaska
Greg Finstad • glfinstad@alaska.edu

Developing educational platforms and curricula that can improve quality of life in rural Alaskan villages is particularly daunting. Many bright young students head down the education pathway and develop careers that lead them far away from the village. Potential non-traditional students, those older or with family and subsistence activity commitments, may be unable to leave the village to participate in sessions at local educational or vocational institutions. Although, great strides have been made in distance delivery of education to off-the-grid communities, face to face interaction with instructors coupled with an active participation in region-specific curricula is the most effective way to assimilate knowledge and skills into the lives of village community members. The University of Alaska Fairbanks, Northwest Campus recently developed a High Latitudes Range Management curriculum that integrates regional natural and human resources in an educational and vocational training platform focused on local work force and economic development. A mobile slaughter plant and a meat processing facility are used as student laboratories to support instruction and training in the inspected slaughter and retail processing of reindeer meat. The curricula and laboratories have been designed to be transported by barge to isolated villages where on-site instruction and training can be delivered. By delivering 'education and vocational training on the fly' we will more effectively engage and instruct members of isolated rural villages to enhance quality of life.

21. Conserving Habitat and Traditional Use in the Nushagak River Watershed
Sue Flensburg and Tim Troll • sflensburg@bbna.com

In the 1980's local communities along the Nushagak River engaged with the State of Alaska to develop a recreation management plan for state lands in the watershed. Later these same communities created the Nushagak-Mulchatna Watershed Council and the Nushagak-Mulchatna / Wood-Tikchik Land Trust to address specifc conservation issues around water and land. In 2005 the Nushagak-Mulchatna Watershed Council began a watershed conservation planning effort that culminated in 2007 with the publication of the Nushagak River Watershed Traditional Use Area Conservation Plan. This plan remains the guiding document for conservation efforts in the watershed. This presentation will provide an

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overview of these conservation efforts and an update on progress toward completing various strategic actions outlined in the Traditional Use Area Conservation Plan.

22. Inside the Development Process of an eLearning Science Course

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Highlighting salient issues surrounding the development of a distance-based course (ATM 101) using information from Rich Collins and UAF Center for Distance Education instructional designers.

23. Electric Cars in Arctic Regions – Study of the Potential Reduction of Emission By-products and the Impact on Permafrost

Michael Golub and Javier Fochesatto • migolub@alaska.edu

Electric vehicles have drawn increasing interest from federal agencies, the auto industry, academia, and the general public as a promising solution to reducing reliance on fossil fuel energy, and toward eliminating pollution. Carbon dioxide (CO2) is the primary product of fossil combustion, and it may substantially contribute to global warming and result in the melting of permafrost. Electric vehicles (EVs) are more suitable for cold regions than warmer regions since more pollution is generated in cold weather; this is due to the inefficient combustion and elongated warm-up period of the gas-powered automobile. Our current research shows electric vehicles exhibit a pollution reduction of both CO2 and Green House Gases (GHG) at approximately ten percent over gasoline vehicles. This study also seeks to determine potential adverse human health issues from the use of gasoline-powered vehicles in extreme cold temperatures thereby strengthening the case for Arctic electric vehicle usage. However, Arctic electric vehicles need to be studied further to corroborate not only CO2 and GHG reduction, but particle matter as well. At Arctic winter temperatures, vehicle emissions produce gases and particles which can undergo transformations, such as gas-to-particle conversion, which impacts air pollution. Sub-micron and micron size fractions of aerosols can serve as deposition surfaces for volatile gases due to their vapor pressure reduction. Therefore, breathable particles can be becomes severely unhealthy and this will depend on ambient temperature and fuel composition factors. This project proposes to determine the molecular composition of the particulate matter generated after the initial start-up of a vehicle using combustion fuels in an arctic environment. It will also determine how the cold temperature regimens will interact and affect emissions.

24. Effect of Francisella Pathogenicity Island Protein PdpD on Host Cytokine Response

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Francisella tularensis is a gram-negative coccobacillus, and the etiologic agent of the disease tularemia. Due to it's highly infectious nature, Francisella has been designated a category A select bioterrorism agent by the Centers for Disease Control (CDC). Despite this, little is known about the molecular mechanisms of it's virulence. In 2002, a group of 19 genes, termed the Francisella pathogenicity island (FPI) was identified and found to be essential for full virulence. The function of these genes has yet to be determined, however. Interestingly, it has been shown that in the absence of the some FPI genes, host immune response to infection is altered. It has been suggested that some of the FPI genes have an immunomodulatory effect, serving to promote intracellular survival of the bacteria. However as these proposed immune modulatory genes are essential for intracellular growth, interpretation of these results is not straightforward. Two FPI genes, pdpC and pdpD, have been identified as dispensable for intracellular growth of Francisella but are essential for full virulence. Given this characteristic, pdpC, pdpD, and their encoded proteins are good candidates for the investigation of the interaction of FPI genes and host immune response. We studied TNF-a response to infection in the J774 murine macrophage-like cell line and demonstrated that of the two genes, a deletion mutant lacking pdpD has a significantly reduced level of TNF-a secretion when compared to the wild-type strains. This downregulation of TNF-a suggests a potential immunomodulatory role for the FPI encoded protein, PdpD.

25. Science of Alaska Seafood for High Schools: An Interdisciplinary Educational Approach

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Plans are underway this fall for conducting the first U.S. high school course in seafood science. The interdisciplinary nature of seafood science stems from the primary fields of biology and chemistry. This course has emerged from teaching the broader subject of food science and will focus on the processing, preservation, quality control, sensory evaluation and nutritional value of selected seafood from the U.S. third most productive commercial harvesting center, Kodiak,

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AK. A partnership has arisen between Kodiak High School, a local seafood processor and the university and will provide an enriching experience for the students. Specific laboratory topics will be taught in the high school and during visits to the UAF Fishery Industrial Technology Center's pilot processing plant and research laboratories. Additional experiential learning will occur when the students take field trips to a couple of local processing plants. The aim of this USDA-funded project is to provide the educational know-how for high school students to pursue potential careers in the Alaska seafood industry.

26. Permafrost Degradation on the Qinghai-Tibet Plateau

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Based on data from six meteorological stations in the permafrost regions, 60 boreholes for long-term monitoring of permafrost temperatures, and 710 hand-dug pits and shallow boreholes on the Qinghai-Tibet Plateau (QTP), the spatiotemporal variability of permafrost degradation was closely examined in relation to the rates of changes in air, surface, and ground temperatures. The decadal averages and increases in the mean annual air temperatures (MAATs) from 1961–2010 were the largest and most persistent during the last century. MAATs rose by 1.3 degree celsius, with an average increase rate of 0.03 ?degree celsius per year. The average of mean annual ground surface temperatures increased by 1.3?degree celsius at an average rate of 0.03 degree celsius per year. The rates of changes in ground temperatures were -0.01 to 0.07 degree celsius per year. The rates of changes in the depths of the permafrost table were -1 to +10 cm per year. The areal extent of permafrost on the QTP shrank from about 1.5 million square kilometers in 1975 to about 1.26 million square kilometers in 2006. About 60 percent of the shrinkage in area of permafrost occurred during the period from 1996 to 2006. Due to increasing air temperature since the late 1980s, warm (>-1 degree celsius) permafrost has started to degrade, and the degradation has gradually expanded to the zones of transitory (-1 to -2 degree celsius) and cold (<-2 degree celsius) permafrost. Permafrost on the southern and southeastern Plateau degrades more markedly. It is projected that the degradation of permafrost is likely to accelerate, and substantial changes in the distributive features and thermal regimes of permafrost should be anticipated. However, regarding the relationships between degrading permafrost and the degradation of rangelands, it is still too early to draw reliable conclusions due to inadequate scientific criteria and evidence.

27. Progress from the Ethnobotany Certificate Program at the Kuskokwim Campus of the University of Alaska Fairbanks

Kevin Jernigan

The Ethnobotany Certificate Program at the Kuskokwim Campus of the University of Alaska Fairbanks is the first of its kind for US indigenous serving academic institutions. This program, added to UAF in 2009, concentrates on how native Alaskan peoples view and use plants. It grew out of local support for maintaining the existing traditional knowledge base, providing an educational foundation for future research, and developing new uses for native Alaskan plants. Graduates from our program will also be well positioned for incorporating local knowledge and traditional natural resource management perspectives into the governing process of state and local agencies. The certificate involves 5 core courses and additional electives, to make a total of 30-32 credits. Recent activities also include the convening of four meetings in Bethel of 25 elders from 12 villages of the Yukon-Koskokwim region to discuss 70 local species of plants, fungi and algae for the purpose of creating the first bilingual Yup'ik/English ethnobotany manual.

28. Local Observation of Change by Subsistence Harvesters in Togiak, Alaska

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This paper will describe selected findings of research conducted between January 2009 and March 2010 as part of the Bering Sea Integrated Ecosystem Research Project (BSIERP) on the local traditional knowledge of Togiak , Alaska, hunters, fishers, and gatherers associated with changes in the environment both natural and human. Togiak is located at the mouth of the Togiak River at the head of Togiak Bay within Bristol Bay area of the Bering Sea. Togiak Bay is the premier herring spawning location within Bristol Bay and the location of the Yup'ik named Qayassiq Island (Round Island), a significant Pacific walrus haul out for males in the summer and fall. Commercial fishing for herring in the spring and salmon in the summer is conducted in Togiak Bay. Trawling for yellowfin sole takes place outside of Togiak Bay. Hunting for marine and land mammals, and fishing for salmon and non salmon fish in ocean and fresh water have sustained the Yup'ik residents of the area for millennia. Togiak residents have observed a decline in the presence of ice seals in Togiak Bay due to the infrequency of the southern extent of the sea ice. Changing climate has thus affected hunting patterns for some marine mammals, but observed changes in the behavior of some species including walrus and king eiders are attributed by Togiak residents to human disturbance from commercial fishing.

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29. Resilience of Local Knowledge in Tree Harvesting and an Assessment of Climate Changes on Harvesters

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Tlingit and Haida people have been harvesting trees for household items and ceremonial uses for thousands of years. By using their local knowledge, harvesters knew when to harvest wood, roots and bark. Some scientists have found that climate change has been influencing yellow cedar growth in Southeast Alaska. Possible causes are early thaws, subsequent freezing, and low snow cover. When the winter comes, snow is good for cedar, because it provides insulation from temperature fluctuations. In the last few decades many of the winters have had less snowfall and temperature fluctuations. Research indicates healthy trees need to have a cold and wet winter to grow. The impact of climate change on spruce root and cedar bark harvesting will be assessed.

30. Exploring the Long-term Care Needs of Alaska Native Elders in Rural Alaska.

Jordan Lewis • jplewis@alaska.edu

The current trend in long-term health care service delivery includes placing older adults in long-term care or skilled nursing facilities. Many of the rural villages in the State of Alaska have little to no access to routine health care services let alone a long-term care facility. When an Elder begins to need more assistance or medical care than family members are able to provide, many of them are sent to a long-term care facility in an urban location. Previous research with Alaska Native Elders has given voice to the Elders' preference of remaining in their home community as they grow old (Lewis, 2011). We were approached by a community in the Northwest region of Alaska to conduct a needs assessment with the Elders in the area to determine the most effective, efficient, and culturally congruent way to serve the Alaska Native elders in their communities. Working collaboratively with the 5 participating villages we conducted a quantitative needs assessment employing the use of the Indian Health Service "Identifying our Needs" survey instrument. This phase consisted of interviews with 134 Alaska Native Elders aged 60 years and older, and was followed by a qualitative phase in which selected elders were interviewed to help gain a deeper understanding of their wants and needs. The results provide strong support for a much needed paradigm shift in the way long-term care is delivered in Alaska.

31. What Successful Aging means to Alaska Natives: Exploring the reciprocal relationship between the health and well-being of Alaska Native Elders and Communities in Bristol Bay, AK

Jordan Lewis • jplewis@alaska.edu

As rural and urban communities in Alaska face an increasing elderly population, it will be important to understand the experiences of Alaska Native (AN) Elders and explore the reciprocal relationship between Elders and communities and the impact each has on health and wellbeing. This article highlights the role of the community in AN Elders' definitions of successful aging, and explores how AN Elders contribute to the health and resilience of rural communities. This study utilized grounded theory with a purposive sample of 26 Elders in five villages in Southwest Alaska that were selected by their respective tribal councils. The findings highlight the importance of family and community support, which contributes to their optimistic attitude toward life. They provide the Elders with a sense of purpose and having a role in their family and community, directly impacting their health and wellbeing and enabling them to remain active in their homes and communities. As the population of older adults and community dynamics change, so will the concept of successful aging and how AN Elders view the contributions of community engagement and health, as well as how they view their role(s) in contributing to the health and wellbeing of their community.

32. Essential Fish Habitat: Not Just Hard Substrate, But Ecosystem Processes (An Overview).

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Amendments to the Magnuson-Stevens Fishery Conservation Act (MSFCA) in 1996 were groundbreaking in several respects. We define Essential Fish Habitat (EFH), and expand upon a growing awareness that EFH is not simply hard substrate. Ecosystem processes influence suitability of habitat in riverine, estuarine and marine habitats. Recognized concepts suggest each system contributes to the character of the other in ways not yet fully understood. In watersheds, our understanding of hyporheic processes is expanding. This zone where ground and surface waters interact are essential spawning and rearing habitat for anadromous and resident species. At a larger scale, terrestrial landforms saturated by annual snowmelt and rainfall support instream flows flushing interstitial substrate. At finer scales, this exchange transports essential gases, removes waste, provides nutrient and groundwater recharge regulates over winter water temperature on salmonid embryos. Outwelling rivers flood marine estuaries with detrital and marine derived nutrients combining with tidal and current driven marine nutrients. Contrasting temperature, salinity gradients and sunlight fuel

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primary and secondary production. These complex estuary processes provide nutrient to multitudes of trophic levels. Further influenced by tides and currents, marine waters rich in upwelling nutrient combine with this rich estuarine complex. Productivity in marine processes are amplified and distributed in pelagic waters, often seen as convergence fronts. Growing understanding of ecosystem processes and complexity suggest a greater physical connection between terrestrial, estuarine, and marine processes. Fisheries managers and investigators in science and research need to look beyond specific species or lines of jurisdiction to consider overall ecosystem processes that influence long term fisheries sustainability.

33. Dolly Varden S. malma Life History Studies in Togiak National Wildlife Refuge

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Three species of char Salvelinus occur in southwest Alaska. A survey in the mid-1990s determined that 90% of subsistence households in the village of Togiak utilize char in their diet and harvested approximately 10,800 char. Early work determined that this harvest is composed of primarily anadromous Dolly Varden S. malma. Concerns about declining fish size and abundance prompted investigation of Dolly Varden populations in Togiak Refuge. A variety of methods have been employed since 1997 to determine Dolly Varden distribution, abundance, life history characteristics, and spawning and overwintering habitat in three major drainages within Togiak Refuge. Salmon weirs are being used to monitor abundance and maturity of Dolly Varden. Over 13,000 adult Dolly Varden have been captured and marked. An additional 280 were surgically implanted with radio transmitters and relocated during 80 tracking flights. Genetic tissue has been collected from over 7,500 juvenile and spawning adult Dolly Varden. Over 300 tagged Dolly Varden have been recaptured in various fisheries and research activities. Ten tagged fish have been recovered from the subsistence, sport and commercial fisheries in other drainages around the Bering Sea coast - as far away as Norton Sound, approximately 500 miles to the north." "A summary of life history observations for the Dolly Varden that use the Refuge include: DV are anadromous, but spend most of the year (July – May) in freshwater DV runs are comprised of mixed maturity and mixed stocks DV return to their home waters to spawn, but not always to overwinter DV spawn during late August to mid October DV are concentrated in the main river and lakes during winter DV exit freshwater to the ocean after ice breakup – April to June DV travel great distances throughout the Bering Sea between spawning and overwintering streams Monitoring DV abundance is not easy due to their roaming migrations This research supports the conclusion that the concerns raised about Dolly Varden size and abundance may be due to natural variability or due to their migratory behavior and lack of overwintering habitat fidelity.

34. Evaluation of Salmon and Alder as Drivers of Nutrient Availability and Lake Productivity in Southwestern Alaska

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Southwestern Alaska supports the greatest salmon runs in the world. The importance of salmon to humans as a food and recreational resource has been long understood, and there is now a growing awareness of the ecosystem services salmon provide. Marine-derived nutrients through salmon runs play a key role in nutrient cycling and productivity of terrestrial and aquatic ecosystems. As a result, management often focuses on the importance of marine nutrients to aquatic system health. However, salmon are not the sole nutrient source in aquatic systems in southwestern Alaska, but little is known about alternative productivity sources. Results from a pilot study conducted on Togiak National Wildlife Refuge indicate that watershed alder cover significantly enhances nutrient availability and lake productivity. Differences in watershed characteristics that affect nutrient transport may also be important for understanding the influence of alder on lake productivity, but have not yet been investigated. Here, we examine the effects of alder on the nutrient regime and productivity of lakes today, and investigate the relative roles of salmon and alder in controlling nutrient availability in aquatic systems. To this end, we obtained lake nutrient and productivity data and measured salmon abundance from a suite of lakes selected to represent a wide range of alder and salmon gradients. We will characterize watershed features to examine the role of abiotic characteristics in modulating the relationship between alder and lake productivity. We have completed the first year of data collection in a four-year study, and expect completion in 2013.

35. Pacific Walrus and Climate Change: Observations and Predictions

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The sea ice habitats used by Pacific walrus (Odobenus rosmarus divergens) are diminishing resulting in altered walrus behavior and distribution, changes in ecosystem properties, and expanding commercial activities. We document changes that have occurred over the past several decades and make predictions out to 2099. Sea ice is projected to monotonically

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decline resulting in more ice free summers of longer duration. Several other stressors are directly influenced by, or interact with, sea ice changes including: harvest, ocean acidification and warming, commercial fishing, energy development, and international shipping. How these stressors materialize were framed as most likely-case, worst-case, and best-case scenarios that were then used to develop four comprehensive working hypotheses that can help identify and prioritize management and research projects, identify mitigation actions that are appropriate under all scenarios, and guide monitoring programs to track future developments and adjust programs as needed. In the short-term, the most plausible hypotheses predict a continuing northward shift in walrus distribution, increasing use of coastal haulouts in the summer and fall, and a population reduction set by the carrying capacity of the near shore environment and sea ice refugia, or the population continues to decline to a level where the probability of extinction is high. In the long-term, walrus may abandon the Bering and Chukchi Seas for sea ice refugia to the northwest and northeast, and ocean acidification and warming may alter walrus food resources. Alternatively, improved conditions that reverse current trends cannot be ruled out in the long-term. Which comes to fruition depends on how the stressors develop and the success of mitigation measures. Best-case scenarios indicate that successful mitigation of some stressors; primarily harvest and haulout mortalities can be effective.

36. Energy Efficiency vs. Renewable Energy: Data Analysis and Economics

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The consumption of high amounts of fossil fuels in rural Alaska poses environmental, economic, and other challenges. Two basic approaches to reducing the consumption of fossil fuels are energy efficiency and renewable energy. Rural entities often face the question – which approach is more economical? The purpose of this study is to compare, from the economic perspective, these two approaches by investigating practical examples of energy efficiency measures and renewable energy installations in rural Alaska. Both real-life data from existing systems and simulations are used to generate data on the amounts of fossil fuels saved and evaluate the economic feasibility of the studied options. The results show that even though energy efficiency is currently typically more economical than renewable energy, there are limitations to the amount of fossil fuels that can be saved via energy efficiency. Therefore, an economical solution to ultimately eliminating the use of fossil fuels has to include both energy efficiency and renewable energy. Even though this seems like a generally known fact, there is often misunderstanding about the specifics. The value of this study is in providing the specific data.

37. Sustainable Energy Education at UAF BBC

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The consumption of high amounts of fossil fuels poses economical, environmental, and other issues not just in the Bristol Bay Region, but all across Alaska and beyond. A transition towards more sustainable practices requires human capital educated in the area of energy efficiency and renewable energy. The UAF Bristol Bay Campus (BBC) has been developing a sustainable energy program to facilitate this transition. The program activities include teaching classes, developing new curricula, organizing non-credit educational events, developing educational tools, collaborating with high schools on career pathways, and helping local entities with their specific energy issues. An important component of the new curricula development is an Occupational Endorsement in Sustainable Energy, which is currently in the approval process. This presentation provides an overview of the proposed Occupational Endorsement in Sustainable Energy and other UAF BBC's activities related to sustainable energy education.

38. Emerging Energy Technology: Alaskan Innovation for Global Solutions

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Alaska is an ideal test bed for emerging energy technology. Given Alaska's abundant energy resources, the high cost of energy, and vast variation in climate and landscape, Alaska is quickly becoming a leader in energy technology development and deployment, providing localized energy solutions and global expertise. Energy technology has a development process: it moves from ideas, to the lab, to demonstration, then to commercialization. Emerging energy technology is a key phase in this process, linking research and development to commercialization of energy solutions, but has historically been underfunded and overlooked. In recent years, however, a new emphasis has been placed on this critical phase. Emerging Technology Funds have helped states, provinces, and countries attract private investment, create jobs, and develop cutting-edge energy technologies. These funds serve as examples of how government investment in innovative research and development creates jobs, fosters entrepreneurship, and increases the quality of life for the community. Alaska has recently developed two such funds, the Denali Commission's Emerging Energy Technology Grant (EETG) and the State of Alaska's Emerging Energy Technology Fund (EETF). EETG project examples include in-river hydrokinetics in Nenana and

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Eagle, wood pellet biomass in Juneau, a sea water heat pump in Seward, a high penetration wind-diesel hybrid test bed at UAF, psychrophiles for biogas digestors in Cordova, and even solar thermal technology in Kotzebue

39. The Veterinary Sciences Program and "Drumbeats"
Suzanne Nolan

The Veterinary Sciences certificate program is a part of the Drumbeats grant program supported by the United States Department of Agriculture. The central mission of these programs is to increase the numbers of Alaska Native students earning degrees in and entering career pathways in the USDA sciences. Veterinary Sciences (VTS) uses the content area hook of domestic animal care careers and issues to bring students into these USDA fields of study. Students in these programs are supported while taking not just content area specific courses but also the general university core classes required for graduation. Student support is a key component of each Drumbeats certificate program. The VTS program uses innovative teaching tools to bring relevant laboratory experiences to students through distance teaching methods as well as during face to face sessions.

40. Seafood Dryer Economy
Leo Pedersen, Scott Smiley, and Peter Bechtel • Ex. 6 PII

The drying of seafood has historically been an integral part of life in Asian, European and American arctic regions. Open air drying, as is generally practiced in traditional arctic societies, however, can result in inconsistent product quality due to variable weather conditions. Additionally, activities by various insects, mammals and birds can raise product safety concerns, bringing forward the demand for a drying system that appropriately meets the region's special needs. By basing the drying unit on a 40 foot container, these needs can potentially be met. The container provides a rugged envelope for the dryer and its modular size is familiar, being routinely handled in most arctic communities. A container based - forced air drying module can be manufactured at a reasonable cost, is easily transported and can be quickly installed onsite. The availability of such a containerized dryer will lead to monitoring of product drying resulting in controlled product quality. This will allow for the continuation of indigenous traditions for producing dried seafoods but will also provide a potential for introducing seafood products into commercial markets by meeting standard regulatory product safety requirements. In addition to providing a means of producing traditional dried seafood products, a cost-effective system will allow the drying of seafood processing byproducts for use as foods or feed ingredients either locally or through established distributors. Processing byproducts represent a substantial part of the landed weight for fish depending on species and product form. Other seafood products, such dried fish heads, squid, seaweed and sea cucumbers, for which there are well established overseas markets, could also be pursued to the economic benefit of communities. Dried products can be shipped, as partial loads if required, at a much lower rate than frozen seafoods in refrigerated containers.

41. Environmental Studies Certificate: Healthy Ecosystems and Sustainable Energy for Rural Alaska Science Education & Interdisciplinary Science
Todd Radenbaugh • taradenbaugh@alaska.edu

A healthy environment that includes sustainable energy is essential to rural Alaskans and their subsistence lifestyle. To meet this need, the UAF Bristol Bay Campus and the USDA Drumbeats Consortium developed an Environmental Studies Certificate for the UA system. There is a statewide need for more rural environmental specialist to become involved in studies and policy making. This UAF certificate is designed for rural students and prepares them for entry level position in environmental fields by offering academic training, the technical skills and hands-on experiences. Further, this place-based program combines contemporary scientific studies with traditional knowledge allowing graduates a diverse learning experience. Since the program was piloted in 2006 and approved in 2009, the UAF Environmental Studies Certificate has provided educational opportunities for Alaskan residents, particularly Alaska Natives. The certificate is helping to build the educational tools that empowers many students and their communities to adapt to the overwhelming outside social, ecological, and economic pressures on resources.

42. Benthic Zones of Nushagak Bay
Todd Radenbaugh • taradenbaugh@alaska.edu

Nushagak Bay is located in southwestern Alaska famous and for its large salmon returns. The estuary is fed by four large rivers, the Nushagak, Wood, Igushik, and Snake Rivers, and trends primarily north to south opening in to Bristol Bay at a wide

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mouth influenced by large tides. In addition to salmon the estuary also supports a host of other ecologically important species that has not been extensively studied or documented. Over the summers from 2007 to 2011 the BBESL made 35 otter trawls sampling over 70,000 m3. Cluster analysis shows that the estuary can be divided into four faunal zones that correlate to differences in species as well as salinity, turbidity, and bottom sediments. Important invertebrate species in numbers and biomass include bay shrimp (Crangon sp), Gammarid amphipods (Gammarus sp.), and Baltic Macoma clams(Macoma baltica) in the upper estuary and starfish (Piaster sp.) and urchins (Strongylocentrotus droebachiensis) in the lower estuary. Dominate fin fish species can be related to faunal zones and salinity but wide-spread species include the starry flounder (Platichthys stellatus) blackline prickleback (Acantholumpenus mackayi), and Spinyhead sculpin (Dasycottus setiger). The upper estuary was found to have a low Shannon Diversity (H') value of 1.54 but diversity increases southward as salinity and depth increases. The low diversity of Nushagak Bay is most likely due to its low salinity, strong currents, and high turbidity. Future work in the bay includes food web analysis and seasonal changes of species abundances.

43. Traditional Knowledge of Non-Salmon Fish in Stebbins, Alaska

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This paper reviews some preliminary results from a project on the Local Ecological Knowledge of Non-Salmon Fish in the Bering Strait Region. This project is a collaboration between Kawerak Incorporated and the tribal councils of Shishmaref, Wales, Brevig Mission, Teller and Stebbins. Information documented through our work with non-salmon experts in Stebbins is presented and discussed, including changes in harvest levels and usage of non-salmon fish over time, changes in non-salmon fish populations, environmental changes that may be impacting non-salmon fish, and the importance of these fish to the community. Project background, methods and future work are also discussed.

44. Evaluating Effects of Potential Flow Modifications on Fish Habitats in the Vicinity of the Pebble Project

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The development of the Pebble Project has the potential to affect the current hydrology of one or more of three watersheds in the project study area - the North Fork Koktuli River, South Fork Koktuli River, and Upper Talarik Creek. These effects may include temporal and spatial changes in the frequency, magnitude and duration of hydrologic conditions as well as rates of flow change. Changes in flow can influence the function of various salmonid life stages via alterations in both the quantity and quality of associated habitats. These changes could be beneficial or detrimental depending on their timing, magnitude, and location. This paper describes the results of baseline studies contracted by the Pebble Limited Partnership (PLP) to characterize the baseline relationships between flow and fish habitat and to evaluate potential effects of changes in flow on the fishery resources of the three study streams. This paper focuses on the mainstem portions of these systems. The primary method of analysis was patterned after the Physical Habitat Simulation (PHABSIM) method developed by the USFWS. Field data (depth, velocity and substrate) have been collected from 117 cross channel transects distributed within different habitat types located throughout the systems. We developed hydraulic models for each cross-section and linked these with Habitat Suitability Curve (HSC) criteria that define species and life stage habitat use to derive habitat-flow relationships for six target fish species. In addition, meso-habitat mapping was completed using a combined field and GIS-based approach for each system and resulted in the delineation of over 1800 habitat units. We then synthesized habitat – flow relationships for each habitat unit delineated. A computer model was developed using Microsoft Visual Basic and provides the platform for evaluating spatial and temporal changes in habitats resulting from flow modifications at the habitat unit scale.

46. Monitoring Lead Concentrations in the Andes using River-Specialized Waterfowl, Merganetta armata

Andrea Repetto, Todd O'Hara, and Kevin McCracken • andrea.repetto@alaska.edu

Mining and mineral extraction in modern-day Peru has existed for centuries, even before Spanish influence. However, mineral extraction today continues at a highly elevated pace in Peru, partially because new technologies have opened previously unprofitable deposits for extraction. Mercury, cadmium, lead and other elements are released into the environment through natural erosive forces and through human activities such as mining and other development. This is evident in the Andes, since potentially toxic levels of lead have been detected in the blood of human populations in the Andes, close to highly developed areas and mining activities (Cooke 2008, Krause et al. 2003a, Krause et al. 2003b, Fraser 2009). Lead is toxic to a number of organ systems, especially the nervous and the circulatory systems, based on the level of exposure. Torrent ducks (Merganetta armata) are found throughout the South American Andes, including in close proximity to mining activity. Monitoring lead levels in torrent ducks may provide a way to identify

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areas that pose a potential human health risk, as well as identifying health risks to the torrent ducks and other ducks that reside in the rivers. In September and October of 2010, 49 torrent ducks were sampled in the Peruvian Andes. Blood and feather samples were collected, hematological analyses (hemoglobin concentration, packed cell volume, red blood cell concentration) were completed, and morphometrics (such as mass, wing chord length, etc.) were taken. Lead in feather samples was highly variable, depending on the age of the feather after last molt, and on placement on the body. Although the lead levels found in many feathers were below those considered toxic in waterfowl, we have shown that lead levels may be highly variable, depending on sample collection.

47. The Origins of Posteruption Insect Populations on the Aleutian Island of Kasatochi

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This project will compare the dispersal and/or survival ability of insects on the recently erupted volcanic Aleutian Island of Kasatochi. The island erupted in 2008, two months after the island had been briefly surveyed for terrestrial arthropods. Having pre-eruption specimens provides biologists with a unique and rare perspective of island ecosystem assembly. I intend to use DNA from insect specimens from Kasatochi and surrounding islands to determine the origins of post-eruption insect populations. These tests will focus primarily on two groups of insects; winged shore-flies in the family Scathophagidae and a newly discovered species of wingless salpingid beetle in the genus Aegialites.

48. Managing the Commercial Salmon and Herring Fisheries of the West Side of Bristol Bay

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The State of Alaska is the primary management agency for the commercial salmon and herring fisheries in Bristol Bay. These fisheries are of significant economic importance to the region. This talk will provide an overview of the fisheries, their history and the management systems the state uses to manage the fisheries.

49. Soil-Ecological Site Inventory and Mapping in the Nushagak Mulchatna Watershed

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USDA-Natural Resources Conservation Service (NRCS) Soil Survey Division has inventoried and mapped 8.3 million acres in the Nushagak and Mulchatna watersheds since 2006. This is part of the nationwide soil survey program, and is one step in producing coverage for the entire state of Alaska. Recent work summarized here focuses on the location and formation of the major soil and vegetation components of the Bristol Bay Lowlands MLRA. The Bristol Bay-Northern Alaska Peninsula Lowlands encompass most of the southern half of the survey area. Much of the landscape consists of relatively wet, gently sloping to rolling plains of glacial drift covered with thick eolian deposits. Drier plains and hills occur in areas proximal to the mountains surrounding the lowlands. Permafrost is common, but sporadic, and often forms peat mounds. Sedges and moss are found in organic rich depressions and broad drainage ways, low scrub and lichen on eolian plains, and mixed forests and alder on rises of eolian plains and on flood plains. Lakes and ponds are scattered throughout the lowlands. Taxonomic subgroups of the major soil types include typic haplocryods, typic dystrocryepts, histic cryaquepts, and typic cryohemists. These soil types correlate to vegetative communities as well as landform and slope position. Key factors in soil formation in this area include the coarse-silty loess parent material with moderately slow permeability, a cool climate that keeps the ground frozen longer, and low relief throughout the landscape. Field work is completed and the project will be completed in 2012. Final products will be available at http://websoilsurvey.nrcs.usda.gov/app/.

50. Traditional Fishing and Problems of Legal Regulations of Local and Indigenous Peoples Access to Aquatic Biological Resources

Victoria Sharakhmatova

According to the Russian Federation Constitution the natural resources, whatever they are, including land or fish, must be used as the basis livelihood for indigenous (local) populations inhabiting the territory of the natural resource. Of all the large complex of legislative regulation of fishing and preservation of aquatic biological resources, the dramatic situation is observed in the matter relating to the access to aquatic biological resources of indigenous peoples and local population for personal consumption and for their economic activities.

Numerous complaints and petitions of citizens, organizations and indigenous communities of the North, Siberia and

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Far East about violations of the rights for priority access to fishing grounds and water resources are field in the federal, regional authorities, and the mass media.

The Fisheries Law artificially divided the population into those who are entitled to receive fishing quotas for their own use for free – these are indigenous peoples, and those who are no such right – local peoples not belonging indigenous peoples although they live in the similar conditions. Thus, we have created an environmental leading to the emergence of not only social, but also ethnic tension in the areas inhabited by indigenous peoples. Competitive distribution of fishing grounds has pushed a sharp increase in the number of indigenous communities.

Quite possible link poaching prevention with community development and meaningful incentives for sustainable use. Promote the "Community Development Concept for Indigenous Communities on the Base of Using Fish Resources" ideas as one that gives local people an incentive to follow and enforce fishery management laws.

51. Habitat Conservation Strategy for the National Petroleum Reserve - Alaska

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Today's spatial tools and increasing biological information allow us to study and plan for large landscapes in ways not possible in past decades. The National Petroleum Reserve – Alaska (NPRA) is one of the last and largest intact landscapes remaining in the US. At more than 22 million acres, roughly the size of Indiana, the NPRA hosts a great diversity of arctic habitats vital to northern Alaska's migratory birds and terrestrial and marine mammals. While officially designated a petroleum reserve, Congress has also explicitly recognized in statute the importance of protecting special areas and outstanding surface values within the NPRA. We used Geographic Information Systems (GIS) in combination with an extensive literature review and consultation with federal, state, and borough land managers to evaluate wildlife data and identify the highest priority concentration areas. We worked with partners to develop a Habitat Conservation Strategy which identifies areas of outstanding biological value, and provides conservation recommendations, including proposed leasing deferrals and restrictions. The Strategy describes important habitat areas for nesting and molting birds, the Western Arctic and Teshekpuk caribou herds, large mammals such as wolves, grizzly bears, and wolverines, and coastal marine mammals including polar bears, beluga whales, walruses, and ice seals. The NPRA is a place where we still have the opportunity to plan resource development starting from a relatively clean slate, using the best available technology and conservation tools. The Strategy provides policymakers an option to balance conservation and resource development, allowing oil and gas extraction in portions of NPRA while protecting the areas with highest biological value.

52. Identifying Marine Important Bird Areas in Alaska: Progress toward a Standardized Method

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The distribution of an estimated 100 million seabirds in Alaska's marine waters is discontinuous in time and space. Effective marine conservation requires knowledge about the areas that are most important to seabirds, but as yet there is no standard method for identifying and mapping such areas. There are a number of potential routes to achieving this goal, depending on what biological and oceanographic data are available. Even if resource data were ideal, however, many common challenges in defining and delineating marine hotspots would remain. What abundance or density of birds qualifies a site as important? Should hotspots be centered on significant breeding colonies, buffered by some standard distance to protect foraging areas? Should nearby colonies be grouped into larger metacolonies to acknowledge the relationship between sites? How can we analyze pelagic survey data to better define foraging hotspots and identify places that are persistent over time? How should boundary lines be drawn? We have explored these issues in Alaska in an effort to develop an objective and repeatable method for identification of globally significant (areas that support at least 1% of the global population of a species) marine Important Bird Areas (IBAs). We analyzed multiple spatially explicit approaches and built a geospatial processing tool to automate the delineation of proposed IBAs. Our tools and research will eventually integrate data along the entire Pacific Flyway, and may be used to help set national standards for marine IBA identification.

53. Commercial Fishing and Resource Extraction in Bristol Bay: New Data on Community Views

Samuel Snyder • Ex. 6 PII

As the largest source of sockeye salmon in the world, Bristol Bay is a region defined by commercial fishing. Since the late 1800s, the Bristol Bay salmon fishery has employed thousands and supplied a foundational economic system not only to Southwest, Alaska but also to the state and the nation. Today, while the fishery employs over 13,000 commercial

fishermen and supports an economy of over $400 million annually the region is faced with difficult decisions surrounding economic and development opportunities. One of the major issues at stake is the potential for large-scale mining development near the headwaters of the Bristol Bay watershed, most notably represented by the proposed Pebble Mine. Amidst this debate, those who depend upon the fishery must decide what they desire for the future. In doing so, decision makers must understand social sentiment and preferences toward the fishery or a future of mining, including the issue of whether large scale mining and the largest sockeye salmon ecosystem can coexist. This proposed poster presentation, then, reveals data - resulting from detailed surveys of registered Bristol Bay commercial fishing permit holders - that highlights social perceptions on the value of the fishery and perceptions of mineral development in the region. Questions cover the importance of fishing to the culture and economy of the region and the state, the significance of the fishery for future generations, the role of both state and federal government in fisheries and resource management, and how a potential future of mining is perceived by those dependent upon the fishery. We believe that by presenting and discussing this data, we can inform the debates surrounding future resource development and opportunities in the region.

54. Developing Standards for Responsible Mining in the Nushagak River Watershed

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In 2007 the Nushagak-Mulchatna Watershed Council published its strategic conservation plan for the Nushagak River Watershed. Among the actions set forth in the plan was the preparation of an analysis of the risks posed to the aquatic resources of the watershed from large scale open pit mining. The analysis was completed by The Nature Conservancy in 2010. Now the Watershed Council is considering a policy document to address some of the risks identified. The document also applies to the Nushagak watershed some of the evolving international standards for obtaining the consent of indigenous peoples (Free, Prior and Informed Consent) for development projects . This session will be a presentation of that document entitled: Standards and Practices for Environmentally Responsible Mining in the Nushagak River Watershed - A Preliminary Statement of the Nushagak-Mulchatna Watershed Council.

55. Striving for Diversity: Undergraduate Research and Mentoring Alaska Science Education & Interdisciplinary Science

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URM Alaska is a three year pilot project at the University of Alaska Fairbanks (UAF) that is designed to prepare under represented, undergraduate students for post graduate studies and research careers in the biological science. URM Alaska targets junior and senior Alaska Native students and provides them with annual stipends, travel to professional meetings and research supplies for up to two years. Faculty members provide strong mentorship with an emphasis on developing students' communication and presentation skills. To ensure success, we have developed a program combining a solid mentoring program, career services and a range of enrichment activities. To date the URM Alaska has supported 13 Alaska Native students. One student has graduated and several more students are expected to graduate during the coming year. The 2010 graduate will enter pharmacy school academic year 2011-2012.

56. Tracing Cycles of Trans-Arctic Marine Faunal Connections with Genetic Data

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There is much in common between the shallow-water faunas of the northern North Pacific and North Atlantic. The shared faunal elements reflect the dynamics of past opportunities for trans-Arctic dispersal in animals which under the prevailing climate would not be able to cross the Arctic basin. Much of a previously endemic Pacific fauna was first introduced to the North Atlantic through the newly opened Bering Strait ca 3.5 million years ago. Subsequently, the ocean basins were mostly effectively isolated through the Pleistocene, by harsh climates and by the repeatedly emerging land bridge. Closely related sibling taxa, genetically distinct but hard to distinguish externally, have meanwhile evolved in the two ocean basins. Nevertheless, in some cases, the inter-oceanic isolation has not been complete, but occasional trans-Arctic exchange has taken place. Such repeated connections will probably be enhanced with the current climatic amelioration and a newly deglaciated Arctic, and their consequences are also therefore of acute interest. Current genetic studies are tracing the hitherto cryptic history of the inter-oceanic connections, and have pointed out cases where the North Pacific has repeatedly sent off propagules to create increased genetic and taxonomic diversity in the North Atlantic. Some of the best evidence is about two taxa of bivalve mollusks, and of herrings in the genus Clupea. In each instance, a recently expanded Pacific invader stock now coexists and interacts in a variety of ways with a long-established Atlantic counterpart in the North-East European seas.

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57. Decline of the Ahklun Mountain Glaciers, Southwestern Alaska

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The Ahklun Mountains, centered at the northeast quadrant of the Togiak National Wildlife Refuge in southwestern Alaska, support the only extant glaciers in western Alaska. These glaciers were originally mapped by the U.S. Geological Survey using photogrammetry methods based on 1972 aerial photos. We digitized their map into a geographic information system, then surveyed for presence or absence of glaciers by fixed-wing aircraft using a GPS-linked computer mapping application that permitted high precision navigation. Of 116 glaciers originally mapped, 109 were surveyed in September 2006. Ninety-seven were verified as extant and 12 (11%) were determined to have disappeared. Using time-step imagery from 1957, 1984, and 2009, we determined that overall glacial extent has decreased by approximately 50% since 1957, and that all Ahklun Mountain glaciers are likely to be extinguished by 2100.

58. Moose on the Move in Southwestern Alaska— The Colonization of Togiak National Wildlife Refuge

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Moose (Alces alces) are recent colonizers of southwestern Alaska. Here we report the results of a 22-year investigation into the colonization by moose of the ~2.1 million ha Togiak National Wildlife Refuge. Moose on and near the Refuge increased from a minimum population of 4 in 1991 to a minimum population of 1,626 in 2011. To understand the carrying capacity of the moose habitat on Togiak Refuge, we developed a landcover map which describes the distribution and quantity of lands suitable for moose. We determined that ~14% of the study area is suitable as winter moose habitat, while ~86% provides little value to moose. However, based on comparisons of physiological performance (age of first calf, calving percentage, twinning rate, and body weight) between the Togiak Refuge moose population and other populations in Alaska, we conclude that habitat quality is exceptionally high. To understand why habitat quality is high, we present comparisons of nutritional value of moose browse plants at Togiak Refuge and two other Alaska study sites. We hypothesize that nutritional quality is a function of the colonization event, and that it will decline over time.

59. Temporal use of the Nushagak Peninsula by Wolves, Togiak National Wildlife Refuge, Southwestern Alaska

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A caribou population was established on the Nushagak Peninsula via transplantation in 1988, grew rapidly until peaking in 1997, and since has declined by ~60%. A potential causal factor (and the factor most often discussed during local public meetings) is predation by wolves. This leads to requests to state and federal wildlife regulatory agencies for wolf population control. However, we hypothesize that wolf predation is not the primary driver for the Nushagak Peninsula caribou population. To test this, we investigated the time budgets of wolves that use the Peninsula. Using GPS radio telemetry, we recorded locations of up to ten wolves from three packs at 3-hour intervals from March 2007 through 2010. Additionally, we located another four wolves approximately once monthly using conventional radio telemetry. We found that only one pack used the Peninsula, and spent ~32% of its time there, with 68% of its time off the Peninsula, and thus not in contact with caribou. Most use occurred in the late summer and fall (mid-August--November), while little use occurred during the caribou calving season, at which time caribou are particularly vulnerable to wolf predation. Our preliminary conclusion is that wolf predation is not the principal driver for this caribou population.

60. Pebble Watch: An Educational and Fact-based Initiative

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In the largely undeveloped Bristol Bay area, developers' proposal to build a large gold-copper-molybdenum mine (Pebble) has prompted concern about risks to the environment, particularly to salmon and other natural resources depended upon by the local subsistence-based communities. More than 70 percent of shareholders polled by Bristol Bay Native Corporation (BBNC) in 2007 said they opposed the mine. But engaging on the topic requires understanding a range of scientific concepts across the disciplines, from fisheries biology and hydrology to human health risk assessment, as well as some understanding of mining permitting procedures and policies. To keep shareholders informed and engaged in the process, BBNC developed Pebble Watch, an informational resource consisting of a newsletter sent to more than 1,200 shareholder families, a website, PebbleWatch.com, and in-person presentations. Despite having an official position against the mine, BBNC has made careful efforts to separate this publication from its advocacy process, to provide shareholders with the facts necessary to find their own answers. In just over one year of publishing, the publication format has changed. Originally, the newsletter topics mirrored the expected environmental impact statement process. Now the format is based on EPA's watershed assessment. After publishing five newsletters and working on the PebbleWatch.com

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resource, the science and editorial team has concluded that a combination of online, print and in-person presentations is the most effective way to reach our community. We also have learned the importance of advertising and reminding readers of the resource.

61. Determining Effective Methods for Classifying and Quantifying Juvenile Salmon Habitat on the Kulukak River Using Decision-based Fusion of Multispectral Aerial Photography

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Monitoring the quality and quantity of freshwater rearing habitat for Pacific salmon Oncorhynchus spp. is essential for maintaining stocks of these species. Field-based habitat monitoring in remote areas can be expensive, time-consuming, and impractical. I demonstrated the usefulness of high resolution multispectral images acquired in the visible, near-infrared, and thermal-infrared regions in effectively delineating habitat classes and quantifying habitat variables important for juvenile salmon rearing on the Kulukak River in Southwest Alaska. This study showed that different spectral bands have complementary strengths, with visible bands being best for delineating main-channel habitats, visible and thermal-infrared for off-channel habitats, and near-infrared for landcover classes. Although no individual classification result captured all the habitat elements, a decision-based fusion that uses selected classes from all classified images provided a product that showed the spatial distribution and quantity of habitat classes. An accuracy analysis using ground-truthed reference data for two separate study areas demonstrated that habitat classes were identified with accuracies of 82.5% and 67.5%, respectively. In addition, I demonstrated the ability of these methods to quantify various habitat variables often used in habitat studies, including those used to produce habitat suitability maps. Although one study area produced lower accuracies than expected, this study demonstrates that low-cost airborne images can be used to effectively determine the quality and quantity of juvenile Pacific salmon rearing habitat in small streams and thus decision-support in fisheries management.

62. Freshwater Baseline Inventory and Monitoring in Nushagak and Kvichak Headwater Streams

Carol Ann Woody, Sarah O'Neal, Dan Bogan • Ex. 6 PII

Bristol Bay is home to one of the largest, most valuable salmon fisheries in the U.S. owing largely to its pristine nature. In Alaska, fish must be explicitly documented in a water body for fish conservation statutes and regulations to apply, though less than half of the state's streams have been surveyed. Consequently, presence/absence surveys were conducted in headwater streams of the Nushugak and Kvichak Rivers including the Koktuli River, Talarik Rivers, Chulitna Creek, Sixmile Lake, and the Newhalen River. Non-salmon species important to subsistence and sportfishing stakeholders, including Dolly Varden and rainbow trout, were found in 96% of streams surveyed, and salmon were documented in 3 of every 4 streams surveyed excluding those in the Chulitna drainage. Salmon were documented directly on top of the proposed Pebble deposit. Freshwater macroinvertebrate, diatom, and physical habitat monitoring was conducted concurrently to produce baseline data within and adjacent to mining claims in the region. This study underscores both the importance of headwater streams as essential salmon rearing habitat and the lack of data for two of the world's most productive salmon ecosystems. The work provides some legal protection to 149 kilometers (92.5 miles) of newly documented salmon streams.

63. Coal Development in Alaska: Current status and future solutions

Kendra Zamzow and Emily Fehrenbacher • kzamzow@csp2.org

Coal-fired power is one of the main drivers of global warming. There is some irony in that Alaska, which is and will be impacted by global climate change, also holds tremendous reserves of coal. Dr. Zamzow will focus on the proposed Chuitna coal mine on Cook Inlet and the Matanuska coal fields, discussing local impacts and likely precedents in water quality regulation and reclamation. Zamzow and Fehrenbacher will encourage the audience to consider and discuss long-term impacts, long-term solutions, and economic development that keeps coal in the ground.

64. Making Methylating Bacteria Happy: Conditions They Thrive In and Implications for Mercury Methylation in a Warming Arctic

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Alaska receives mercury from global sources, yet it does not enter the food chain until it is transformed into methylmercury through the activities of natural bacteria. As the arctic warms, more areas may become hospitable to these bacteria. This

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talk will walk through aquatic mercury cycling and highlight the conditions that are likely to enhance methylation and demethylation.

65. The Waters of the Kvichak and Nushagak: Independent Baseline Studies of Water Quality Near the Pebble Prospect in Southwest Alaska

Kendra Zamzow and Ann Maest • kzamzow@csp2.org

Although Alaska is famous for the gold rush that brought people to the state in the 1890's, no large scale mines existed until 1989. The first world-class copper-gold sulfide mine to be pursued in Alaska, the Pebble mine, is preparing to apply for mining permits. The mine would be located in the headwaters of the Nushagak and Kvichak watersheds that feed Bristol Bay and Lake Iliamna, one of the largest lakes in North America and the largest sockeye salmon rearing lake in the world. Independent scientists conducted studies on water chemistry and copper bio-availability at rivers and tributaries in the region. The scope of the studies and available results will be presented, along with a discussion of the risks the mine poses.

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