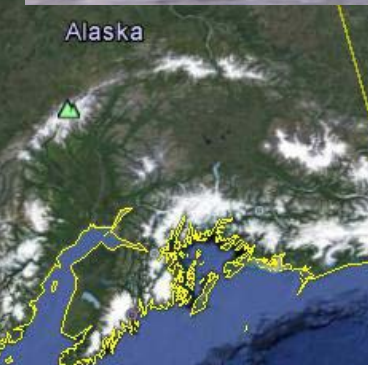
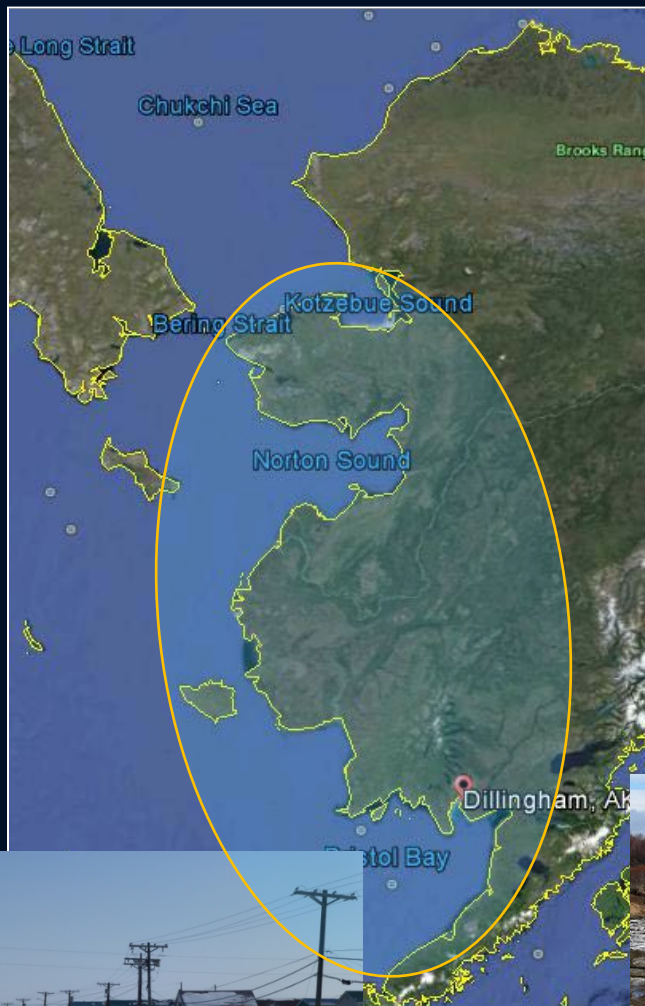


Sustaining Science Programs in Western Alaska



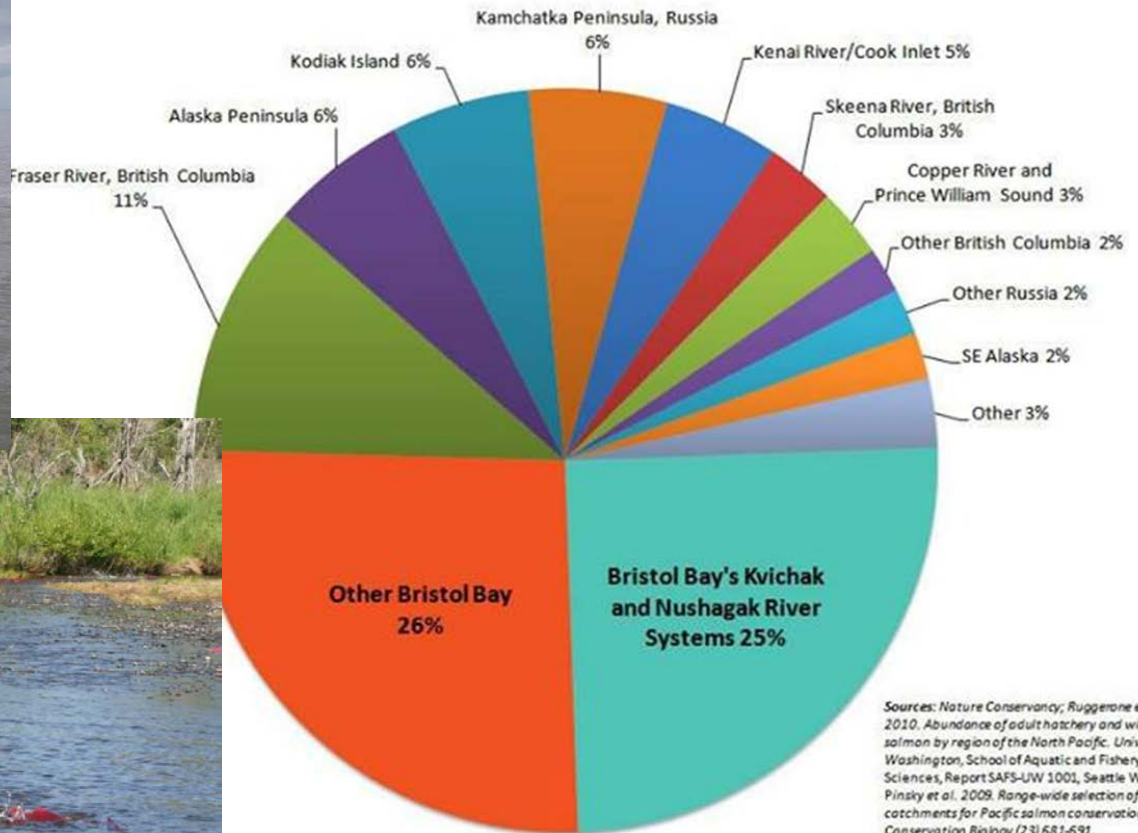
TODD A. RADENBAUGH
UNIVERSITY OF ALASKA FAIRBANKS BRISTOL BAY CAMPUS
BRISTOL BAY ENVIRONMENTAL SCIENCE LAB

Western Alaska



Known For Salmon

Over 50% of worlds sockeye salmon
But there is so much more...



Healthy Ecosystems

Rapid change = environmental challenges

The region has depended on:

- Historically low population densities (0.06/km²)
- Environmental stewardship - culture interlinked w/biota.

Rapid change – altering the socio-economic and ecological systems:

- Need to adapt to the shifting patterns in the climate, habitats, and economy

Strategies to maintain ecosystem health:

- Merge local knowledge with scientific practice.
- Maintain access to subsistence
- Explore the best use (or non-use) of resources



UAF CRCD Community Campuses



Bristol Bay Campus

- 712 Students
- Dillingham, AK



Chuckchi Campus

- 405 Students
- Kotzebue, AK



Kuskokwim Campus

- 496 Students
- Bethel, AK

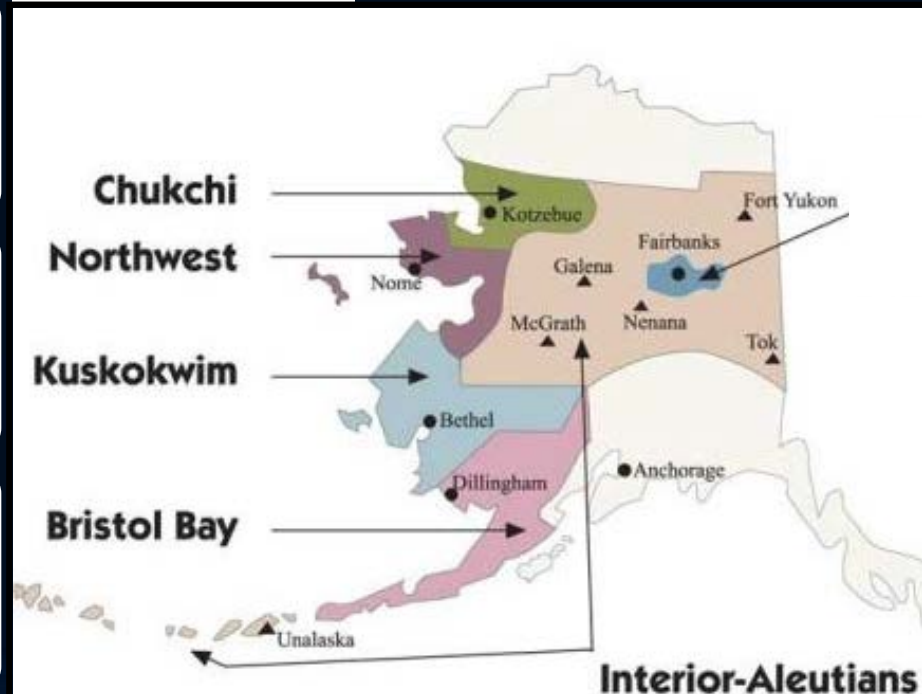


Northwest Campus

- 363 Students
- Nome, AK



CRCD enrollment = 2,706
UAF enrollment = 10,799



Local Workforce Needed

Environmental Training and Data

- Water quality technicians
- Fisheries field staff
- Watershed monitors
- Toxicology technicians
- Ecotour guides
- Naturalist
- NEPA specialist
- F&W technicians



Education Requests

Environmental Science

Field Work

Water Quality

NEPA

Natural History

Ecology

Climate Change



Internships

The potential of tidal energy for the fishing industry in Nushagak Bay, Alaska



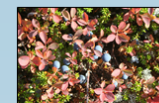
Tina Carr

Aleknagikigap@starband.net

Todd Radenbaugh
Btfar@uar.edu
and Victor Zinger
btyaz@uar.edu

University of Alaska Fairbanks
Bristol Bay Campus

Can a Gold and Copper Mine Feed a Subsistence Culture?



Angela Chingliak (tsac@uaf.edu) & Todd Radenbaugh (btfar@uaf.edu)

University of Alaska Fairbanks, Bristol Bay Campus

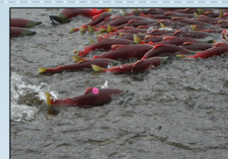
Introduction

Subsistence in rural Alaska has been a major part of the native society for thousands of years. There is a cultural connection between the health of the landscape and the native economic and spiritual wealth. This cultural connection with the landscape has placed a high aesthetic value on the natural ecosystems generally not included in Western-style economic analysis.

This study investigates the potential intrinsic and extrinsic value of The Pebble Limited Partnership proposed Pebble Mine Project in the Ilamna region of southwest Alaska. If built, this mine would be among the largest mines in North America, having enormous social and ecological influence. Pebble Limited Partnership estimates that the mine may contain as much as \$470 billion dollars in copper, gold, and molybdenum (at 2008 metal prices) along with some additional silver. The relative number of people required to mine this wealth, however, is relatively small. Employment estimates for the Pebble Project are approximately 1,000 new jobs over the 30 to 80 years of proposed mining-related activity.

For comparison purposes, the smaller Red Dog Mine operated by Teck Cominco Alaska Inc. currently employs 466 people to mine zinc and lead ore. The mine has a leasing and operation agreement with the property owner, NANA Regional Corporation (the Northwest Arctic region's Native Alaskan development corporation). The Red Dog mine has been in operation since 1989, and it has at least another 23 years of operation life. Out of the 466 full-time employees, NANA shareholders hold 262 full-time jobs, as opposed to 204 non-shareholders. Of the shareholders, there are 180 blue-collar miners, and 18 white-collar workers, with annual salaries ranging from \$37,051 to \$99,429. Because of this, Red Dog has a higher than average Native local hire for Alaskan mines.

The Pebble Mine Project is located in the sparsely populated Bristol Bay Borough (864 locals that are 18 years and older (2000 US Census)). The majority of the individuals in the mining area have little formal education (most only a high school diploma) but have a deep understanding of local ecosystems passed down through traditional knowledge. As the Pebble Limited Partnership suggests, most of their employee positions will require either a bachelor's degree, one- or two-year technical diplomas or an associate's degree; most of the highest paying jobs may not go to locals and therefore the majority of the wealth will not stay in the Bristol Bay region. This suggests that the current residents will lose not only some potential economic wealth but spiritual wealth as well. Thus, if a subsistence lifestyle is important to the residents of the region, this lifestyle may be at odds with a mining culture.

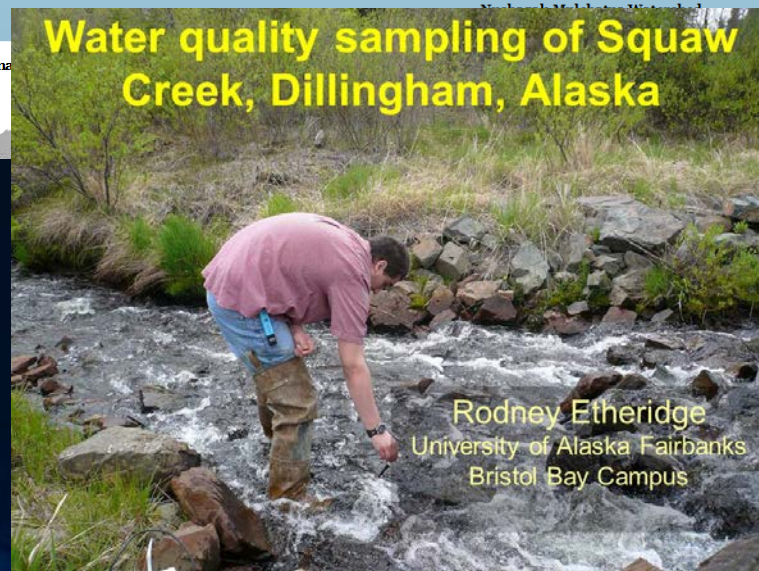


Study Area

Nushagak-Mulchatna

Alaska
1,477,652 km²
640,000 residents
Population density: 0.4/km²

Water quality sampling of Squaw Creek, Dillingham, Alaska



Rodney Etheridge
University of Alaska Fairbanks
Bristol Bay Campus

Dillingham Deadwood Survey

My experiences as a environmental intern

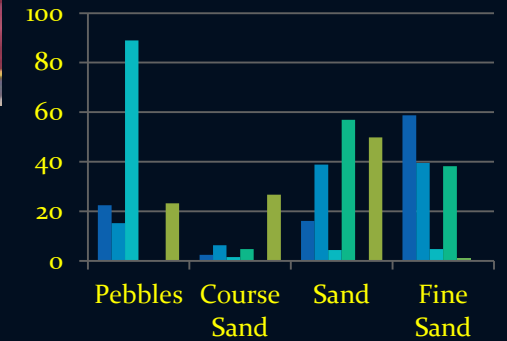
• **By Kimberly Seybert**



Bristol Bay
Native
Association



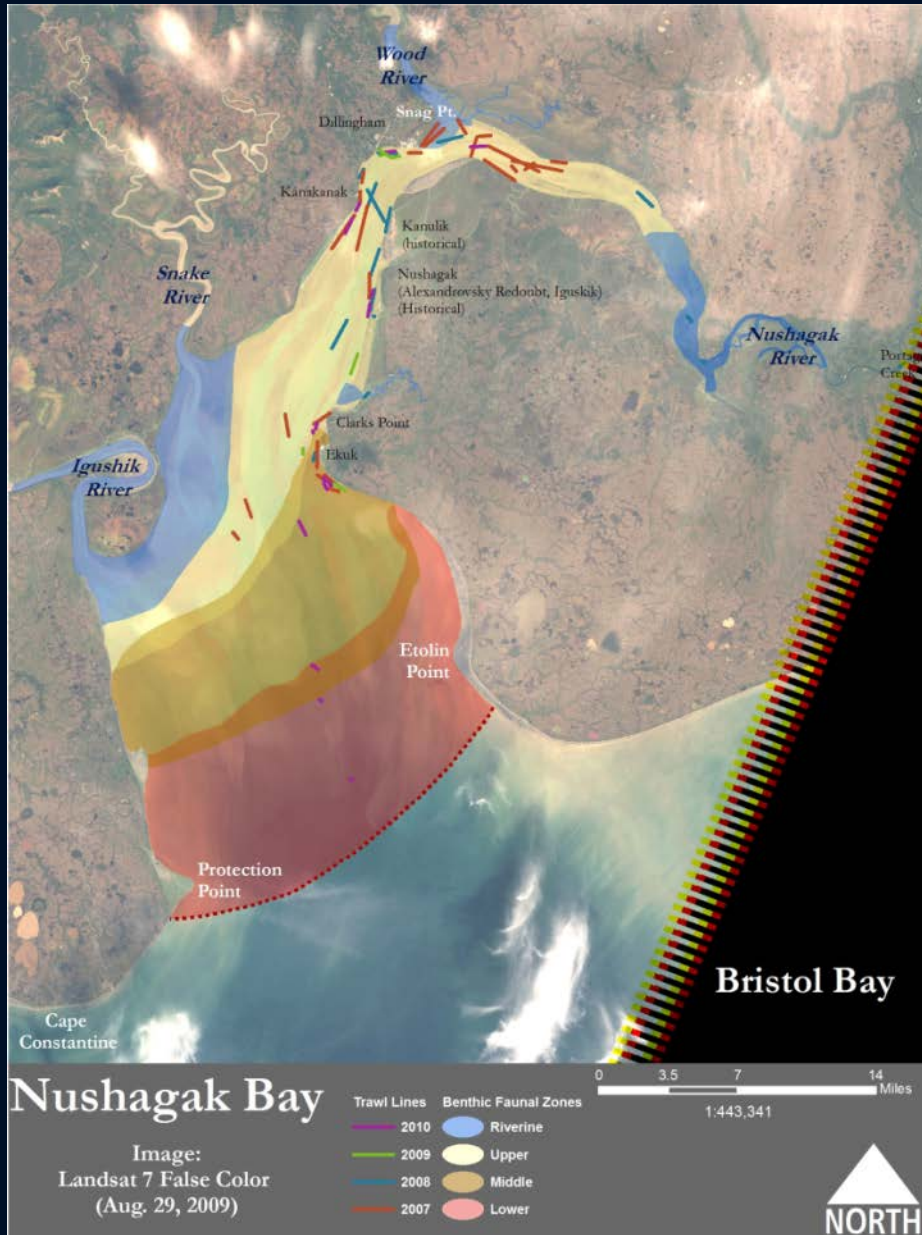
Baseline Data Collection



Citizen Science



Estuary Characterization



Riverine

Sediment: Gravel / Cobble, coarse sand

Turbidity: Low (0-50 NTU)

Diversity: Lowest

- All freshwater

Biomass: Lowest

Upper Estuary

Sediment: Course to fine sand

Turbidity: Highest (200-300 NTU)

Diversity: Medium

- Euryhaline epibenthic to pelagic

Biomass: Medium (shrimp/amphipods)

Lower Estuary

Sediment: Med. sand to silt (bars), coarse sand (channels)

Turbidity: Variable (50 – 200 NTU)

Diversity: Highest

- Euryhaline epibenthos and marine

Biomass: Highest (echinoderms, fin fish)

Controversy to Promote Science Education



Proposed Pebble Mine

Area:

- 39,627 million hectares
- 3.2 Km open pit 518 m deep
- Underground mine in west
- 4 large dams - water and tailings
 - Tailings dam 226 meter high and 7 km long

Population:

- 2007—about 546 residents
- Estimated 1000 employees for 20 to 50 years

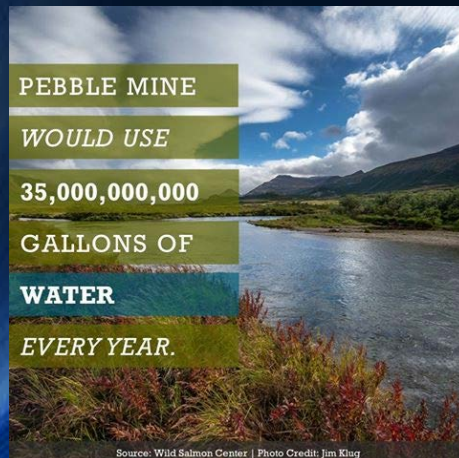


Photo Credit SkyTruth <http://skytruth.mediatools.org>

UAF CRCD Drumbeats



Drumbeats Certificate Programs: We Will Live Well

- 5 rural, Alaska Native-serving rural campuses of UAF CRCD
- Respond to community needs
- To strengthen career pathways into the subsistence sciences Help rural students earn degrees in the USDA disciplines of plant sciences, animal sciences, and environmental studies:

<http://www.uaf.edu/drumbeats/>



Bristol Bay Campus
Dillingham

[link](#)



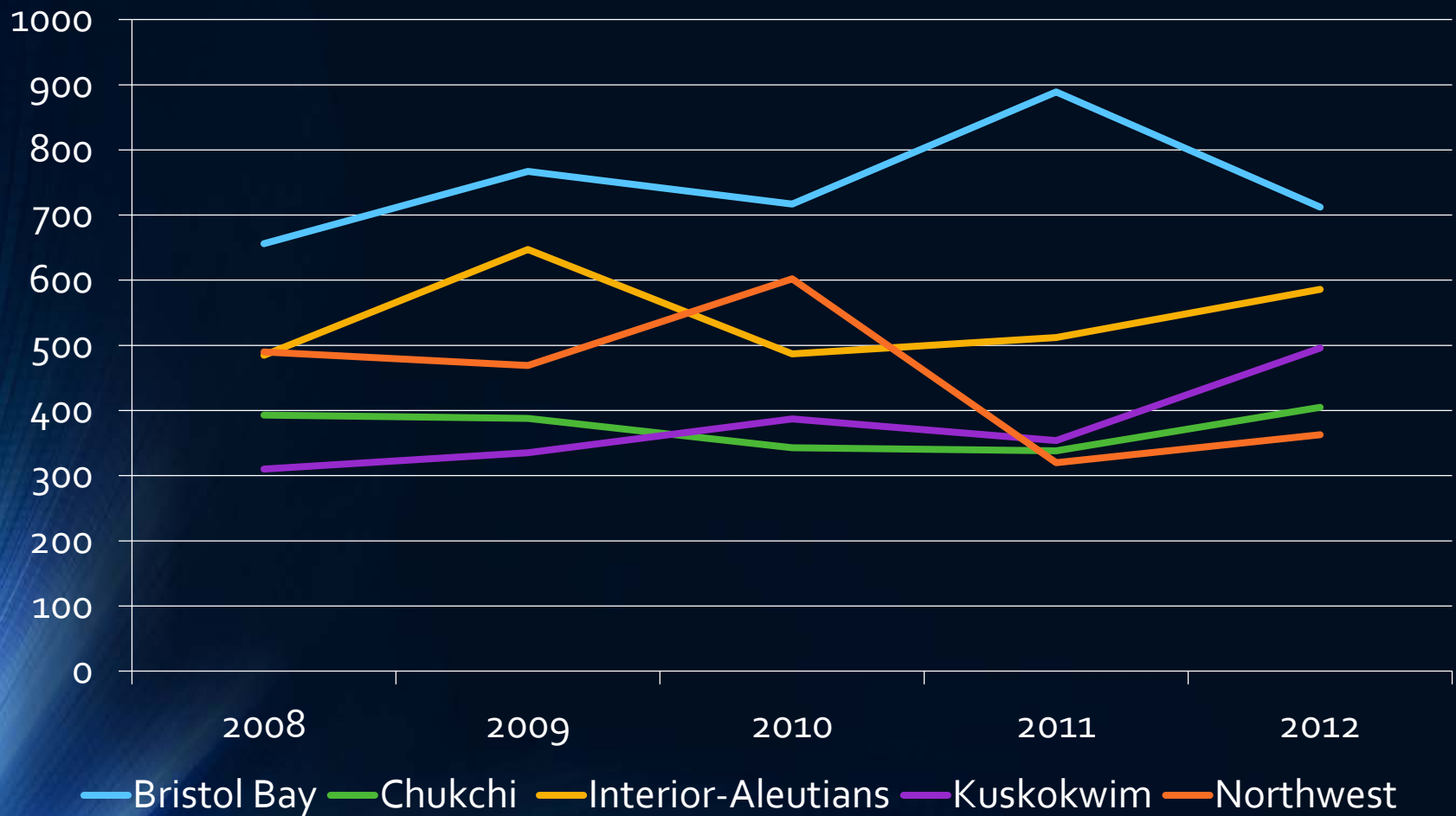
Kuskokwim Campus
Bethel



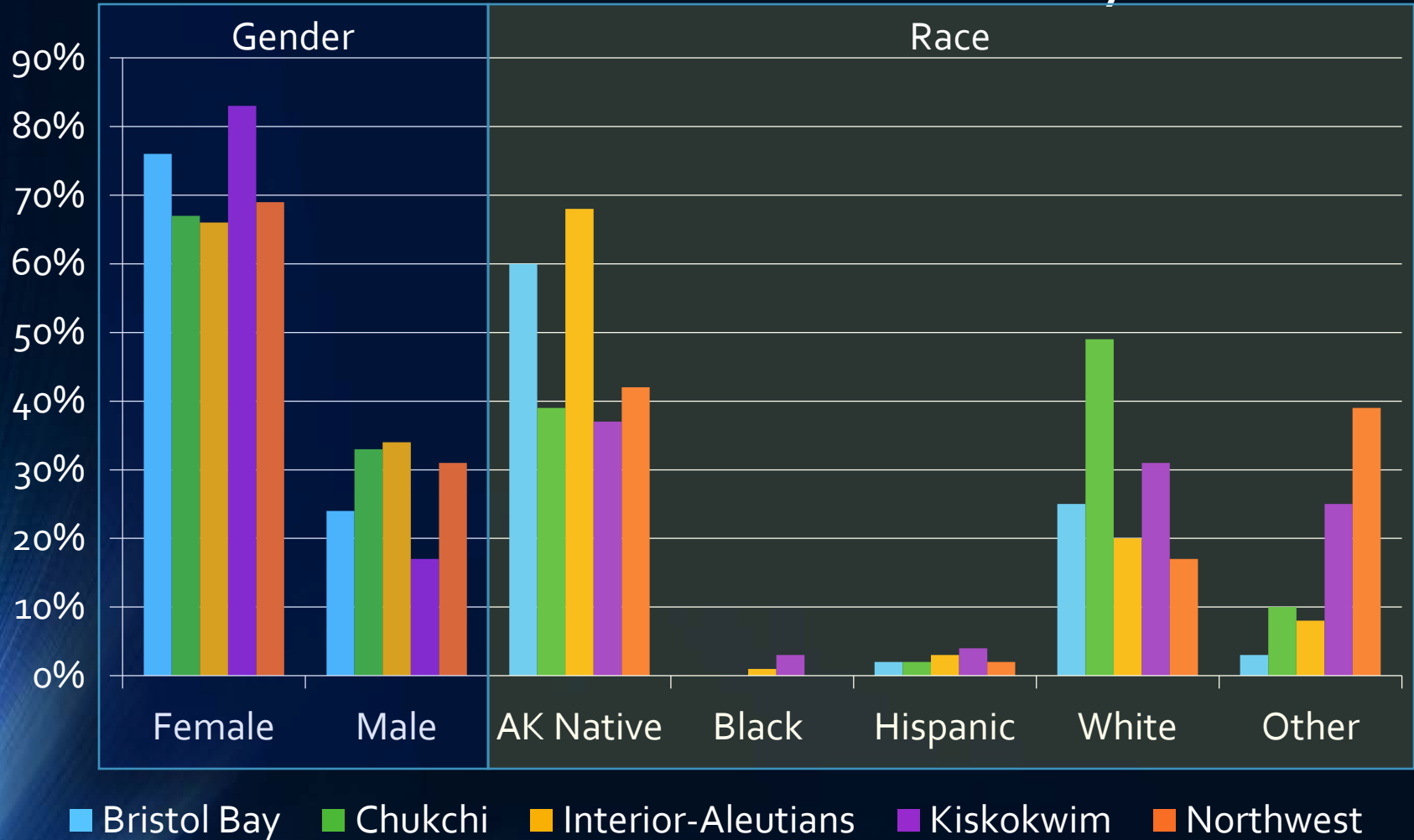
Northwest Campus
Nome

AY Enrollment

UAF CRCD Community Campuses



UAF CRCD Student Diversity



UAF BBC Science Enrollment



HONORING PLACE IN A CHANGING WORLD

NUNAPUT STEWARDSHIP THROUGH SCIENCE: SCHOLARS PROGRAM

Do you care about environmental or energy issues in your community? UAF Bristol Bay Campus has begun a scholarship program for students interested in becoming better stewards of Nunaput.

Nunaput, Yup'ik for "our place, our land."

COMMIT: commit to action as a NUNAPUT Scholar. By applying into the program, you make a commitment to becoming a better steward of your community and to succeeding in your educational goals.

GET INSPIRED: By becoming a NUNAPUT Scholar, you will engage personal mentor(s) who will help to nurture and guide your academic growth. You will also engage your peers, professors and Alaska Native leaders during face-to-face orientation meetings, lab intensives and Stewardship Summits.

GET INFORMED: By becoming a NUNAPUT Scholar, you will enroll in a number of stewardship-oriented courses tailored to your educational goals.

GET PREPARED: If you are in need of improving your math skills, you will have the ability to reach your educational goals through the support of a personalized Math Success Plan via the Math Academy.

TAKE ACTION: You will be encouraged to conduct a community research project to help create local solutions to an environmental, energy-related or cultural issue of relevance to you & your community.

SHARE IT: As a Nunaput Scholar, you will be supported in sharing your knowledge and the results of your research project by giving a presentation to your community, village council, other native organization, and/or at a regional science conference.

Apply to be a Nunaput Scholar Today

Students must apply to become a Nunaput Stewardship Scholar recipient. Priority will be given to students in the Environmental Science or Sustainable Energy Programs at UAF Bristol Bay Campus. Alaska Native students are strongly encouraged to apply. Stipends will range in size up to \$1000 per year and cover any combination of tuition, books, materials and living allowance. Visit www.uaf.edu/bbc or call the UAF Bristol Bay Campus at 847-5109 or 800-478-5109 to find out more information.

Stewardship
(stew-ard-ship, stee-ard, -stee-ard)

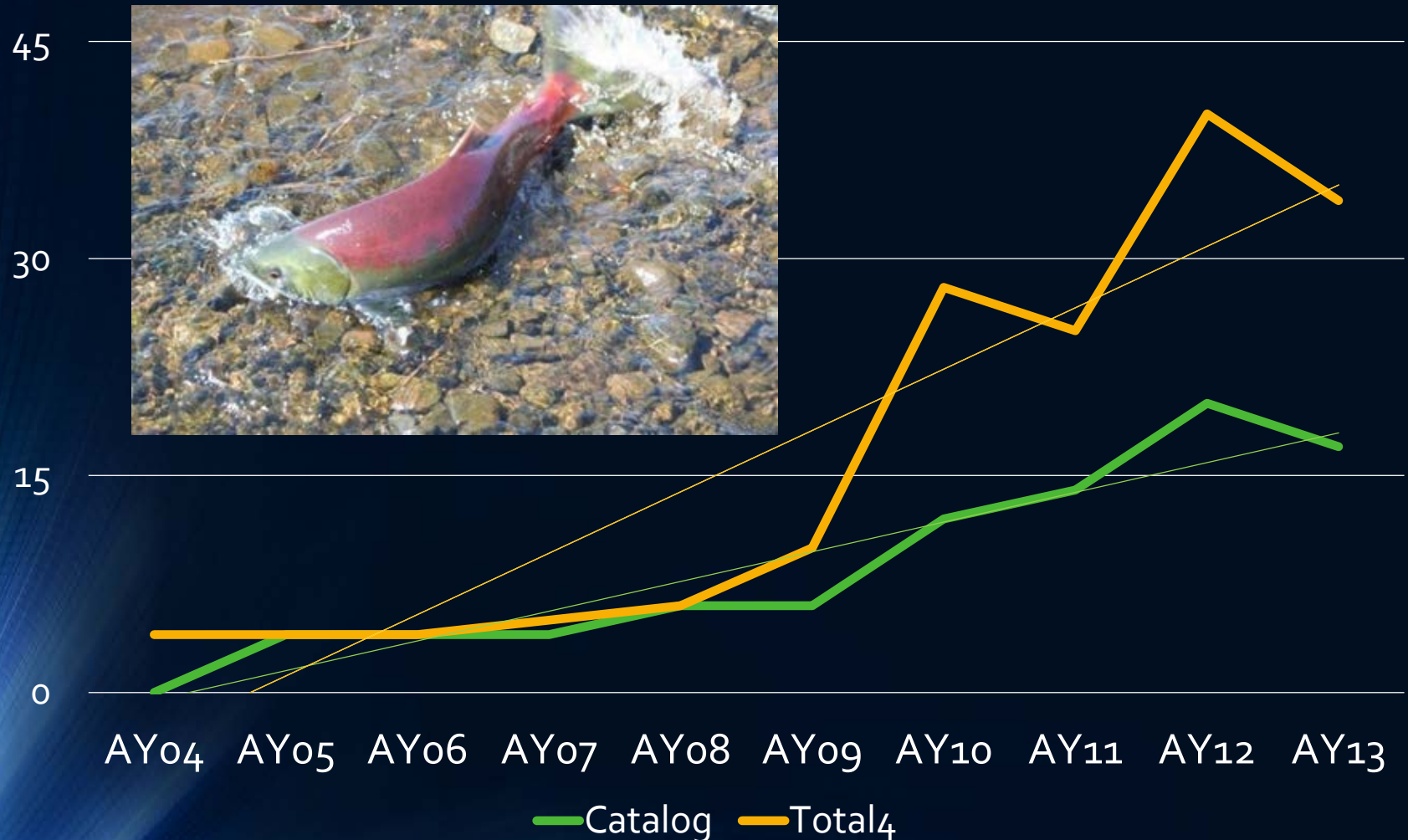
Definition of STEWARDSHIP
1. taking an active role in caring for the natural resources where one lives or just alone; actively participating in adaptive solutions to ensure the viability of my community; the careful and responsible management of something entrusted to one's care; stewardship of natural resources.

EARN & LEARN APPLY TODAY

[HTTP://BRISTOLBAY.UAF.EDU](http://BRISTOLBAY.UAF.EDU)

Logos: NSF, UAF Bristol Bay Campus, UAF UNIVERSITY OF ALASKA FAIRBANKS

UAF BBC Science Course Offerings



Western Alaska Interdisciplinary Science Conference

[Dillingham 2008](#)

[Nome 2009](#)

[Unalaska 2010](#)

[Bethel 2011](#)

[Dillingham 2012](#)

[Nome 2013](#)

[Kotzebue coming in 2014](#)

<http://seagrant.uaf.edu/conferences/waisc/>



2008 Western Alaskan
Interdisciplinary Science Conference and Forum
Weathering Change, Monitoring Uncertainty
Dillingham, Alaska, April 4-6, 2008



Western Alaska Interdisciplinary Science Conference and Forum 2008

"Weathering Change, Monitoring Uncertainty"

April 4-6, 2008
Dillingham, Alaska

The WAISC organization committee wishes to thank everyone who participated in this conference—by most measures it was an outstanding success. WAISC included people from diverse backgrounds including universities, government agencies, industry, and students coming together and discussing science. One major outcome was that it produced lots of synergy and identified misunderstandings between groups. Please check this web site often as we will be adding more information about the conference and the papers that were presented.

Sincerely,
Dr. Todd Radenbaugh

Current conference

2008 home

Call for papers

Session information

Schedule

Keynote & Plenary info

Lodging

Registration (closed)



AAAS Arctic Division in Dillingham

American Association for the Advancement of Science Arctic Division, 2011

http://www.aaas.org/news/releases/2011/1018arctic_div_pebble.shtml



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News

News Archives

Proposed Pebble Mine Has Alaskan Community Focused on Critical Science and Policy Issues

DILLINGHAM, Alaska—In the remote and undeveloped hills northeast of here, the clear waters of great sub-Arctic rivers and their tributaries carve an intricate web across the tundra. Upper Talank Creek flows into Lake Iliamna, one of the largest lakes in North America and home to millions of sockeye salmon, and Lake Iliamna empties into the Kvichak River. The Kvichak and Stuyahok flow into the Mulchatna River, which flows into the broad Nushagak. In time, all of these waters flow into Bristol Bay, perhaps the most productive wild salmon fishery remaining in the world.

The land between Lake Iliamna and the Mulchatna holds other riches, as well. Over the past 30 years, an almost mythic lode of valuable minerals

LINKS
[Watch a video of the public forum on the proposed Pebble Mine held at the AAAS Arctic Division annual meeting.](#)
[To learn more about the scientific issues related to the proposed Pebble Mine, visit Pebble Science.](#)



2011 Arctic Science Conference
Dillingham, Alaska
September 21st – 24th
Ecosystems: Understanding the Cycles

<http://arctic.aaas.org/meetings/2011/>

AAAS NEWS&NOTES

EDITED BY EDWARD W. LEMPINEN



AAAS ARCTIC DIVISION In Fight over Alaskan Mine, Public Interest Turns to Science

DILLINGHAM, ALASKA—Every summer, salmon by the millions swim from Bristol Bay up into the Nushagak and Kvichak Rivers, bound for tundra waters where they repeat the primeval cycle of spawning before death. But the discovery of other natural riches beneath the tundra—a vast lode of copper, gold, and other minerals—is raising deep questions about the future of the salmon and the region itself.

While Bristol Bay may be the most productive wild salmon fishery remaining in the world, a plan under development by an international consortium would put one of the world's biggest mines in the watershed that feeds the bay. It is called the Pebble Mine, and when the AAAS Arctic Division convened here recently, elected officials, Alaska

a regional scale," said Lawrence K. Duffy, executive director of the AAAS Arctic Division. "But it certainly was inspiring."

The annual Arctic Division meeting—held for the first time in the Alaskan Bush—convened 21 to 24 September at the University of Alaska-Fairbanks, Bristol Bay Campus. More than 75 scientists, policy-makers, and others attended from Alaska, the Lower 48, Canada, and Russia's Kamchatka Peninsula, and at a half-day Pebble Mine forum, they were joined by more than 150 local residents in the Dillingham Middle School gymnasium. The meeting was organized by Duffy; division president Todd Radenbaugh, director of the campus Environmental Science Lab; and Al Teich, senior science policy adviser at AAAS and liaison to the division.

A future mine? A proposal by the Pebble Limited Partnership, a global mining consortium, could put a massive pit and underground mine on the Alaskan tundra upriver from Bristol Bay salmon fisheries.

fuel spills to habitat destruction and dissolved copper contaminating the Bristol Bay watershed. For John Shively, chief executive officer of Pebble Limited Partnership, the key is whether engineering and technology can neutralize those risks. He said the mining consortium has thus far invested \$120 million and hired some 500 researchers to conduct "the largest science project ever undertaken for any mining project anywhere in the world."

The Pebble site is about 200 miles southwest of Anchorage, on undeveloped state-

<http://www.sciencemag.org/content/334/6055/469.full.pdf>

Downloaded from www.sciencemag.org on September 11, 2011

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Foundation[Print Page](#)Adjust Font Size: [A](#) [AA](#)

Big science comes to tiny fishing town

NSF Award: [Resilience and Vulnerability in a Rapidly Changing North: The Integration of Physical, Biological and Social Processes](#) (University of Alaska Fairbanks Campus)

State: [Alaska](#), [International](#)

Congressional Districts: Alaska At Large

Research Areas: [Education](#)

The tiny fishing town of Dillingham sits about 250 miles from the road system, however, as host to two major science conferences, Alaska's 20th-largest community welcomed scientists and students from across the nation to highlight research outcomes, and exposed them to the unique cultural and ecological considerations of arctic science.

The American Association for the Advancement of Science (AAAS) held its Arctic Science Conference in Dillingham for the first time in September 2011. Six months later, scientists again flooded the southwest Alaskan town for the 2012 Western Alaska Interdisciplinary Science Conference (WAISC).

Dillingham's newfound popularity as a conference venue stems from efforts by the University of Alaska's Todd Radenbaugh to bring the first WAISC to the town in 2008. Subsequent WAISCs were held in Nome, Unalaska and Bethel before returning to Dillingham in 2012. It was the success of the initial Dillingham conference that led AAAS to propose holding their 2011 meeting there.

The town's proximity to the site of the proposed Pebble Mine has heightened Dillingham's appeal as a meeting site. Pebble, a proposed gold mine, was a key topic at both the 2008 and 2012 WAISCs and at the AAAS meeting; the latter two conferences both had special sessions entirely devoted to the controversial project.

The AAAS and WAISC conferences are highly interdisciplinary, covering a huge range of fields and topics—from salmon fisheries to sustainable rural energy to education and traditional ecological knowledge. A number of local residents participated in the 2012 WAISC meeting, including students and Alaskan Native elders who attended sessions and who served as presenters.

Funding from the Alaska Experimental Program to Stimulate Competitive Research (EPSCoR) enabled researchers and students to attend the WAISC and AAAS conferences.

Image

[Click here to go to webpage](#)

Alaska Local SAGE Workshop

SAGE 2YC

Supporting and Advancing
Geoscience Education in
Two-year Colleges



Geoscience in Two-year Colleges > Supporting and Advancing Geoscience Education in Two-Year Colleges > Workforce Development > SAGE2YC Local Workshop: Western Alaska 2013

Geoscience in Two-year Colleges

Teaching Resources
and Perspectives

Faculty Careers

Workshops and Events

Supporting and
Advancing Geoscience
Education in Two-Year
Colleges

PI Workspace

Advisory Committee
Workspace

Workforce
Development

Preparing Students in
Two-year Colleges for
Careers

GSA 2012 Preparing
Workforce and
Transfer Students in
2YC

ASLO 2013 Workforce
Workshop

Texas 2013
Workforce Workshop

Alaska Local
Workshop 2013

Program

Chicago Local
Workshop 2013

Georgia Local
Workshop 2013

LA Local Workshop
2013

Virginia Local
Workshop 2013

Supporting Student
Success

Local SAGE2yc Workshop:

Western Alaska Interdisciplinary Science 2013

NOTE: This workshop has already occurred.

Read the [Conveners' Final Report](#) (Microsoft Word 2007 (.docx) 111kB Apr30 13).

This workshop was held in conjunction with the Western Alaska Interdisciplinary Science Conference held in Nome, AK. March 20, 2013 at the UAF Northwest Campus

Workshop Goals

Success in student undergraduate science education often starts with resilient programs at two-year colleges (2YCs). In rural Alaska, the community campuses are playing an increasingly important role in science education as well as developing a competent and technical workforce. This is done through working with K-12 teachers, high school dual credit courses, and providing opportunities for students to conduct research. To do all of this, faculty at Alaskan colleges face substantial challenges; limited resources for travel, isolation, and few opportunities for professional development.

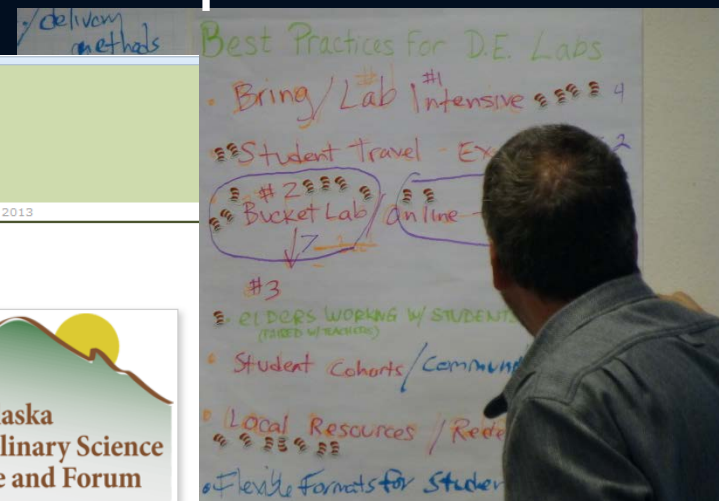
Goals include building or improving:

- Strategies to increasing number of STEM students
- Tactics to increase retention of current students
- Approaches to better train 2YC students for S
- Ways to prepare 2YC students to attend four-
- Undergraduate research and internship opportu
- Cooperation between Alaska rural campuses an
- Bridges to gaps between college- transfer and
- Lasting partnerships between academia and en

Dates

Workshop was held **March 20, 2013** 8:00am to 5:30pm, w

Expectations



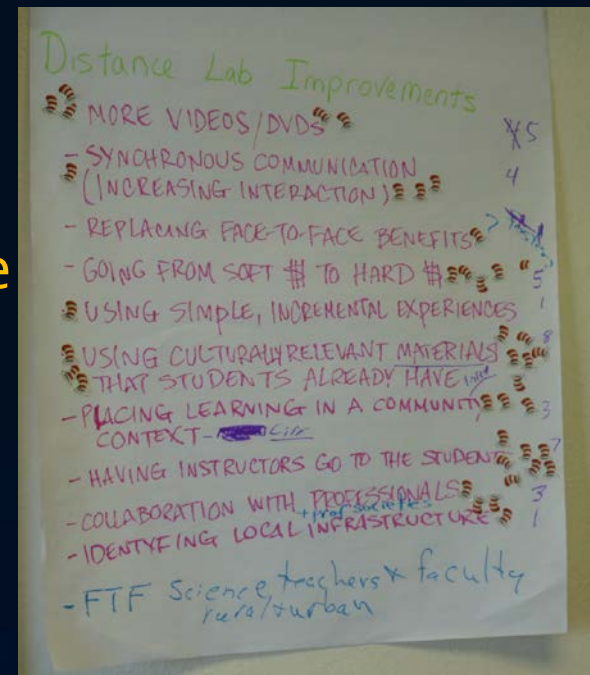
<https://serc.carleton.edu/sage2yc/workforce/local2013alaska/index.html>

Alaska Local SAGE Workshop

Topics Discussed

- Workforce development in rural Alaska
- Distance education delivery methods for science courses including labs
- Innovative learning techniques in distance education
- 2 year to 4 year college transition
- Developing a community of rural AK college educators
- Student support services needed for successful rural science programs

[Full report click here](#)



Alaska Local SAGE Workshop

Important Cultural Issues

- Living in two worlds
- Definition of subsistence is important and diverse
- Every village and community has a different local culture
- Worldview— expand science
- Community campuses: a place for this education in the student's context.



Sustainability – What is our future?



Thank you

