

COSEE Alaska: People, Oceans and Climate Change Annual Report Year 1 (Aug 15, 2008 – August 1, 2009)

Executive Summary

The Alaska Ocean Observing System (AOOS), the Alaska SeaLife Center (ASLC), the University of Alaska Fairbanks School of Fisheries and Ocean Sciences (SFOS), the University of Alaska Fairbanks Center for Cross-Cultural Studies (CCCS), the Anchorage School District (ASD), and the Alaska Sea Grant Program (ASG) partnered to create a COSEE Alaska with a geographic emphasis on the U.S. Arctic and sub-Arctic coasts and a nationally significant thematic focus on ocean climate change.

The COSEE Alaska grant proposal was submitted on March 1, 2007, the project actually began August 15, 2008. Sub-contracts were developed and issued in September and October, 2008.

During our first year, COSEE Alaska hired a fulltime faculty-level marine education specialist, met with an expanded regional advisory board, accomplished all of our Year 1 goals (detailed below) and participated in the national COSEE Council, COSEE Network and a number of working groups for the national program. We forged new strategic alliances and partnerships with organizations that expand our ability to network ocean scientists with diverse educational and public audiences both in Alaska and in the nation, and successfully reached out to coastal Alaska and diverse communities with the launch of ocean science fairs.

Overall description of program

COSEE Alaska was designed to bring together researchers and educators to develop collaborations that integrate, synthesize and enhance the ocean literacy of students and the public in Alaska, as well as that of national audiences. As described in our grant proposal, our goal is to create a long-lasting network of scientists and educators that will work together to:

- increase ocean literacy inside and outside Alaska,
- use ocean climate change as a theme for developing resources to enhance ocean and science curricula by including Alaska Native knowledge and sharing that knowledge with educators and students in Alaska and the rest of the nation,
- take advantage of the Internet and distance learning as tools for disseminating these materials
- provide professional teacher development and training opportunities, and
- leverage these activities with other existing programs to create additional synergism.

We proposed to achieve these objectives:

- WEAVE: Increase collaboration and interaction between ocean scientists, educators, students, and coastal communities in Alaska and the nation with an emphasis on ocean climate change.
- PATHFIND: Provide tools, services and training to help ocean scientists effectively participate in education and outreach with a focus on ocean climate change and ocean literacy.
- SHARE: Enhance teacher capabilities for incorporating ocean climate change information and “place-based” knowledge into existing curricula through professional development and training.
- INVITE: Increase access to and participation in ocean sciences by underrepresented and underserved populations.

- **BRIDGE:** Increase and broaden communication about ocean science and traditional knowledge of ocean climate change to audiences in Alaska and the nation, including the COSEE network

Our original set of activities to achieve these objectives included the Communicating Ocean Sciences workshop to be held annually in conjunction with the Alaska Marine Science Symposium, establishment of a scientist-educator network called SEANET, a variety of virtual field trips, teacher professional workshops, and other educational materials, and establishment of an Ocean Science Fair program (Appendix A).

More than 18 months passed between the time of the original proposal submission and final award. During that time, climate change impacts became a hot topic; many other ocean and marine research entities became involved in climate change education and outreach; and the partner organizations in COSEE Alaska developed a much greater awareness of the potential role of COSEE in ocean and climate change education and outreach within the scientific community as well as the educator (both formal and informal) community. As a result, in October 2008 we developed a more targeted approach to the activities to be used to achieve our original objectives (Appendix B), which included new partnerships with existing programs, including the Alaska Seas and Rivers Curriculum for teacher professional development and the Alaska Marine Conservation Council for the creation of short “Faces of Climate Change” videos, among other alliances and opportunities.

1. Grants and contracts. Notice of the original COSEE award was given in April 2008, however, the actual award was not finalized until August 2008. Subawards were released to the Alaska Ocean Observing System and the Alaska SeaLife Center in September and October. As proposed, the grant was to be administered by the Alaska SeaLife Center (ASLC) which serves as the fiscal agent for the Alaska Ocean Observing System (AOOS), the lead agency for the original proposal. However, the National Science Foundation had concerns about using the ASLC as the granting agency for AOOS since the center was also a sub-awardee for the grant. The ASLC and AOOS are kept fiscally separated and subject to independent audits, but given the delays the project had already experienced, the project leaders chose to have the University of Alaska Fairbanks School of Fisheries and Ocean Sciences (SFOS) administer the grant. Paula Cullenberg, with the SFOS Alaska Sea Grant Program became the official lead Principal Investigator (PI), although Molly McCammon, AOOS Director and the original lead PI, continues to serve unofficially in that role.

2. Administration & management. We proposed an administration and management structure consisting of a senior management team and an external advisory board. Cullenberg and McCammon are jointly responsible for overall project administration including compliance with NSF reporting requirements. McCammon serves as lead for the Senior Management Team, which consists of representatives from each partner organization, and serves as the Alaska representative to the COSEE Council. Nora Deans serves as the COSEE Alaska Director and the Council alternate. Dr. Andrea Anderson is the COSEE evaluator. Also serving on the team are Dr. Ray Barnhardt (UAF Center for Cross-Cultural Studies), Dr. Mike Castellini (UAF School of Fisheries), Texas Gail Raymond (Alaska School District), and Marilyn Sigman, (UAF Marine Education Specialist and COSEE Alaska Program Manager.) Sigman is the only full-time employee working for COSEE Alaska. The hiring process for her position (which included a national search) took more than four months, and thus she only began working in March 2009.

With the Senior Management Team based in Fairbanks, Anchorage and Seattle, we have found it advantageous to meet frequently by teleconference – at least monthly, and often more frequently. We have also held three meetings in person in Anchorage.

The original COSEE Alaska Advisory Board was composed of 12 representatives of formal education, informal education, research entities, and the private sector. The management team saw the board as an opportunity to engage a broader group of organizations involved in education and outreach, and thus expanded the board to include state commissioners, federal agencies and non-governmental organizations (Appendix C). The originally proposed chair, Alaska Education Commissioner Dr. Roger Sampson resigned following the original proposal submittal, but his replacement, Commissioner Larry LeDoux, agreed to serve as interim chair until elections could be held.

The Advisory Board held its first meeting in Anchorage, and NSF Program Manager Don Elthon, and COSEE Council Chair Lundie Spence addressed the group via teleconference to provide an overview of the national program. Molly McCammon and Chair Larry LeDoux facilitated the meeting, in which staff and principal investigators shared details about the COSEE Alaska program, and engaged in lively discussion with the advisors. Appendix D includes detailed minutes of the June 2 meeting. LeDoux, University of Alaska Southeast Chancellor John Pugh, and Doug DeMaster, Director of NOAA's Alaska Fisheries Science Center, all agreed to co-chair the board.

3. Expanded list of partners. We proposed collaborating with a wide variety of organizations representing key stakeholders in the research and education communities. Collaborations that began in Year 1 included: the North Pacific Research Board, the Arctic Research Consortium of the United States, the Alaska Center for Climate Assessment and Policy, NOAA's Alaska Fisheries Science Center, the Prince William Sound Science Center. Informal education collaborations began with the Alaska Geographic. Collaborations with specific COSEEs include COSEE NOW and COSEE Southeast.

4. Participation in COSEE Council & Network activities. Molly McCammon, COSEE Council member, and alternate Nora Deans attend monthly COSEE Council teleconference calls, and attended the annual COSEE Council/National Advisory Committee meeting in November 2008 in the new Sant Ocean Hall at the Smithsonian Institute's National Museum of National History in Washington D.C. Nora Deans, Dr. Ray Barnhardt and Dr. Andrea Anderson attended the COSEE Network meeting in May 2008 at Catalina Island, hosted by COSEE West, and Molly McCammon, Nora Deans, Marilyn Sigman and Dr. Anderson attended the 2009 COSEE Network meeting in May in Hilton Head, South Carolina, hosted by COSEE Southeast. Dr. Ray Barnhardt participates in the COSEE Network Diversity Working Group, and Nora Deans participates in the Marketing and Messaging Working Group and the Web Working Group. Dr. Andrea Anderson is involved in the Evaluation Working Group and links closely with the National Evaluation Team. Molly McCammon is a member of the COSEE Council Strategic Planning working group to implement the vision of the recently adopted Business Plan.

Activity Set 1: Link scientists with educators via an expanded Communicating Ocean Sciences Workshop and additions to the Alaska Marine Science Symposium

The Alaska Marine Science Symposium (AMSS), held annually in Anchorage, attracts more than 650 marine scientists from the U.S., Canada, and Russia and serves as a useful opportunity for researchers to network and develop collaborations with each other in support of their research in Alaska's seas. Nora Deans of the North Pacific Research Board launched a new Communicating Ocean Science (COS) workshop at the 2007 symposium, which drew scientists, graduate students, community members and media. An expanded workshop in 2008 drew more scientists. Among the speakers, Paula Keener-Chavis introduced the Centers for Ocean Sciences Education Excellence (COSEE) program, and scientists and the media shared examples of sharing research results with the public via magazines, books, the internet and through community celebrations of science and art (e.g., Sitka Whalefest). In 2008, the workshop featured scientists who shared their broader impacts activities with museums, working with film to share

research stories, reaching out to fishing and Alaska Native communities, through radio programs and multi-media campaigns. Deans launched discussion of a network (SEANET) for scientists, educators, community members and the media and received strong support from participants, as did the idea of creating a regional directory.

In January 2009, our new COSEE Alaska developed expanded educational features for the Symposium and enhanced the COS workshop so that educators, scientists, students, and community members could share experiences and highlight “best practices” of national, regional and local ocean education programs, as described below in SEANET activities and summarized in the evaluation report, “Communicating Ocean Sciences Workshop at the AMSS” (Appendix E). The 2009 COS agenda (Appendix F) included scientists sharing experiences with teachers at sea; data visualization ideas for scientists and educators; tips for taking videos in the field, an introduction to COSEE Alaska and an update on the new Alaska Seas and Rivers curriculum which features the latest Alaska ocean research in the case studies, thanks to scientists participating in teacher curriculum writing workshops at Kasitsna Bay.

To showcase best practices in outreach and broader impacts with all Symposium participants, COSEE co-sponsored luncheon presentations at the 2009 conference. The first luncheon featured National Ocean Science Bowl competition between local high school students and between teams of academic and NOAA scientists. In the final round, the winning high school team soundly trounced the winning academic team, much to the delight of the audience. The popularity of the event was overwhelming and will be repeated at future symposia. During our second luncheon presentation, COSEE featured Geoffrey Haines-Stiles, co-creator of the NSF-NASA funded International Polar Year communication program, “Polar Palooza.” A number of the scientists and Alaska Natives in the audience were “stars” of this cutting-edge multimedia event that traveled to informal education venues all over the U.S. Geoffrey shared the development of the program and initial evaluations, culminating his presentation with the rap music video, “Take Aim at Climate Change,” which delighted the audience.

In the evaluation report for these activities, (Appendix E), Dr. Anderson writes that attendees noted that workshop sessions were interesting and useful, offered new ideas for educational outreach and most audience members were interested in considering how to use the approaches with their own scientific research. Audience members were very interested in linking scientists and educators in collaborative endeavors, and see SEANET as offering a great opportunity to help facilitate collaborations. She concludes that “the Communicating Ocean Science workshop is a highly successful model for helping scientists share and learn about best practices for educating others about their research. The event also provides opportunities for scientists to hear from educators about possible ways to plug in to effective educational practices.” The workshop attracted approximately 65 individuals, primarily made up of scientists and graduate students, with community members and informal educators from state and federal agencies and informal learning centers as well.

Activity Set 2: Develop SEANET: a network of scientists, students, and community members in Alaska.

SEANET was formally launched at the Communicating Ocean Science workshop in January 2009, but the need for such a network and the functions it could fulfill were discussed at workshops in 2008 and 2007. A list of 165 scientists and educators who attended one or more of the workshops forms the core group for the network. Scientists who made presentations at these COS workshops that showcased excellent education and outreach strategies are highlighted on the appended list (Appendix G). This core group includes representatives of more than 80 organizations and agency units, including the major marine research institutions in Alaska as well as a number of universities and consultants outside of Alaska (including several in Russia and Canada) who conduct research within the region, state and federal agencies that employ both researchers and education/outreach specialists, Native organizations and

communities involved in natural resource management, and non-profit organizations that provide informal marine education to Alaskan communities, schools, and visitors.

A Google group was established for the network in June 2009, which will be used to share information about science outreach opportunities, high-quality resources for teaching about Alaska ocean climate change, and training opportunities for scientists and educators in best education and outreach practices. Google groups was chosen to provide an opportunity for SEANET members to interact with each other and for the COSEE group manager to create group web pages that could provide archived information from multiple contributors on topics of interest. Work is on-going to develop a regional directory (see below). Through this effort, additional scientists and graduate students who are currently involved in Alaska ocean climate change research and marine educators and organizations will become members of SEANET with a statewide directory as their resource and will be invited to participate in the Google group. The network will expand to other states through the revival of an Alaska chapter of the Northwest Aquatic and Marine Educators which would link Alaska members to those in Washington, Oregon, and British Columbia and share resources and models.

A SEANET Steering Group will be organized in September and have an initial meeting/teleconference in conjunction with the Alaska Science and Math Education Conference in Juneau in October. The Steering Committee will assist the COSEE Alaska educator in facilitating a review of a draft document that describes best practices and additional criteria for excellence in education about Alaska ocean science and climate change for K-12, Alaska communities, and public audiences (Appendix H). This will be featured in the regional directory of ocean science climate change scientists, educators, communications experts and local and regional programs that scientists will be able to link with for their broader impacts – in both an interactive online format and printed version updated annually.

Activity Set 3: Education & outreach tools for scientists

An initial survey of “the landscape” of Alaska ocean and ocean climate change scientists and outreach paints the picture that:

- A tremendous amount of climate-related research is underway, much of it at ecosystem and international scales (e.g., the North Pacific Research Board/NSF Bering Sea program, the International Polar Year).
- Significant outreach efforts have recently been implemented for the large-scale programs that employ multi-layered websites, podcasts and blogs from oceanographic cruises and expeditions, teachers embedded in cruises and expeditions, video production, and, in the case of the International Polar Year, a Polar-Palooza program that brought Arctic scientists and Native storytellers to museums throughout the U.S.
- In addition to NSF requirements that research addresses broader impacts, most other research entities that specifically fund Alaska marine research have incorporated grant review criteria for community involvement, inclusion of traditional or local ecological knowledge, and/or outreach.
- Interest in integrating long-term observations in the form of traditional and local ecological knowledge into scientific research is growing, along with acceptance of their value, particularly for studying the implications of climate change in northern areas where the effects are already being experienced.
- The weight given research grant criteria and an awareness of best practices in science outreach, however, lag well behind the weight given scientific merit and best practices for conducting scientific research.

COSEE Alaska thus has the opportunity to play a unique role in facilitating ocean and climate change science outreach by serving as a clearinghouse for educators to find out about what is available and in

relating individual resources to a framework for K-12 and community literacy about the ocean and climate change. Through its partnership with University of Alaska Fairbanks/School of Fisheries and Ocean Science (UAF/SFOS) and potential partnerships with other major research funders such as North Pacific Research Board (NPRB), the project also has the potential to increase the priority placed on outreach in general and to raise standards and awareness about what constitutes effective outreach, provide skill-building opportunities for scientists, reduce the effort required for scientists to interact with educators and communities, and develop incentives such as awards and recognition at the AMSS to help shift attitudes within the scientific community about the importance and need for high-quality science outreach.

COSEE Alaska initiated a comprehensive identification of scientists engaged in ocean and ocean climate research in Alaska and their needs. This activity began with the series of three COS workshops which were attended by a large number of scientists and “science translators” for state and federal agencies and research institutes each year as well as by individuals who self-identify as both scientists and educators. Marilyn Sigman and Ruth Post, UAF, have been working to expand the potential pool of scientists who could be served by COSEE. They developed an Excel database for the 120 scientists who presented at the 2009 AMSS on topics related to ocean climate change and are researching the nature of their pending research grant commitments for addressing the “broader impacts” of NSF grants or community involvement or education and outreach requirements of other research funding entities such as Alaska Sea Grant, the North Pacific Research Board, and the Arctic Yukon-Kuskokwim Sustainable Salmon Initiative. They are also searching the NSF award database for awards made in Arctic and Alaska ocean climate change research and/or scientific outreach programs in recent years to add to the database.

The database is one of the starting points for a regional directory of scientists, educators, and community members interested and involved in ocean science. The 120 scientists who presented on climate change-related research will be augmented by a NPRB database that includes more than 100 scientists involved in the National Science Foundation-North Pacific Research Board-funded Bering Sea Ecosystem Study (BEST) Bering Sea Integrated Ecosystem Research Program (BSEIRP) www.bsierp.nprb.org and the 650 scientists and educators who participated in the 2009 Alaska Marine Science Symposium (AMSS), as well as the more than 200 ocean scientists studying Alaska’s seas in projects funded by NPRB. A survey has been drafted to collect consistent information for directory members which will be expanded for scientists to assess what scientists are currently doing in terms of education and outreach, what they would like to do in the future, and the types of tools they would need to do so. An expanded survey for educators will ask about the types of science outreach activities they prefer and which they have the capacity to support or facilitate. The results of this survey and a survey of best practices at the other COSEEs will guide the development of tools and outreach opportunities for the scientists.

The directory itself will be a significant tool for providing meaningful connections between scientists and communities. For example, the Alaska Sea Grant program has Marine Advisory Agents in ten Alaska coastal communities. These agents seek to provide community and classroom presentations about research happening in the local area, but do so now on an opportunistic basis when they become aware that scientists will be traveling to field sites near their community. The directory would provide guidance and contact information for scientists about who to contact in specific communities to set up outreach events and a potential list of presenters for community educators. In addition, the directory will provide guidance about protocols for visiting and sharing research plans and results with Alaska Native villages who often depend for subsistence on the environment being studied. The directory will be completed by December 2009, and available for distribution to participants in the 2010 COS workshop and AMSS.

COSEE Alaska lent financial support to an outstanding scientist outreach effort which it will showcase at the 2010 COS workshop. Dr. Andrew Trites met with 4th and 5th grade classes in St. Paul, Alaska, a small

remote village in the Pribilof Islands, via videoconference on a monthly basis after capturing six fur seal pups and transporting them to the Vancouver Aquarium for captive rearing experiments. The class raised more than \$19,000 which COSEE Alaska supplemented to support a field trip to the Aquarium to visit the pups and learn about Dr. Trites' Bering Sea research on patch dynamics and marine mammal biology. The students participated in training and feeding the pups at the Aquarium and had an exchange with a Vancouver class that had recently participated in an aquarium education program. The teacher integrated knowledge from Aleut culture about the fur seals into science units throughout the year.

Craig Strang, of COSEE-California, has been invited to be a presenter at the 2010 COS workshop. Dr. Michael Castellini, UAF/SFOS, and Marilyn Sigman will work with him to establish a Communicating Ocean Sciences for Informal Audiences course at UAF and instruct it in 2010.

Activity Set 4: Enhance and develop ocean science/ocean climate change educational resources

1. Ocean Science Fairs and Projects. Included in the COSEE Alaska scope of work for Year 1 was an initiative to help school districts in Alaska organize local and regional science fairs around themes related to local knowledge of oceans, fisheries and marine environments. COSEE's ocean science fair initiative is coordinated through the Alaska Native Knowledge Network housed at the University of Alaska Fairbanks. The first pilot round of science fairs was initiated through a statewide planning workshop with teachers held in Anchorage October 10-11, 2008 (agenda, Appendix I).

A series of local and regional science fairs incorporating an ocean science theme were held by participating school districts, culminating in the top projects entering the Alaska State Science Fair in Anchorage March 27-29, 2009. The State Fair was groundbreaking in that participation of some rural students took place entirely by digital media and the internet (i.e. SKYPE), to offset the burden of travel costs. Guidelines for the science fairs were posted on the web at <http://www.ankn.uaf.edu/COSEE> so that teachers and students could obtain detailed information on what was needed to host a local COSEE Science Fair and participate in the State Science Fair. Information was also provided on the web site for helping students choose and develop exciting science fair projects.

The original proposal planned to engage an Alaska Native graduate student to assist with organizing the ocean science fairs. However, in order to get the program up and running quickly, retired teacher Alan Dick was contracted to work directly with school districts and teachers, including helping participating school districts to sponsor a local or regional science fair, providing workshops for participating teachers, developing ideas for ocean-oriented science fair projects, and organizing/implementing an ocean science theme for the annual Alaska State Science Fair. He has also been available to assist schools in the development and implementation of ocean- and marine-related curriculum, drawing on the science projects developed for the science fairs. Fairs were held in these communities and school districts in Year 1 (Science Fair Calendar, Appendix J):

Unalaska Science Fair (Unalaska, Steven Gregory)
Lower Yukon School District Science Fair (Mountain Village, Raphia B. Maglinao)
Bering Straits School District Ocean Science Bowl (White Mountain, Jack Adams)
North Slope Borough School District Science Fair (Barrow, Emily Roseberry)
Yukon Flats School District Science Fair (Ft. Yukon, Michael Jeffrey Slebodnick)
Alaska State Science Fair (Anchorage, Texas Gail Raymond)
Southeast Alaska Science Fair (Juneau, Linda Frame)
Kuspuk School District Science Fair (Sleetmute, Cheryl Jerabek)
Kodiak Island Borough School District Science Fair (Teri Schneider)

The winning high school project was from Kotzebue entitled “Shee Fish Feeding Habits.” Middle school winners were from Unalaska (“Water Filtration”) and Mountain Village (“DNA of Local Berries”). The elementary school winner was a first grader from Girdwood (“Tides: Rates and Effects”).

2. Other Resources and Content. Within the broad thematic focus of ocean climate change and the regional focus on Alaska and the Arctic, COSEE Alaska has set priorities for organizing and developing educational resources in four areas:

- Sea ice dynamics and implications to marine ecosystems;
- Accelerated coastal erosion (related to diminished ice);
- Hydrologic changes that will affect nearshore salinity regimes and ocean current dynamics; and
- Ocean acidification.

A review of available resources and existing science outreach programs on these topics is on-going to guide educators in reliance on a small number of resources with accurate information, engaging formats, and visuals that illustrate dynamic processes that often require illustration over long time scales. The review is also taking place for resources that present Alaska Native perspectives on climate change. Both efforts present significant challenges. Information about climate change and its current and potential impacts has rapidly become a flood of popular and scientific information. Perhaps no other topic has provided such an opportunity to bring the importance of good science to the forefront and such risk that scientific information will be misused, challenged, or ignored due to its societal implications. COSEE Alaska is working closely with its research PIs and science outreach programs at the UAF Geophysical Institute and International Arctic Research Center in this dynamic situation with respect to scientific information and scientific consensus.

Disseminating resources about Alaska Native perspectives requires cultural sensitivity and long-term relationships with the communities involved. COSEE Alaska is being well-served in these respects by many years of work by COSEE PI Ray Barnhart and his staff at the UAF Alaska Native Knowledge Network. Dr. Barnhart has also been working on an NSF-sponsored project with WGBH Boston which produced a special multi-media collection of videos and associated lesson plans *Alaska Native Perspectives on Earth and Climate* that was made available on their Teachers Domain website (<http://www.teachersdomain.org/ean>) in April 2009. This special collection will be a primary resource for educators and COSEE Alaska is exploring the potential of a customized special collection that could involve re-mixing videos with specific climate change science or Native perspective content with additional content relevant to Alaska or North Pacific Ocean dynamics.

COSEE Alaska has adopted the recently developed *Alaska Seas and Rivers* online curriculum as its primary K-8 curriculum resource, with the support of PI Paula Cullenberg of Alaska Sea Grant, the curriculum program sponsor. Marilyn Sigman, the COSEE Alaska educator, was the science content reviewer for these materials and participated in a broad-based Steering Committee for the project supported by grant funding from the Alaska Department of Education and Early Development. The Steering Committee developed best practices standards that included alignment of the units with both Ocean Literacy Principles and Alaska grade-level standards for science education, an inquiry and learning cycle approach, and authentic assessment methods. The curriculum is innovative with respect to science outreach by engaging students via an “Alaskan science story” that threads through each unit. The stories selected have a level of complexity appropriate to the age level and the potential for connections with on-going research and the scientists involved in them.

In addition to the *Alaska Seas and Rivers* curriculum and the WGBH special collection, resources that met the review criteria have been posted to the COSEE website and will be highlighted on the SEANET

Google group listserve. New K-12 lesson plans are being developed using the format and best teaching practices of the Alaska Sea Grant-sponsored *Alaska Seas and Rivers* curriculum.

The regional directory described above will be a major resource for educators as well as scientists. COSEE Alaska will work to facilitate partnerships between scientists and educators based on the capacities and needs of both and will seek ways to fill gaps.

In addition to these activities, COSEE Alaska is partnering with the Alaska Ocean Observing System (AOOS) to facilitate a model for science outreach using the AOOS Prince William Sound Field Experiment (called Sound Predictions 2009) during July and August 2009. The project involves more than a dozen scientists from the University of Alaska, the Prince William Sound Science Center and Oil Spill Recovery Institute, the NASA Jet Propulsion Lab, and four universities in California, Maine, and Texas and is field testing models developed by AOOS for wind, waves, weather and ocean circulation. Specifically, COSEE Alaska is:

- Collaborating with COSEE-NOW to record “Gazing at the Sea” podcasts by scientists and stakeholders who benefit from an improved ocean observing system and predictive models and arranging for these to be broadcast on Alaska public radio stations and archived on the AOOS website;
- Assisting in the development of a media packet and opportunities for journalists and writers to participate in the experiment;
- Assisting with AOOS website content and design to communicate the research being conducted by individual scientists and to explain the science and technology of the experiment to general public audiences;
- Developing a blog for Pete Puffin, a puffin toy character in *Pete Puffin’s Wild Ride*, a children’s book co-produced by AOOS and overseeing the development of lesson plans for elementary school teachers related to currents and climate change. In the book, Pete is dropped off a cruise ship offshore of Alaska by a vacationing child, and he rides Alaska’s currents, ending up eventually on the East Coast and the home of the much older child who lost him. Pete will find himself in Prince William Sound during the experiment and will blog about his adventures on the AOOS website.
- Overseeing the development of lesson plans for middle school teachers to make use of “real-time” data from the experiment for learning about Alaska currents, ocean circulation, and the potential effects of climate change on these aspects of Alaska’s seas.

3. Virtual field trips. Due to the late hire of our full-time marine educator, we were not able to conduct virtual field trips in summer 2009. However, we have begun the planning so that one or more of these can be conducted during the summer field season in 2010.

Activity Set 5: New techniques for Education and Outreach

During Year 1, COSEE Alaska planned to identify gaps in teacher professional development that could be filled by ocean and ocean climate change science content. Two immediate opportunities to integrate content and instruction into workshops that were in planning stages were identified.

The first opportunity was to add content and instruction to a summer institute for 7-12 science educators “Indigenous and Western Science Observations on Climate Change: resources for teachers” being planned by COSEE Alaska PIs Ray Barnhart, Director of the UAF Center for Cross-cultural Studies and Texas Gail Raymond, Science Curriculum Coordinator for the Anchorage School District (agenda, Appendix K). Marilyn Sigman instructed a two-hour session of the four-day course and added content and engaged teachers in hands-on activities from the *Alaska Seas and Rivers* curriculum related to North

Pacific Ocean currents, global ocean circulation, and predicted effects of climate change. She also introduced teachers to the COSEE-Alaska project and available resources. Workshop participants included 30 rural Alaska teachers and 10 from the Anchorage School District. An evaluation of this session in the form of a short survey of participants (Appendix L) resulted in the following findings:

- 1) the session was highly relevant to the teachers, with 89% of respondents rating the workshop a 4 or 5 (high);
- 2) a significant “take away” from the session was recognition of the connection with tribal elders as a knowledgeable resource about changing climate;
- 3) the resources and connections were deeply appreciated; and
- 4) available time remains the major barrier to including climate change information, given current curriculum requirements.

A primary goal of the workshop was to share Teacher’s Domain resources with the teachers, particularly the special collection on *Alaska Native Perspectives on Earth and Climate*. Ray Barnhart made a presentation and shared resources for planning ocean science fairs, including a lesson plan on the Teacher’s Domain website related to the special collection. As follow-ups to the workshop, COSEE Alaska will be able to create a customized online resource of videos related to Alaskan ocean climate change and the participating teachers will post and review lesson plans on an interactive website. The COSEE Alaska PowerPoint presentation made at the workshop will be available on this website. COSEE Alaska PIs Raymond and Barnhart are continuing to work with WGBH Boston to develop an online professional development course with similar content.

The second opportunity is participation in professional development workshops to disseminate the *Alaska Seas and River* curriculum. Workshops are scheduled for five school districts in Southcentral and Western Alaska (Bering Straits, Southwest Region, Copper River, Chugach, and Unalaska) in August and September 2009. Marilyn Sigman will instruct the Chugach School District workshop and work with other workshop facilitators to highlight content related to climate change concepts and to publicize the resources available through COSEE. COSEE will partner with AOOS to extend learning in the villages of Chenega, Tatitlek, and Whittier in Chugach School District by assisting teachers in piloting lesson plans developed following the AOOS Prince William Sound Field Experiment.

COSEE Alaska also collaborated with COSEE Southeast to provide content and resources to their “*As the World Turns (Warmer and Colder): past, present and future patterns of climate change*” workshop for teachers in North Carolina, South Carolina, and Georgia July 20-25 at the Baruch Marine Lab in Georgetown, South Carolina. COSEE Alaska provided an Alaska case study in the form of information on evidence of climate change in the Alaska region and educational strategies and resources, including the participation of Alaska teachers in climate change-related monitoring projects and the real-time engagement of a teacher in ecological seabird studies on the Pribilof Islands which is being featured on the PolarTrek website during the period that the class is being held.

Activity Set 6: Communicate Alaska’s ocean science/ocean climate change knowledge to the nation and the world

1. Cruise ships. More than one million visitors travel to Alaska each year, drawn by the lure of glaciers, wildlife, fishing, hunting, hiking and camping. The majority choose to travel by cruise ship or cruise/tour packages, with others seeking adventure in the far north on their own or as part of small, organized ecotourism adventures. They experience climate change firsthand as Alaskans are living with it, and seek information at informal learning centers, museums, aquariums and other sites of free-choice learning. COSEE Alaska is working with colleagues at both the Seattle Aquarium/COSEE OLC and Vancouver

Aquarium, (which are located at the major departure point cities for cruises to Alaska) to explore opportunities to deliver climate change messages to cruise ship passengers throughout their journey. In addition, COSEE Alaska is working closely with the Education and Outreach Working Group for the National Federation of Regional Associations for Coastal and Ocean Observing to research and conceptually develop interactive kiosks with real-time and near-real-time data visualizations and stories for use onboard cruise ships as well as in the Alaska Sealife Center and potentially the Seattle Aquarium and Vancouver Aquarium. This builds upon the storytelling and data visualization workshop held in January 2009 by COSEE NOW, NSF and NOAA and attended by Nora Deans and Molly McCammon.

2. Other materials. The SEANET steering committee will begin developing a set of key messages for COSEE Alaska at its fall meeting, working with the full SEANET membership. These key messages will be incorporated into all of the COSEE Alaska materials for formal and informal educators, the website, and scientist materials, as well as the interactive kiosks and multi-media materials to be developed in Year 2.

COSEE Alaska created a pop-up exhibit, Alaska Oceans Science handbook, bookmark and notepad which were distributed at the Alaska Ocean Festival in June 2009 and at the National Marine Educator Association conference in Monterey, California in July 2008. Two flyers describing COSEE Alaska (Appendix M and N) and an article in the Winter 2009 AOOS Update (Appendix O) have also been used to market COSEE Alaska in a wide variety of venues.

Activity Set 7: Establishing an Ocean Climate Change web portal and developing and disseminating Alaska-specific multi-media resources.

1. Website. COSEE Alaska chose to work with the new web template created by the COSEE Central Coordinating Office and the Web Working Group to launch its website in early 2009, and continues to link new resources and build out the site as well as participate in the working group to shape COSEE's overall web presence. We've also initiated a series of videos and distance learning programs through our partners Alaska Sea Grant and Alaska SeaLife Center.

2. "Faces of Climate Change" Videos. COSEE Alaska, together with the Alaska Marine Conservation Council, which represents small fishing communities, and the Alaska Sea Grant Program filmed a series of videotaped interviews of ocean scientists, Alaska Natives and coastal community members sharing western science and traditional knowledge about ocean climate change in Alaska seas. The videos were taped at the January 2009 Alaska Marine Science Symposium and at the 2009 Alaska Forum on the Environment, Alaska's largest environmental conference which had a full day of presentations about the evidence of climate change, research, adaptation, and mitigation strategies. We are currently editing the interviews to create short five- to ten-minute stand-alone videos that we'll also weave together to create a 45-60 minute DVD. The videos will be available on COSEE Alaska and partner websites, featured on YouTube and will be shared throughout the COSEE network as well as shown at film festivals and venues in Alaska and the lower 48.

3. Distance Learning. The Alaska SeaLife Center is in the process of developing a new secondary-level *Northern Exposures: Climate Change* distance learning program with supplemental funding from Congress. Marilyn Sigman is working with Laurie Stuart and other educators to review the draft units and develop an integrated K-12 curriculum framework for both *Alaska Seas and Rivers* and *Northern Exposures* curricula that aligns specific units and lesson plans with national Ocean and Climate Change Literacy Principles and Alaska State Science Standards.

Appendix A

COSEE Alaska objectives and activities described in original March 2007 proposal

COSEE Alaska: Objectives and Activities as proposed March 1, 2007					
	Objective 1 WEAVE	Objective 2 PATHFIND	Objective 3 SHARE	Objective 4 INVITE	Objective 5 BRIDGE
COSEE Alaska Activities	Increase collaboration and interaction between ocean scientists, educators and coastal communities in AK and the nation with an emphasis on ocean climate change.	Provide tools and services to help ocean scientists effectively participate in education and outreach about with a focus on ocean climate change and ocean literacy.	Enhance teacher capabilities for incorporating ocean climate change information and “place-based” knowledge into existing curricula through workshops and training.	Increase access and participation in ocean sciences by under-represented and underserved populations.	Increase communication about ocean science and traditional know-ledge of ocean climate change to audiences in Alaska and the nation, including COSEE network.
Link Scientists and Educators	COS workshop at annual AK Marine Science (AMS) Symposium	Education and outreach (E&O) sessions at AMS Symposium	COS workshop at annual AK Marine Science (AMS) Symposium	Student Participation in AMS Symposium Mentorship Program	Ocean Science Education Conference
Establish Network	Establish SEANET	SEANET	SEANET		Quarterly SEANET Meetings
Develop New Tools for Scientists	Hands-on Learning Sessions for Scientists	E&O Regional Guide and Directory			
Enhance and Develop Educational Resources	Virtual Field Trips	Virtual Field Trips	Teacher guides to support Ocean Science Fairs and Virtual Field Trips	Ocean Science Fairs	
Educator Professional Development	Scientists and educators participate in annual COS workshop		Develop annual workshops		Scientists and educators participate in annual COS workshop
Communicate broadly	COSEE network partnerships			COSEE network partnerships	Creation and delivery of publications and video clips for use with informal audiences

Ocean Climate Web Portal/ Multimedia projects	Information to connect scientists to educators and visa versa	Post guides, directories and other publications	COSEE Alaska activity products hosted on site	Highlight student project work	Provide data and COSEE Alaska products to national audience
Evaluation and Publications					Evaluation reports, journal articles, theme issue: <i>Current: Journal of Marine Education</i>

Appendix B – Objectives and activities as of October 2008

COSEE Alaska Activity Set Details October 28, 2008					
	Year 1 Sept 2008-Sept 2009	Year 2 Sept 2009-Sept 2010	Year 3 Sept 2010-Sept 2011	Year 4 Sept 2011-Sept 2012	Year 5 Sept 2012-Sept 2013
COSEE Alaska	Advisory Board meeting <ul style="list-style-type: none"> ○ Notify Board ○ Set new dates for 2009 (Doodle) ○ Update membership 	Advisory Board meeting (date to be determined)	Advisory Board meeting (date to be determined)	Advisory Board meeting (date to be determined)	Advisory Board meeting (date to be determined)
COSEE Council	Monthly check-in calls Twice yearly meetings <ul style="list-style-type: none"> • NMEA meeting July • Ocean Hall Nov 	Monthly check-in calls Twice yearly meetings <ul style="list-style-type: none"> • NMEA meeting • TBD 	Monthly check-in calls Twice yearly meetings <ul style="list-style-type: none"> • NMEA meeting • TBD 	Monthly check-in calls Twice yearly meetings <ul style="list-style-type: none"> • NMEA meeting • TBD 	Monthly check-in calls Twice yearly meetings <ul style="list-style-type: none"> • NMEA meeting • TBD
COSEE Network	Yearly PI retreat in spring <ul style="list-style-type: none"> • South Carolina Contribute to COSEE.NET	Yearly PI retreat in spring Contribute to COSEE.NET	Yearly PI retreat in spring Contribute to COSEE.NET	Yearly PI retreat in spring Contribute to COSEE.NET	Yearly PI retreat in spring Contribute to COSEE.NET

COSEE Alaska Activity Set Details October 28, 2008
Activity Set 1 AMSS & COS

COSEE Alaska	Year 1 Sept 2008-Sept 2009	Year 2 Sept 2009-Sept 2010	Year 3 Sept 2010-Sept 2011	Year 4 Sept 2011-Sept 2012	Year 5 Sept 2012-Sept 2013
Activity Set 1	<p>Alaska Marine Science (AMS) Symposium</p> <p>Explore ways to include students in AMS events</p> <p>Incorporate Best of EO (Activity 3)</p> <p>EO Luncheon speakers</p> <ul style="list-style-type: none"> o Communicati ng Ocean Science/Infor mal Science Craig Strang to give presentation o NOSB students o Other? <p>COS Workshop 1/19/09 8 am to 1:30 pm w/lunch</p>	<p>Expand AMS Symposium</p> <p>Include students in AMSS</p> <ul style="list-style-type: none"> o Ocean Science Fair student winners o Sunday teacher workshop on Ocean Science Fairs with follow-up project for CEC o Mini “how-to” sessions for scientists on giving better talks, posters, powerpoints, o Solicit scientists from SEANET and others to serve as judges for community Ocean Science Fairs? o Public evening event? <p>Planning Committee for national conference in 2012</p>	<p>AMS Symposium</p> <p>Add student mentorships</p> <ul style="list-style-type: none"> o Ocean science fair winners come to AMSS for next round of judging; go on to State Science and Engineering fair o Planning Committee for national conference in 2012 	<p>Co-host Ocean Science Education Conference (OSEC) Summer 2012</p> <p>Host National Marine Educators Association (NMEA)national conference in summer 2012 with Northwest and Aquatic Marine Educators (NAME) –regional chapter of NMEA</p> <p>Tie in with teacher workshop in Seward summer 2012 (Activity 5)</p>	<p>Host International Pacific Marine Educators meeting?</p> <p>Link with teacher workshop in Barrow in summer 2013 (Activity 5)</p>

COSEE Alaska Activity Set Details October 28, 2008

Activity Set 2 SEANET

COSEE Alaska	Year 1 Sept 2008-Sept 2009	Year 2 Sept 2009-Sept 2010	Year 3 Sept 2010-Sept 2011	Year 4 Sept 2011-Sept 2012	Year 5 Sept 2012-Sept 2013
Activity Set 2	Establish SEANET <ul style="list-style-type: none"> ○ Create listserv from COS participants ○ Formalize as NMEA chapter? ○ Create steering committee at AMS 2009 – dinner mtg ○ Strong links with <ul style="list-style-type: none"> – ARCUS, – Alaska Science Education Clearinghouse (GI)? – Alaska Native Science Education Council? – Alaska Science Consortium – Alaska Science Teachers Association – Northwest Aquatic and Marine Educators Association 	SEANET meets quarterly <ul style="list-style-type: none"> ○ Meet quarterly ○ Identify scientists to mentor students ○ Start development of regional directory ○ Plan NMEA 2012 conference 	SEANET <ul style="list-style-type: none"> ○ meet quarterly ○ Scientists and student mentors for other students ○ Publish development of regional directory ○ Plan NMEA 2012 conference 	SEANET <ul style="list-style-type: none"> ○ Meet quarterly ○ Host NMEA 2012 conference ○ Plan international marine educators conference 	SEANET <ul style="list-style-type: none"> ○ Meet quarterly ○ Host international marine educators conference

COSEE Alaska Activity Set Details October 28, 2008
Activity 3 E&O Guidelines & Enrichment for Scientists

COSEE Alaska	Year 1 Sept 2008-Sept 2009	Year 2 Sept 2009-Sept 2010	Year 3 Sept 2010-Sept 2011	Year 4 Sept 2011-Sept 2012	Year 5 Sept 2012-Sept 2013
Activity Set 3	<p>Identify criteria for excellent education and outreach (E&O)</p> <p>SEANET steering committee & COSEE staff & graduate student establish criteria</p> <p>Identify best practices</p> <p>Awards for Best E&O</p> <ul style="list-style-type: none"> - Dave Atkinson, GI, coastal erosion, storms - Heidi Herter, Nome, video conferences to villages - Hajo Eicken Sea ice observations & LTK 	<p>Showcase best E&O scientists at AMS</p> <p>Showcase during lunches or in each plenary session</p> <p>Develop Communicating Ocean Science course at UAF/UAA</p> <p>Create interactive regional E&O guide on website</p>	<p>Develop and pilot E&O interactive workshops at AMS, other?</p> <p>Offer Communicating Ocean Science course at UAF/UAA</p> <p>COMPASS – hold workshops</p>	<p>Launch regional E&O guidelines and interactive directory</p> <p>Update E&O Regional directory on website and publish – distribute at NMEA 2012</p>	<p>Publish E&O guidelines, directory, and project report</p> <p>Distribute online and at science education conferences (Listservs, NSTA, AFE, AMSS, etc.)</p>

COSEE Alaska Activity Set Details October 28, 2008
Activity Set 4 Ocean Science Fairs & Virtual Field Trips

COSEE Alaska	Year 1 Sept 2008-Sept 2009	Year 2 Sept 2009-Sept 2010	Year 3 Sept 2010-Sept 2011	Year 4 Sept 2011-Sept 2012	Year 5 Sept 2012-Sept 2013
Activity Set 4	<p>Launch Ocean Science Fairs with ocean climate change theme</p> <p>Hosted Ocean Fair meeting for statewide school districts – Oct 10-11</p> <p>Host pilot Ocean Science Fairs in spring in ?? communities</p> <p>Establish scientist in residence program for each community.</p> <p>Solicit 2 sets of judges: <ul style="list-style-type: none"> ○ Cultural ○ Science </p> <p>Link with state science standards; Ocean Literacy & Climate Literacy principles</p>	<p>Expand Ocean Science Fairs spring 2009</p> <p>Alaska Native PhD student involved in ocean science fairs in communities</p> <p>Develop handbook of activities of ocean science fairs; web based</p> <p>Feature ocean science fairs in teacher workshops during school year and summer workshop (Activity 5)</p> <p>Winning students compete at AMSS</p> <p>Media-rich projects encouraged – podcasts, vodcasts, kids posting observations on COSEE Alaska web (Activity 7)</p>	<p>Distribute Ocean Science Fair projects to all Alaska schools</p> <p>Distribute handbook/DVD of activities of ocean science fairs</p> <p>Hold teacher workshops about Ocean Science Fairs (activity 5)</p> <p>Expand Ocean Science Fairs to more communities</p> <p>Link with Imaginarium & others to take Ocean Science Fairs statewide</p>	<p>Evaluate Ocean Science Fairs</p> <p>Showcase Ocean Science Fairs at NMEA 2012</p>	<p>Report on Ocean Science Fairs</p> <p>Distribute Handbook and DVDs</p>

Activity Set 4 Cont'd	Develop content for ocean climate change virtual field trips <ul style="list-style-type: none"> ○ Review existing virtual worlds and distance learning programs ○ Explore bandwidth issue for remote communities ○ Establish development team with SEANET steering committee, COSEE staff and ASLC distance learning team ○ Possible equipment donation from GCI or ASLC 	Offer first virtual field trip Pilot test with teachers during teacher workshop Revise & launch Begin development of second virtual field trip	Add new virtual field trip Pilot test 2 nd virtual field trip during teacher workshop Revise & launch Begin development of third virtual field trip	Add new virtual field trip Pilot test 3 rd virtual field trip during teacher workshop Revise & launch Begin development of fourth virtual field trip	Add new virtual field trip Pilot test 4 th virtual field trip during teacher workshop Revise & launch Evaluate
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COSEE Alaska Activity Set Details October 28, 2008
Activity Set 5 Teacher Workshops

COSEE Alaska	Year 1 Sept 2008- Sept 2009	Year 2 Sept 2009-Sept 2010	Year 3 Sept 2010-Sept 2011	Year 4 Sept 2011-Sept 2012	Year 5 Sept 2012-Sept 2013
Activity Set 5	<p>Identify teacher professional development gaps in ocean climate change</p> <p>SEANET steering committee & COSEE staff & grad student do gap analysis</p> <p>Start planning teacher workshop to be held in Seward in 2010 – incorporate Ocean Science Fairs; real-time data& LTK on climate change</p> <p>Explore link with ASD Academy to reach Anchorage teachers</p>	<p>Hold workshop in Seward Summer 2010</p>	<p>Hold workshop in Barrow summer 2011</p>	<p>Expand Seward workshop Summer 2012; tie-in with NMEA conference as a pre, or post conference workshop and field experience</p>	<p>Expand Barrow workshop summer 2013; tie-in with International Pacific Marine Educators conference</p>

COSEE Alaska Activity Set Details October 28, 2008
Activity Set 6 Reaching Public Audiences via videos, publications

COSEE Alaska	Year 1 Sept 2008- Sept 2009	Year 2 Sept 2009-Sept 2010	Year 3 Sept 2010-Sept 2011	Year 4 Sept 2011-Sept 2012	Year 5 Sept 2012-Sept 2013
Activity Set 6	<p>Develop key messages for tourists, cruise ships & other informal audiences</p> <p>Explore best ways to reach cruisers w/Binkley and Bustamente/Advisory Board</p> <p>Explore hosting "Train the Cruise Ship Naturalists"</p> <p>Create short videos about importance of Alaska's seas</p> <p>Develop ideas for popular publication about Alaska's oceans & impacts of climate change</p>	<p>Explore pilot testing Seasons of the Sea kiosks in ASLC and on cruise ships</p> <p>Develop 2-3 minute videos on Alaska's seas & impacts of climate change for Ocean Hall Kiosks</p> <p>Write design and publish publication</p>	Distribute publications & videos	Refine publications and videos and deliver to tourism audiences	Explore expanded publications and new media for delivering key messages

COSEE Alaska Activity Set Details October 28, 2008
Activity Set 7 Web & Multimedia

COSEE Alaska	Year 1 Sept 2008- Sept 2009	Year 2 Sept 2009-Sept 2010	Year 3 Sept 2010-Sept 2011	Year 4 Sept 2011-Sept 2012	Year 5 Sept 2012-Sept 2013
Activity Set 7	<p>Launch COSEE Website</p> <p>Participate in COSEE.NET web group</p> <p>www.coseealaska.net hosted by COSEE.NET</p>	<p>Develop COSEE Arctic Ocean Climate Change web portal & multimedia materials</p> <p>Kids from coastal communities sending in real-time observations and blobs re: coastal climate change in their region</p> <p>Explore social networking with kids, scientists & educators</p>	<p>Expand COSEE Arctic Ocean Climate Change web portal</p>	<p>Add multimedia materials to COSEE Arctic Ocean Climate Change web portal</p>	<p>Post COSEE Alaska web products on COSEE Arctic Ocean Climate Change web portal</p>

**COSEE Alaska Activity Set Details October 28, 2008
Evaluation**

COSEE Alaska	Year 1 Sept 2008- Sept 2009	Year 2 Sept 2009-Sept 2010	Year 3 Sept 2010-Sept 2011	Year 4 Sept 2011-Sept 2012	Year 5 Sept 2012-Sept 2013
Evaluation	Phone Contact form Formative/base line evaluation		Midterm Evaluation		Final evaluation report, journal articles, project report

Appendix C – Advisory Board Membership

Research	Formal Education Interests	State and Federal Interests	Informal Education Interests	Private Sector Interests
Mead Treadwell Chair, U.S. Arctic Research Commission meadwell@alaska.net	Larry LeDoux, Commissioner, Alaska Department of Education Larry.ledoux@alaska.gov	Amy Holman National Oceanic and Atmospheric Association Amy.Holman@noaa.gov	Ian Dutton Executive Director, Alaska SeaLife Center land@alaskasealife.org	John Binkley Executive Director, Alaska Cruise Association Jbinkley@alaska.net
Denis Wiesenburg Dean, School of Fisheries and Ocean Sciences, UAF weisenburg@sfos.uaf.edu	John Pugh Chancellor, University of Alaska Southeast John.pugh@uas.alaska.edu	Bob Winfrey Science Advisor, Alaska Region, National Park Service Robert_Winfrey@nps.gov	Charles Money Executive Director, Alaska Geographic Association cmoney@alaskageographic.org	Cam Toohey Alaska Manager, Shell Exploration & Production Company Cam.toohey@shell.com
Clarence Pautzke Executive Director, North Pacific Research Board cpautzke@nprb.org	Enid Silverstein Curriculum Director, Anchorage School District Silverstein_enid@asdk12.org	Ellen Lance U.S. Fish and Wildlife Service Ellen_Lance@fws.gov	Patricia Partnow Vice-President, Alaska Native Heritage Center ppartnow@alaska.com	Karen Gillis Bering Sea Fishermen's Association karen.gillis@bsfaa.org
Richard Glenn Barrow Arctic Science Commission rglenn@asrc.com	Joanna Wassilie Bering Straits Jwassillie1@yahoo.com	Commissioner Larry Hartig, Department of Environmental Conservation Larry.hartig@alaska.gov		Margaret Williams World Wildlife Fund Margaret.williams@wwfus.org
Douglas DeMaster Director, NOAA Alaska Fisheries Science Center Douglas.demaster@noaa.gov	Peggy Cowan Superintendent, Juneau School District Peggy_cowan@jsd.k12.ak.us	Commissioner Denby Lloyd, Alaska Department of Fish and Game Dfg.commissioner@alaska.gov		
Larry Hinzman Director, International Arctic Research Center lhinzman@iarc.uaf.edu				

Appendix D – Advisory Board Meeting Minutes

Alaska COSEE Advisory Meeting Draft Minutes

June 2, 2009

10 am – 3 pm

Anchorage, Alaska

Advisory Board members in attendance: Mead Treadwell, Larry LeDoux, Denis Wiesenburg, Clarence Pautzke, Douglas DeMaster, John Pugh, Joanna Wassilie (by phone), Amy Holman, Bob Winfrey, Ian Dutton, Charles Money, Cam Toohey, (Peter McCroy for Larry Hinzman)

Project Principal Investigators: Molly McCammon, Ray Barnhart (by phone), Michael Castellini, Paula Cullenberg, Texas Gail Raymond, Laurie Stuart for Nicole Nelson

Staff: Nora Deans, COSEE-Alaska Director; Marilyn Sigman, COSEE-Alaska Program

Manager; Andrea Anderson, Project Evaluator; Alan Dick, Laurie Stuart

Invited guest speakers: Don Elthon, National Science Foundation Ocean Sciences Education Program Officer; Lundie Spence, COSEE-SE & COSEE Council

Role of the Advisory Board: After introductions, COSEE Alaska Management Team Lead Molly McCammon shared information about the role of the COSEE-Alaska Advisory Board. (See Appendix 1 for a summary and www.coseealaska.net for powerpoint slides)

National COSEE program: Nora Deans presented an overview of the national Centers for Ocean Sciences Education Excellence (COSEE) funded by the National Science Foundation Ocean Science Division , with additional comments by Program Officer Don Elthon, and COSEE Council Chair Lundie Spence. (See Appendix II for a summary and www.coseealaska.net for powerpoint slides)

Alaska COSEE Overview: Nora Deans and Marilyn Sigman introduced the Advisory Board to the COSEE Alaska program. (see Appendix III for a summary and www.coseealaska.net for powerpoint slides)

Presentations by Principal Investigators COSEE Alaska PIs each shared information about their institution's involvement in COSEE. (see Appendix IV for a summary and www.coseealaska.net for powerpoint slides)

Opportunities and Recommendations for COSEE Alaska: Following the presentations, the Advisory Board discussed opportunities for COSEE Alaska, including questions regarding project evaluation, the niche for COSEE Alaska, and collaborative partnerships.

Evaluation for COSEE Alaska

- The National Science Foundation's COSEE program will undergo a decadal review and evaluation in 2010, which will determine the continuation of the program for another decade. This is independent from on-going evaluations of each Center.
- There is no established set of metrics for all of the COSEEs to measure impacts, in part because the Centers are quite different. It is up to each Center to determine the metrics of success.

Appendix D – Advisory Board Meeting Minutes - continued

- NSF has not made the establishment of a baseline survey of ocean literacy a priority for the COSEE network because they view them as a small fraction of the large community working on improving ocean literacy.
- The NSF COSEE program is not involved in common core student performance standards or national curriculum development. State and national science standards do not explicitly require education about the ocean or marine science concepts but they do include concepts that can be taught through ocean science. Ocean literacy principles and fundamentals have been developed by COSEE Centers with NOAA and other entities (as have climate change literacy principles) and are external to the formal education system.

Evaluation questions raised by Advisory Board members:

- What is COSEE Alaska's niche? How will COSEE add value beyond what the agencies and schools are doing right now; where will it fit in and what is the incremental addition?
- We want to have scientists involved, but for what benefit? Public literacy? Increasing students in Science and Technology-Engineering-Math disciplines? A "pipeline" for Alaska rural students to science and natural resources careers? An increase in advanced placement students in the sciences? Increasing student capacity to achieve in science?
- How do you measure the impact of COSEE (trainings) and impacts on ocean scientists?
- Can we develop "niche maps" of where we are right now and how things can change – i.e., a shifting baseline map?

Potential Niches for COSEE-Alaska

- Providing educational components that don't exist now (e.g., agencies do not all have web sites that are educational), taking existing materials or information and making them available to wider audiences, e.g., making Alaska fisheries data available especially to K-12 audiences
- Providing scientists lists of presentation/outreach venues and strategies; an easy funnel for them to plug into to address broader impacts
- Providing outreach protocols and best practices to scientists and science educators, e.g., how to engage Native people or informal education audiences appropriately and successfully
- Using the ocean and climate change as a catalyst for increasing student capacity in science
- Developing exemplary activities or programs (teacher workshop, scientist-teacher-student partnership) and then "scaling up" to a statewide, regional, or national impact

Collaborations and partnership recommendations

- A survey of ocean literacy for Alaska and perhaps the region with COSEE.
- Invite a representative from the U.S. Forest Service to join the Advisory Board. They have a strong focus on climate change, particularly on hydrologic changes and impacts on fisheries which could provide web content. Their Mendenhall Visitor Center has 50,000 visitors annually.
- Invite a representative from UAA to join the Advisory Board.
- Partnerships with the National Park Service, U.S. Forest Service, and U.S. Fish and Wildlife Service could help with providing information and/or training for onboard interpretive programs on ferries and cruise ships re: ocean climate change. (The Seattle and Vancouver Aquaria have already been identified as venues to reach cruise ship tourists whose tours originate in those cities.)
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Appendix D – Advisory Board Meeting Minutes - continued

- An “ocean Twitter” for cruise ships where people could twitter about what they are seeing. Also podcasts to tourists.
- Funding for kids to do real research with examples of questions that could be investigated (grant funds are currently available annually from NPRB for Community Involvement project and from the NPS Coastal Fund); a streamlined grant application for mini-grants would make it more likely that teachers and students would apply.
- Science internships for kids and young adults to participate in research
- Support improvement in academic achievement in science and math through teacher trainings (in-service and pre-service) and better access to scientific data and other science education resources by teachers and students.
- Contribute content to the Smithsonian’s Sant Ocean Hall, Google Ocean, and Google Earth.
- Look for co-sponsors for a “Science for All Alaskans” lecture series on ocean climate change. The last one for Fairbanks, Anchorage, and Juneau was very popular.
- Look into digital storytelling as a strategy; UAS has a new program in this and faculty expertise
- Video content for the two “Science on a Sphere” exhibits in Juneau

“Outreach as showing up in the schools won’t work; doing it differently could really have a synergy. Doing more of the same won’t work.”

“We need to get kids curious again. If I had my way I would have science being the core of the curriculum and English reading and math would exist to support this.”

Conclusions and Fall Meeting Preview

The group revisited chairmanship of the group. Molly extended her appreciation to Larry LeDoux for agreeing to be the chair initially. Larry, Doug DeMaster, and John Pugh agreed to co-chair the group.

A fall meeting will be scheduled to coincide with a site visit by NSF COSEE program officers, if possible. Action items include:

1. The formation of task forces to develop outreach strategies for specific audiences.
2. Further discussion about evaluation “metrics” for the project.
3. The review and refinement of work plans for Years 2 and 3 of the project.
- 4.

Appendices

Appendix I: Role of the Advisory Board

- NSF requires an advisory board with representatives in the categories of: 1) research; 2) formal education (K-16); and 3) informal education (out of school, adults, and general public).
- COSEE-Alaska has also invited representation from the private sector and state and federal agencies.
- Per the NSF requirements, the role of the Advisory Board is to “help guide and advise COSEE Alaska in terms of direction, operations, priorities and opportunities.”
- The Board can meet as a full board and/or form committees and task forces.
- The critical focus areas for the Advisory Board in helping COSEE-Alaska:
 - Help scientists achieve broader impacts on society
 - Be transformative – to be unique and transform the way we do business in terms of education outreach from the scientific community
 -

Appendix D – Advisory Board Meeting Minutes - continued

- Be a catalyst – to work at bringing people together and doing collaborative work that is better, more effective, and with greater impact
- Don Elthon, NSF stated that the Advisory Board should:
 - Be helpful to NSF and COSEE-Alaska, serving as a sounding board and playing a crucial arms-length review of Center activities.
 - Ask the hard questions and push the Center hard to excel, but in a supportive way. Serve as the catalysts to make the Center work by asking: Are we the best at what we do? Are we doing the best that we can?
 - Listen carefully to what the evaluator and other assessments can tell you particularly in years three to five. Listen to the evaluator about problems and work with project management to define and achieve success in terms of demonstrating the value of the Center.
 - Help the Center avoid or solve problems related to setting priorities, making partnerships work, and staying at the leading edge

Appendix II: Overview of NSF’s COSEE Program and Network

- COSEE is funded by the Ocean Sciences Division of the Geosciences Research Directorate at the National Science Foundation. The focus is on helping ocean scientists improve their broader impacts. Three challenging realities:
 - The ocean is not understood by public
 - Ocean discoveries are not being translated for/to the public
 - Ocean science needs to be coordinated at a national level.
- The COSEE model:
 - Collaborative, transformative partnerships – academia and informal centers
 - Regional or thematic mission
 - Formal and informal education transformation
- The COSEE Network is made up of 12 centers on both coasts plus one in the Great Lakes, with liaisons to Hawaii and Colorado. The network has a central coordinating office and a COSEE Council with representation from each of the COSEE Centers

Appendix III: Introduction to COSEE Alaska

- COSEE Alaska has both a regional focus on the Arctic and a thematic focus on “Ocean, People, and Climate Change” with a particular emphasis on integrating traditional knowledge and western science in “telling the story” of climate change to Alaskans and the rest of the U.S.
- The grant application identified specific activities to meet the project goals and objectives.

Year 1 – Proposed Activities	Year 1 – Accomplishments to Date
Communication Ocean Science Workshop	Held in January as part of Alaska Marine Science Symposium, 65 participants and positive evals.
Launch ocean science fairs	Held in several rural communities; awards at statewide science fair

Identify gaps in teacher professional development	Instruction provided at workshops through partnerships with Sea Grant <i>Alaska Seas and Rivers</i> program and Anchorage School District Academy
Launch COSEE web site portal	http://coseealaska.net up and running with general program content and resources for teachers
Establish the SEANET listserve	Underway
Develop messages for tourism	Underway
Begin design of virtual field trips	Underway
	<i>Voice of Climate Change</i> videos in production; partnership with Sea Grant
	Support for a field trip to the Vancouver Aquarium for students from Pribilof Is.

Potential new collaborations and future directions:

1. Bring graduate level university course in communicating ocean science to Alaska (developed by COSEE California and adopted throughout the U.S.).
2. Develop a framework to align Alaska education standards with the national climate change literacy standards
3. Partner with public outreach and education focused on the AOOS Prince William Sound field experiment in summer, 2009
4. Collaborate with WGBH Boston video collections to develop customized video resource for COSEE Alaska about Alaska native knowledge and climate change
5. Potential for citizen scientists and observation networks focused on ocean climate change as part of the IARC project.

Appendix IV: Principal Investigator Overviews

Impacts on Ocean Scientists and their Broader Impacts

Mike Castellini, UAF/School of Fisheries and Ocean Sciences:

- COSEE can give scientists: 1) opportunities and trainings in best practices in outreach and education, 2) support for broader impacts, 3) access to audiences, 3) access to tools and expertise, 4) access to a nationwide program, and 5) access to working examples.
- Research groups such as UAF give COSEE access to research scientists in social, physical and biological sciences, 2) assistance with finding appropriate links for the COSEE staff to help them with developing and
- implementing the projects, and 3) help with changing the mindset that outreach is not very important and that it is a one-way street.

Appendix D – Advisory Board Meeting Minutes - continued

Networking Scientists with educational and public audiences

Paula Cullenberg, UAF/Alaska Sea Grant:

- The Sea Grant Marine Advisory Program has 15 faculty members in 10 coastal communities: Nome, Bethel Dillingham Unalaska Fairbanks Anchorage Cordova Homer Kodiak Juneau, Petersburg.
- The MAP network can provide broad outreach opportunities and expertise in communicating with adults and linking scientists and community members via presentations and citizen science. S
- Sea Grant also has a publishing arm that could be useful to the COSEE.

Texas Gail Raymond, Anchorage School District:

- Texas Gail described the recent Anchorage Academy teacher workshop where COSEE-Alaska provided instruction. The workshop for teachers in grade 7-12 focused on resources for integrating Native and science knowledge to teach about climate change. Thirty of 40 slots were reserved for rural teachers who received travel funds to participate. This project featured Web 2.0 social networking technology to sustain the participants as a community sharing the content provided by scientists at the workshop and lesson plans with each other and other teachers. The course will also be developed as online credit course for teachers. She reviewed some of the resources on the website which will be linked with the COSEE-Alaska website.
- She summarized the role of the Anchorage school district in the COSEE project as developing and providing professional development and resources for teachers.

Laurie Stuart, Alaska SeaLife Center (original P.I. Jessica Ryan has taken a new position):

- Laurie provided an overview of ASLC distance delivery technology which will be used for COSEE Alaska virtual field trips. S
- he described aspects of their current program which have been successful, including the use of live animals, capability to broadcast live throughout the facility, hands-on activities, student engagement, and teacher guides to accompany the videoconferencing.

Underserved & Under-represented audiences; traditional knowledge

Ray Barnhart, UAF Center for Cross-cultural Education and Alaska Native Knowledge Network

- Ray and Alan Dick reviewed the success of ocean science fairs with judging criteria for both scientific merit and cultural or community relevance. Alan tried to add a digital option with students communicating to judges in Anchorage using Skype which worked but was only used by one student.
- The Alaska Native Knowledge Network webpage has links to pages with resources for the fairs including a list of over 200 project ideas.
- Alan visited several schools which was critical to inspiring and supporting participation. The intent is to reach out to more districts and schools next year, including those in Southeast Alaska and to continue to experiment with cyber fairs.
- The grant includes an objective of involving a Native Alaskan graduate student in this aspect of the COSEE project.



Communicating Ocean Science Workshop

January 19, 2009

8 a.m. to 1:30 p.m.

Hotel Captain Cook Foredeck (Ballroom)

2009 Alaska Marine Science Symposium

Hosted by

COSEE Alaska, North Pacific Research Board and Alaska Ocean Observing System

Nora L. Deans, Moderator

GOALS

- Share programs and events that communicate information about research in Alaska's oceans to national, regional and local audiences.
- Join SEANET (Scientists and Educators of Alaska Network) - a network of those focusing on communicating ocean science in Alaska.

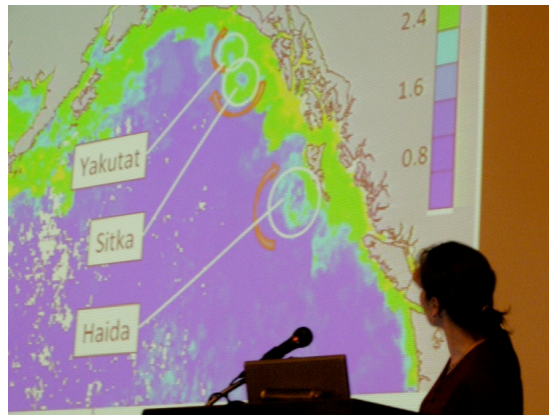
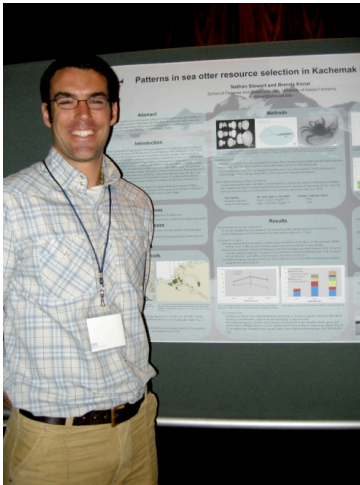
AGENDA

8:00 am – 8:15 am	Welcome, Introductions – Nora L. Deans, COSEE Alaska
8:15 am – 8:30 am	Alaska Sea's and Rivers – Marla Brownlee, Alaska Sea Grant and Marilyn Sigman, Center for Coastal Alaskan Studies

Appendix E – Communicating Science Agenda

8:30 am – 9:30 am	Communicating Ocean Science at Sea – Scientists and Teachers Sharing Research Experiences in Remote Locations – Janet Warburten, Kristen Timm, PolarTREC ARCUS; Lee Cooper, University of Maryland
9:30 am – 9:45 am	Discussion
9:45 am – 10:15 am	Sharing Science by Visualizing Data – Rob Bochenek, Information Architect, Axiom Consulting and Design
10:15 am – 10:45 am	“Don't Zoom, Don't Pan” Tips for taking videos in the field – Deborah Mercy, Alaska Sea Grant
10:45 am – 11:00 am	Discussion
11:00 am – 11:45 am	COSEE Alaska: People Oceans and Climate Change – Nora L. Deans, COSEE Alaska
12:00 pm – 1:15 pm	SEANET -- LUNCH provided

Appendix F – Communicating Ocean Sciences Evaluation Report



Communicating Ocean Science Workshop

January 2009

Activity Evaluation Report
COSEE Alaska

Andrea Anderson
SoundView Evaluation & Research



Appendix F – Communicating Ocean Sciences Evaluation Report - continued

Table of Contents

Event Description.....	3
Context.....	3
Evaluation Methodology.....	3
Findings.....	4
1. Participants found the sessions very useful for increasing understanding of Alaska oceans education programs.....	4
2. Participants believe it is valuable for scientists and educators to collaborate.	4
3. SEANET is viewed as a valuable and helpful resource to ocean scientists and educators.	5
4. Data Visualization presentation was useful and concepts likely to be used by nearly half the participating scientists.....	5
5. The session about PolarTREC was interesting and useful; scientists seem unlikely to replicate this model in their own research area.	6
6. Alaska Seas and Rivers curriculum is new, interesting and potentially something for scientists to use.	7
7. Video Use session complicated by faulty technology resulted in reduced impact on participants.	8
8. Participants gave thoughtful feedback about essential characteristics or attributes of an ocean focused, exemplary education program.	9
9. Interest in and willingness to collaborate with COSEE Alaska is apparent in participants' responses.	10
Conclusions and Recommendations	10
1. COSEE Alaska might consider strategies for expanding the COS program to reach more scientists.	11
2. COSEE Alaska might consider a follow up with participants to see how they incorporate best practice ideas in their own E&O.	12
3. COSEE Alaska might consider sharing the COS models with the other COSEE centers.	12
Appendix.....	13



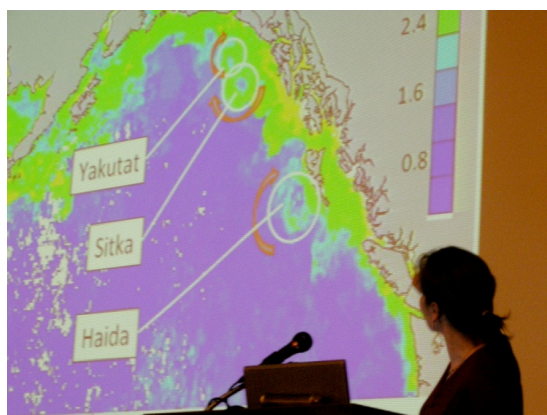
Appendix F – Communicating Ocean Sciences Evaluation Report - continued

ACTIVITY EVALUATION: Communicating Ocean Science—AMSS

By Andrea Anderson, Ph.D.,
Event Dates: January 19, 2009

Event Description

COSEE Alaska: People, Oceans and Climate Change is one of 12 Centers for Ocean Science Education Excellence in the United States. The core mission for these centers is to provide support for ocean scientists to communicate with the public and to increase ocean science awareness and literacy among the citizens. COSEE Alaska, the most recently funded of the centers, aims to “spotlight the Arctic, the wealth of ocean and climate change research currently underway in Alaska, as well as the richness of Alaska’s local and traditional knowledge inherent in its indigenous populations.” Toward that end COSEE Alaska sponsored a Communicating Ocean Science workshop at the Alaska Marine Science Symposium. This report documents the impacts of that event.



Context

Anchorage in January is the destination for many of the nation’s ocean scientists. More than 650 scientists conducting research in the Arctic Ocean, Bering Sea, and the Gulf of Alaska convene each year for four days of plenary sessions and workshops focused on each of these large marine ecosystems. In recent years, the North Pacific Research Board and the Alaska Ocean Observing System have sponsored a free workshop for scientists aimed at enhancing communication skills and strategies, networking scientists with educators, media and the public. This year, with the support of the newly formed COSEE Alaska, the workshop was held the morning of the opening session. More than 65 scientists, local science educators and community members attended the four-hour workshop, despite the existence of competing science workshop opportunities. Four programs were presented to the audience as exemplars of ocean science communication strategies.

COSEE Alaska developed new education features for the Symposium, expanded and enhanced the COS workshop to incorporate ocean science, climate change, and traditional and local knowledge, and used the session to further expand SEANET as a core communication strategy. The workshop targeted these core objectives:

- Increase collaboration and interaction among ocean scientists, educators, students, and coastal communities in Alaska and the nation with an emphasis on ocean climate change.
- Provide tools and services to help ocean scientists effectively participate in education and outreach with a focus on ocean climate change and ocean literacy.
- Enhance teacher capabilities for incorporating ocean climate change information and “place-based” knowledge into existing curricula.
- Increase access to and participation in ocean sciences by underrepresented and underserved populations.



Activity Evaluation: AMSS Communicating Ocean Science Workshop
Event Date: January 2009

Andrea Anderson, Ph.D.

3

Appendix F – Communicating Ocean Sciences Evaluation Report - continued

- Increase and broaden communication about ocean science and traditional knowledge of ocean climate change to audiences in Alaska and the nation, including the COSEE network

Evaluation Methodology

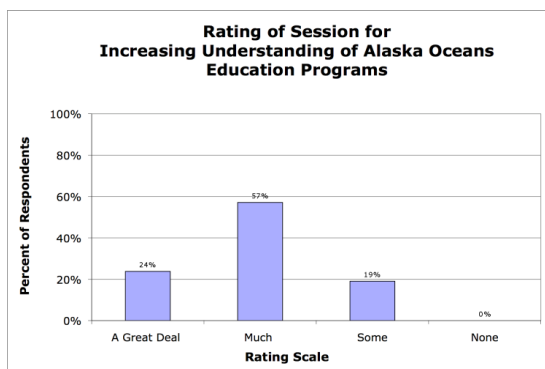
The purpose of the evaluation was to assess participants' views about the workshop. A post event survey asked participants to rate the usefulness of the topic, their interest in the topic, the likelihood of using the information and whether audience members had prior knowledge of the specific topics. Additional questions were aimed to help COSEE Alaska staff develop a better understanding of ways to serve this audience. The survey is included in the Appendix.

Survey data was tabulated; frequencies for each item were computed for the four presentations. Graphs were made to illustrate the findings and are included in the next section. Twenty-seven people filled out the survey, approximately half of those in attendance.

Findings

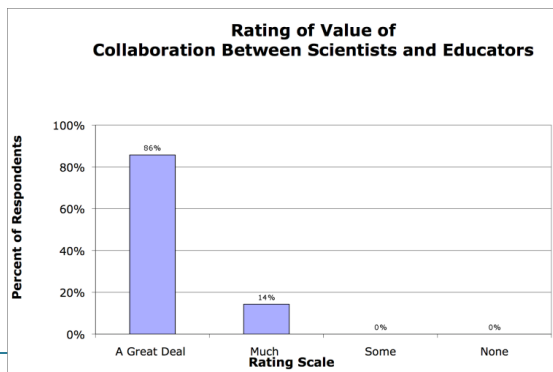
1. Participants found the sessions very useful for increasing understanding of Alaska oceans education programs.

Overall the survey respondents said the workshop helped increase their understanding of the Alaska Oceans education programs. Eighty one percent rated the sessions as either helping a “great deal” or offering “much” help.



2. Participants believe it is valuable for scientists and educators to collaborate.

Collaboration is a significant value to those who attended the workshop. Of those responding to the survey, 100% rated the value as either “a great deal” or “much.”



Activity Evaluation: AMSS Communicating Ocean Science Workshop
Event Date: January 2009

Andrea Anderson, Ph.D.

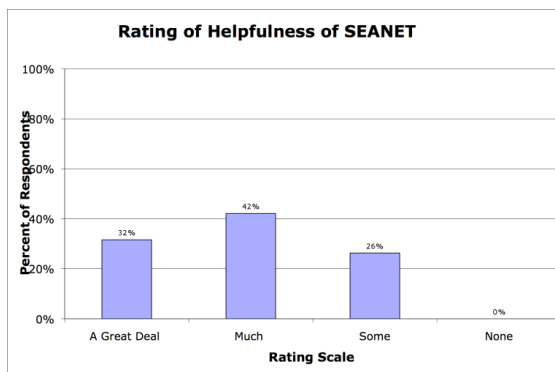
4

Appendix F – Communicating Ocean Sciences Evaluation Report - continued

3. SEANET is viewed as a valuable and helpful resource to ocean scientists and educators.

Nearly three quarters of respondents said that SEANET will be a “great deal” of help or provide “much” help to the scientists and educators in Alaska.

A discussion about SEANET at the conclusion of the program helped illuminate some of the ideas and opportunities that SEANET would offer. One consideration on the table was that SEANET become a chapter of the National Marine Education Association (NMEA) and that Alaska separate from the Northwest Aquatic and Marine Educators (NAME) chapter. It would allow Alaska its own identity and perhaps encourage more Alaskan teachers to participate—if they could attend conferences within the state rather than across the Northwest. It was clear however, from the discussion that Alaskans are not prepared to have SEANET become a separate chapter of (NMEA). Those present preferred to have Alaska remain affiliated with the Northwest Aquatic and Marine Educators (NAME) group.

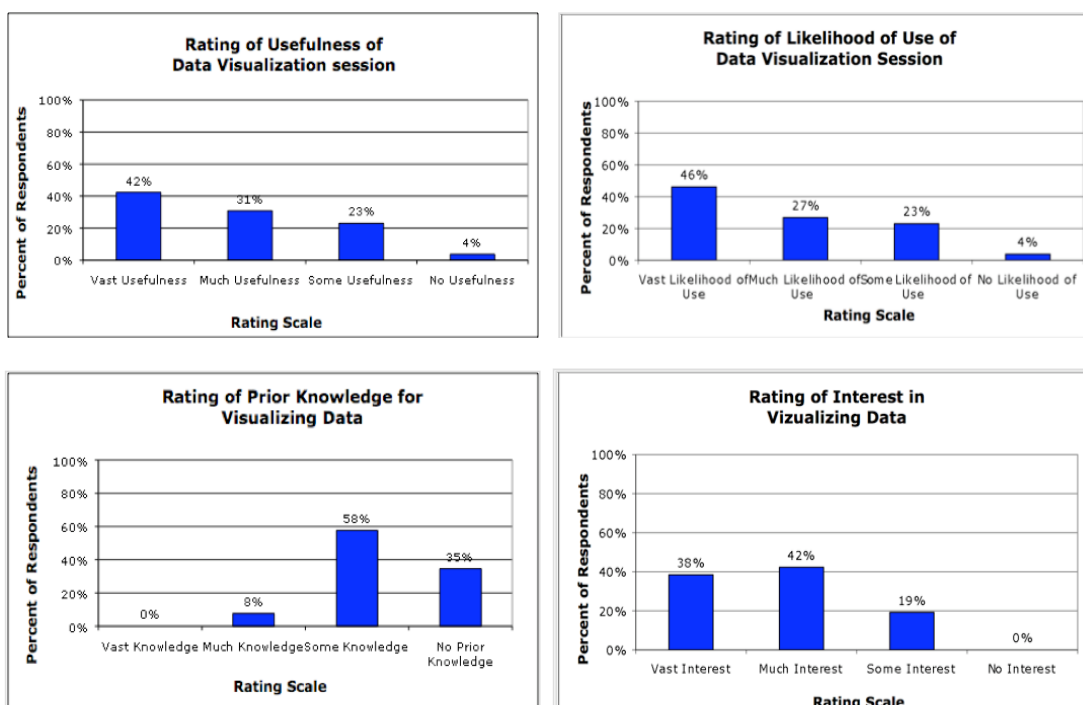


4. Data Visualization presentation was useful and concepts likely to be used by nearly half the participating scientists.

The Data Visualization presentation provided highly visual, frequently aesthetic and graphical ways to portray data. Very few individuals were knowledgeable about Data Visualizing as a technologically powered capacity to communicate often intellectually challenging concepts, with 93% claiming little prior knowledge. At the end of the session 80% claimed “vast” or “much” interest in this approach. Nearly half the respondents said they found the session useful and they were likely to use data visualization approaches in the future.



Appendix F – Communicating Ocean Sciences Evaluation Report - continued



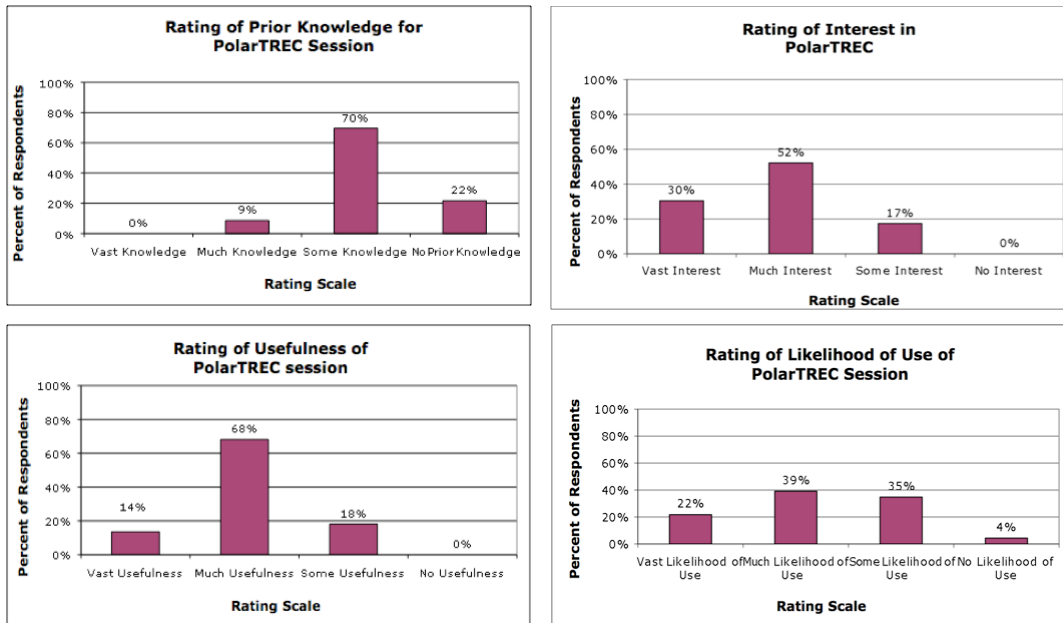
5. The session about PolarTREC was interesting and useful; scientists seem unlikely to replicate this model in their own research area.

PolarTREC takes teachers to the Arctic with the scientists and while in the polar regions teachers engage in research and communicate with their students. The scientists and educators learn from each other and develop strong interpersonal relationships. The session presented at the workshop involved both scientists and teachers.

Most of the participants (70%) had *some* prior knowledge of PolarTREC, and the session generated a stronger level of interest (82%) in the project, if the two highest rating levels are combined. The survey respondents found “much” usefulness in the session, with more than two-thirds giving it that rating.

At the same time, the data give little clarity about whether scientists could use the lessons learned from the PolarTREC session. It may be that the type of research being conducted by the scientist would preclude involving teachers. Or it may be that scientists’ feel organizing such an endeavor would be too challenging and time consuming. Additional research would need to be completed to understand how scientists utilize the lessons learned from this model whether or not they could replicate the experience.

Appendix F – Communicating Ocean Sciences Evaluation Report - continued



6. Alaska Seas and Rivers curriculum is new, interesting and potentially something for scientists to use.

The Alaska Seas and Rivers presentation offered participants a new idea to consider. The presentation was primarily about a curriculum project currently in use in many of the schools. The session focused more on how those who had created the curriculum also developed a framework around the state standards. The presenters made clear that should scientists wish to contribute lessons based on their research there was already an organizer that would help make lessons fit the required curriculum.

As seen in the following charts, the majority (89%) of those surveyed had little or no prior knowledge of the curriculum project. Likely this explains the relatively high interest participants had in the presentation. Eighty-four percent rated their interest in the session as “vast” or “much.”

The usefulness of the session was less clear, with more than half giving a “vast” and “much” usefulness rating to the presentation, with 81% confirming there was either “vast” or “much” likelihood of using the materials.

Appendix F – Communicating Ocean Sciences Evaluation Report - continued



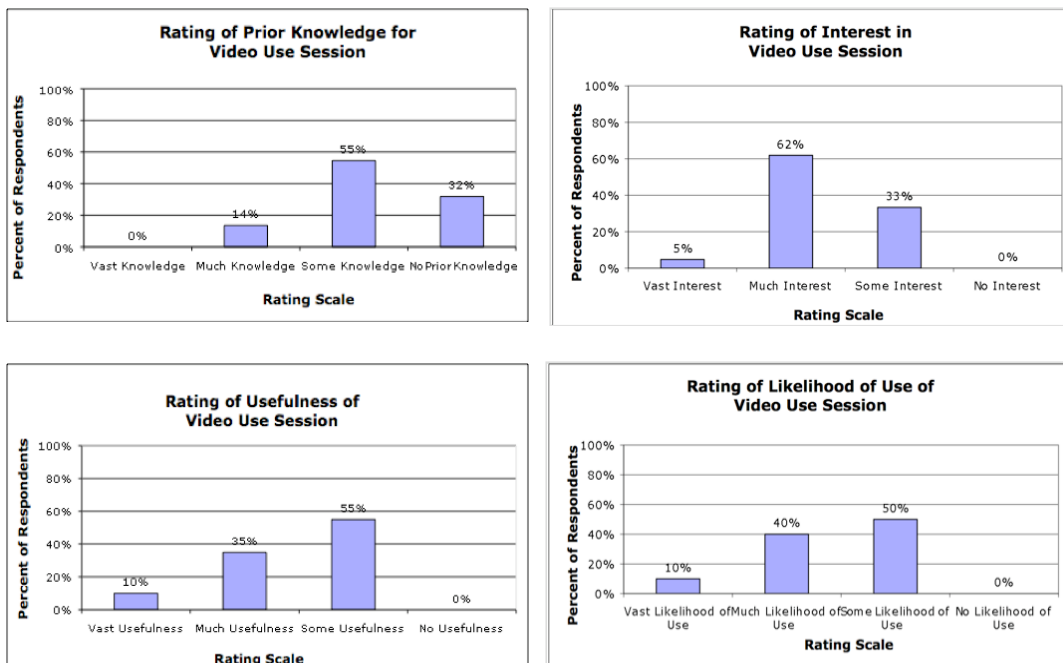
7. Video Use session complicated by faulty technology resulted in reduced impact on participants.

Approximately one third (32%) of the survey respondents had no prior experience with or knowledge of using videos for communicating their science. Slightly more than half (55%) indicated some prior knowledge. Respondents said they had an interest in learning more about using videos. In general the usefulness of the session was rated lower, than most sessions and there was somewhat less likelihood of using video in the future.

The Video Use session was challenged by technology that didn't work as planned. The presenter had to *talk* about video rather than showing examples. The presenter was unable to demonstrate how people have taken and used videos from fieldwork as an effective way to communicate the research experience and the findings.



Appendix F – Communicating Ocean Sciences Evaluation Report - continued



8. Participants gave thoughtful feedback about essential characteristics or attributes of an ocean focused, exemplary education program.

In response to the open-ended question about essential characteristics of exemplary education programs, participants provided useful feedback to the COSEE Alaska staff. The following list reflects the recommendations of the respondents about exemplary programs:

- Should be relevant to Alaskans and connect people the ocean
- Need to consider accessibility — content and exposure — easy for any user to access
- Should establish clear connections between research and tools that teachers can easily use in the classroom (and link to standards)
- Provide meaningful information (understandable data) that users can understand and talk about (only then can they make into useful to their own needs)
- Address issues with key questions to answer (especially issues that future careers can focus on)
- Provide training and support for teachers in using tools; conducting experiential education
- Have a global context — connecting students/participants of all geographies to the ocean(s)
- Are topical (what people see in the news and what they do not!)

Big question! There are so many!

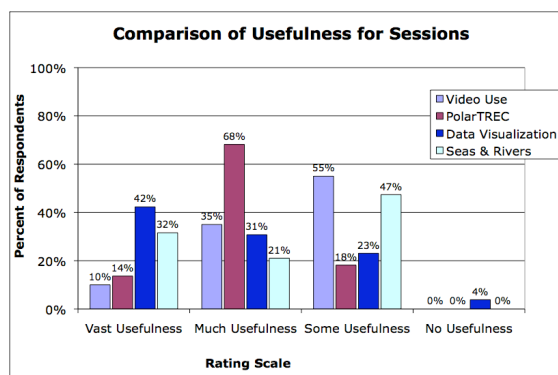
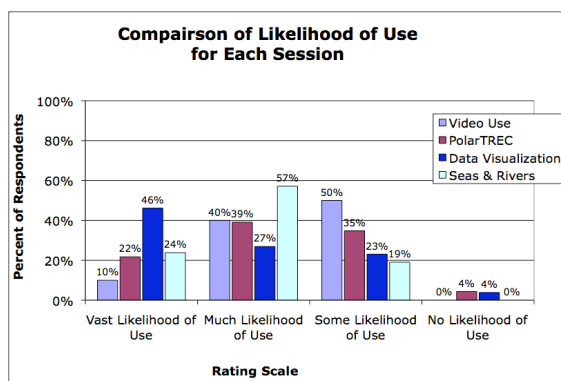
I appreciated the “framework” slide that Marilyn showed as this was how the “professional teaching community” interfaced with “professional science community.”

I thought this was excellent. Good example top-down (fitting into existing standards) and bottom up (field trips, classroom experience) approaches used.

Going beyond place-based — everyone should care!!

-Participants’ comments

Appendix F – Communicating Ocean Sciences Evaluation Report - continued



- Flexible for both formal and informal; involving scientists and creating collaborations and partnerships

9. Interest in and willingness to collaborate with COSEE Alaska is apparent in participants' responses.

In the final survey question participants were asked how they imagine working with COSEE Alaska to increase education about Alaska's oceans. Respondents urged the COSEE staff to:

- Draw from wealth of expertise, combine efforts for curriculum development and outreach
- Involve the Alaska region NOSB teachers and students in various marine education programs
- Define how to further both the Pratt Museum's mission in concert with COSEE's mission
- Cross reference polar/ocean resources, podcasts, and networks.
- Facilitate opportunities for teacher training and student field science camps at NOAA Kasitsna Bay Lab
- Facilitate connections between COSEE and ongoing NOAA/National ocean science ocean education efforts

Absolutely I will take advantage of this. Our winners go to ISEF also – please find out about SEAK regional fair – we have 125 projects – much larger than Anchorage Fair and 25% are ocean projects

To be determined – but I very much look forward to exploring the opportunities to do so.

-Participants' comments

Conclusions and Recommendations

A review of the stated COSEE Alaska objectives indicates that this event contributed positively toward achieving those aims. The surveyed participants represented a broad cross section of age groups and a representative sample of both scientists and educators. Ninety-four percent were women.



Activity Evaluation: AMSS Communicating Ocean Science Workshop
Event Date: January 2009

Andrea Anderson, Ph.D.

10

Appendix F – Communicating Ocean Sciences Evaluation Report - continued

Like many COSEE events across the country, the findings reflect the concerns and interests of scientists who already have a strong interest in education. Even so, the data and findings remain useful for COSEE Alaska to proceed with future Communicating Ocean Science events.

The workshop sessions were interesting and useful to those who attended. The sessions offered new ideas for educational outreach and most audience members were interested in considering how to use the approaches with their own scientific outreach.

Audience members are very interested in linking scientists and educators in collaborative endeavors, even if as yet the strategies to do so are not crystallized. SEANET provides a great opportunity to help facilitate the collaborations, yet the concept is still somewhat vague for individuals. As SEANET gets more established and the COSEE Alaska website supports the efforts of SEANET, more people will engage. More people will perceive a helpful and easy way to enter into doing high quality education and outreach.

The Communicating Ocean Science workshop is a highly successful model for helping scientists share and learn about best practices for educating others about their research. The event also provides opportunities for scientists to hear from educators about possible ways to “plug into” effective educational practices. The workshop attracted approximately 65 individuals, a respectable number for a workshop, which was in competition with other concurrent sessions. It is about ten percent of those attending the Symposium. The COS workshop gives COSEE Alaska a strong foundation to increase the capacity of scientists and educators to create and share best practices for Education and Public Outreach (EPO.)

The Communicating Ocean Science workshop is a highly successful model for helping scientists share and learn about best practices for educating others about their research. The event also provides opportunities for scientists to hear from educators about possible ways to “plug into” effective educational practices. The workshop attracted approximately 65 individuals, a respectable number for a workshop, but is about ten percent of those attending the Symposium. The COS workshop gives COSEE Alaska a strong foundation to increase the capacity of scientists and educators to create and share best practices for Education and Public Outreach (EPO.)

Below are some recommendations for COSEE Alaska to consider for the future.

1. COSEE Alaska might consider strategies for expanding the COS program to reach more scientists.

As noted above the Communicating Ocean Science workshop gives COSEE Alaska a solid base from which to grow this program. Some approaches to be considered involve those who have participated in the program already. For next year’s session they might be asked to bring other individuals from their labs to participate. This might include some graduate students. As graduate students are the future, such an effort might, with time, increase the number of ocean scientists doing education and outreach using best practices.

Most people refrain from new endeavors because they can’t see what is in it for them. As a first step COSEE Alaska might entice new members with an incentive—a chance to win a valued piece of equipment, or an airline ticket for the next year’s Symposium, or even a \$25 gift certificate to Amazon.com. It should be something that would excite them sufficiently to get in the door. Once inside, the program must help the scientists and educators see how they could and will benefit from educational outreach.



Activity Evaluation: AMSS Communicating Ocean Science Workshop
Event Date: January 2009
Andrea Anderson, Ph.D.

11

Appendix F – Communicating Ocean Sciences Evaluation Report - continued

2. COSEE Alaska might consider a follow up with participants to see how they incorporate best practice ideas in their own E&O.

Part of the mandate for COSEE centers is to catalyze more efforts to education students, teachers and the general public. Equally important is to understand how the current COSEE efforts are having an impact on scientists. Following up with former participants—through formal surveys or informal conversations—will start to generate a database of E&O ideas. The follow up might also reinforce and remind participants of their original intentions to work with education in new ways.

3. COSEE Alaska might consider sharing the COS models with the other COSEE centers.

It would be in COSEE Alaska's interest to share this model as another way to get scientists involved in education. It could illuminate new approaches for the other COSEE centers. Possible venues for a presentation might include the education-focused conferences, such as NMEA and NAME, but COSEE Alaska staff might also consider sharing the model at Ocean Sciences 2010 or other ocean-science conferences. It might even be worthwhile presenting about the idea to the broader AMSS conference, since many of the participating scientists come from other States where other COSEEs are operational.



Activity Evaluation: AMSS Communicating Ocean Science Workshop
Event Date: January 2009

Andrea Anderson, Ph.D.

12

Appendix F – Communicating Ocean Sciences Evaluation Report - continued

Appendix

 <p>The logo for Sound View Evaluation & Research features the words "SOUND VIEW" in a sans-serif font above a stylized blue wave graphic. Below the wave, the words "EVALUATION & RESEARCH" are written in a smaller, all-caps sans-serif font.</p>	<p>Activity Evaluation: AMSS Communicating Ocean Science Workshop Event Date: January 2009</p> <p>Andrea Anderson. Ph.D.</p> <p>13</p>
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Appendix F – Communicating Ocean Sciences Evaluation Report - continued

Communicating Ocean Science Workshop

SEANET

January 19, 2009

8 a.m. to 1:30 p.m.

Hotel Captain Cook Foredeck (Ballroom)

2009 Alaska Marine Science Symposium

Nora L. Deans, Moderator

Share highlights of exciting programs and events that communicate information about Alaska's oceans to national, regional and local audiences.

We welcome scientists, educators, writers, editors, media and anyone interested in sharing research results with diverse audiences to join us for lively discussion.

We'll formalize a network among those focusing on communicating ocean science in Alaska - SEANET (Scientists and Educators of Alaska Network)

And we'll discuss criteria for an annual award for the best education and outreach focusing on Alaska's seas - "Alaska's Science Idol" awards.

Welcome, Introductions - Nora L. Deans

**"Don't Zoom, Don't Pan" - Tips for taking videos in the field -
Deborah Mercy**

**Communicating Ocean Science at Sea - Scientists and Teachers
Sharing Research Experiences in Remote Locations - Janet
Warburten, Kristen Timm, PolarTREC**

Alaska Seas and Rivers

Sharing Science by Visualizing Data - Bochanek,

COSEE Alaska: People Oceans and Climate Change

Discussion

SEANET -- LUNCH provided



Activity Evaluation: AMSS Communicating Ocean Science Workshop
Event Date: January 2009

Andrea Anderson, Ph.D.

14

Appendix F – Communicating Ocean Sciences Evaluation Report - continued

EVALUATION Communicating Ocean Science Workshop—SEANET January 19, 2009

SESSION #1 - Don't Zoom, Don't Pan-

1. Rate your **prior knowledge** of this topic
2. Rate your **interest** in this topic
3. Rate the **usefulness** of this topic to your work.
4. Rate the **likelihood of using** what you learned about this topic

None	Some	Much	Vast
None	Some	Much	Vast
None	Some	Much	Vast
None	Some	Much	Vast

SESSION #2 – Scientists and Teachers Sharing Research Experiences in Remote Locations –

1. Rate your **prior knowledge** of this topic
2. Rate your **interest** in this topic
3. Rate the **usefulness** of this topic to your work.
4. Rate the **likelihood of using** what you learned about this topic

None	Some	Much	Vast
None	Some	Much	Vast
None	Some	Much	Vast
None	Some	Much	Vast

SESSION #3 – Sharing Science By Visualizing Data

1. Rate your **prior knowledge** of this topic
2. Rate your **interest** in this topic
3. Rate the **usefulness** of this topic to your work.
4. Rate the **likelihood of using** what you learned about this topic

None	Some	Much	Vast
None	Some	Much	Vast
None	Some	Much	Vast
None	Some	Much	Vast

SESSION #4 – Alaska Seas and Rivers Curriculum

1. Rate your **prior knowledge** of this topic
2. Rate your **interest** in this topic
3. Rate the **usefulness** of this topic to your work.
4. Rate the **likelihood of using** what you learned about this topic

None	Some	Much	Vast
None	Some	Much	Vast
None	Some	Much	Vast
None	Some	Much	Vast

OVERALL

How useful were these sessions in increasing your understanding of Alaska Oceans education program?

How valuable is it to have scientists and educators collaborate?

How helpful do you think SEANET will be for the work you do?

Not at all	Some	Much	A great deal
Not at all	Some	Much	A great deal
Not at all	Some	Much	A great deal



Activity Evaluation: AMSS Communicating Ocean Science Workshop
Event Date: January 2009

Andrea Anderson, Ph.D.

15

Appendix F – Communicating Ocean Sciences Evaluation Report - continued

What do you think are essential characteristics or attributes of an ocean-focused exemplary education program?

How do you imagine working with COSEE Alaska to increase education about Alaska's oceans?

OPTIONAL

Your Name _____ Best way to contact you for follow up: Phone/Email _____

Job Title/Focus _____ Gender: M F

Age Range: (Circle one) < 21 22 — 30 31 — 40 41 — 50 51-60 60+



Activity Evaluation: AMSS Communicating Ocean Science Workshop
Event Date: January 2009

Andrea Anderson, Ph.D.

16

Appendix G – SeaNet List – 2007-2009

firstName	lastName	agencyName	email	2007	2008	2009
Lorrie	Rea	Alaska Department of Fish and Game	lorrie.rea@alaska.gov		X	
Matthew	Brock	Alaska Department of Fish & Game	matthew_brock@alaska.gov	X		
Toshihide	Hamazaki	Alaska Department of Fish & Game	toshihide.hamazaki@alaska.gov		X	
Cheryl	Clark	Alaska Department of Fish and Game	cheryl.clark@alaska.gov		X	
Michael	Turek	Alaska Department of Fish and Game	mike.turek@alaska.gov		X	
Janet	Schempf	Alaska Dept. of Fish and Game	janet_schempf@alaska.gov	X		
Robert	Pawlowski	Alaska Fisheries Dev. Fdn.	rpawlowski@afdf.org			
Monica	Riedel	Alaska Native Harbor Seal Commission	monicariedel@gci.net		X	
Molly	McCammon	Alaska Ocean Observing System	mccammon@aoos.org		X	
Gina	Palmer	Alaska Pacific University	Gpalmer49@yahoo.com			X
Torie	Baker	Alaska Sea Grant	torie@sfos.uaf.edu	X		
Marla	Brownlee	Alaska Sea Grant	marlabrownlee@mac.com		X	X
Kurt	Byers	Alaska Sea Grant	kurt.byers@uaf.edu	X	X	X
Paula	Cullenberg	Alaska Sea Grant	pcullenberg@alaska.uaa.edu			X
Deborah	Mercy	Alaska Sea Grant	andam@uaa.alaska.edu		X	X
Ray	RaLonde	Alaska Sea Grant	Afrrl@uaa.alaska.edu	X		X
Reid	Brewer	Alaska Sea Grant Marine Advisory Program	brewer@ims.uaf.edu		X	X
Alison	Perry	Alaska SeaLife Center	alisonp@alaskasealife.org	X		
Dawn	Kimberlin	Alaska Sealife Center	dawnk@alaskasealife.org		X	
Jessica	Ryan	Alaska Sealife Center	jessica_ryan@alaskasealife.org	X	X	X
Laurie	Stuart	Alaska SeaLife Center	lauries@alaskasealife.org			X
Anne	Hoover-Miller	Alaska SeaLife Center	anneh@alaskasealife.org	-	X	

Brendan	Smith	Alaska SeaLife Center/Alliance for Coastal Technologies	brendan_smith@alaskasealife.org	X	X	
Aulina	Lestenkof	Aleut Community of St. Paul Island - Tribal Government	adlestonkof@tribaleco.com		X	
Phillip	Zavadil	Aleut Community of St. Paul Island - Tribal Government	pazavadil@tribaleco.com		X	X
Peggy	Osterback	Aleut Marine Mammal Commission	ammc@arctic.net		X	
Della	Trumble	Aleut Marine Mammal Commission	ammc@arctic.net		X	
Barbara	Bennett	American Cetacean Society	aknaturalist@aol.com	-	-	
Kristin	Timm	Arctic Research Consortium - US	Kristin@arcus.org			X
Janet	Warburton	Arctic Research Consortium - US	Warburton@arcus.org			X
Donna	Parker	Arctic Storm	dparker@arcticstorm.com		X	
Melanie	Smith	Audubon Alaska	masmith@alaska.net			X
Robert	Bochenek	Axiom Consulting & Design	rob@axiomdms.com		X	X
Helen	Chythlook	Bristol Bay Native Assoc.	hchythlook@bbna.com	X		
Tim	Stetter	Burke Museum/Univ. of Washington	stetter@u.washington.edu	-	X	
Marilyn	Sigman	Center for Alaskan Coastal Studies	marilyn@akcoastalstudies.org	X	X	X
Katie	Villano	Center for Alaskan Coastal Studies	katie@akcoastalstudies.org	-	-	X
Andrew	Boyscout	Chevak Traditional Council	andrewboyscout@yahoo.com		X	
John	Harper	Coastal & Ocean Resources, Inc	John@coastalandoceans.com			X
Ned	Smith	Community member	nedasmith@earthlink.net			X
David	Cannon	Community member	dcannon4fish@earthlink.net			
LA	Holmes	Community member, Homer	-	-	X	
Karl	Fennessey	Conoco Philips	KarlD.Fennessey@conocophillips.com	-	-	X
Robert	Childers	Deep Ocean Eye	bobchilders@mac.com		X	

Dee	Williams	DOI / MMS	dee.williams@mms.gov		X	
Victoria	Barber	Dutch Harbor fisher	vbarber@alaskanewspapers.com	-	X	
Ban	Su	Entrix Environmental Consultants	sban@entrix.com	X		
Catherine	Boerner	Exxon Valdez Oil Spill Trustee Council	catherine.boerner@alaska.gov		X	
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Clarence	Pautzke	North Pacific Research Board	cpautzke@nprb.org		X	

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Walter	Parker	Parker Associates, Inc	wbparker@gci.net		X	
Ray	Koonuk	Point Hope Whaling Captain Association	rfksr@yahoo.com		X	
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Ryjl	Christianson	Pratt Museum	rchristianson@prattmuseum.org		X	X
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Tamara	Mills	US Fish and Wildlife Service	tamara_mills@fws.gov	X	X	
Vera	Metcalf	US rctic Research Commission	ewc.pd@kawerak.org	X		
Yvette	Gillies	USGS Alaska Science Center	ygillies@usgs.gov		X	
William	Driskell	William Driskell, Consulting	bdriskell@comcast.net		X	X

Appendix H – Best Practices Draft Criteria

Criteria for Excellence in K-12 Education about Alaska Ocean Science/Climate Change

Literacy; Standards-Based	<ul style="list-style-type: none"> Alignment with Ocean and Climate Literacy Principles, National Science Education Standards and Alaska State Content and Performance Standards addressed
Assessment	<ul style="list-style-type: none"> Regular formative assessment, check for understanding and/or reflection; Summative assessment to allow students to demonstrate understanding.
Culminating tasks	<ul style="list-style-type: none"> Authentic task, project, or investigation requiring students to demonstrate knowledge.
Case Studies/Stories	<ul style="list-style-type: none"> Research study or story to introduce content/concept; Alaska Native story when appropriate.
Inquiry Based	<ul style="list-style-type: none"> Provocative essential questions to frame unit or activity
Practices	<ul style="list-style-type: none"> 21st century technology integrated when appropriate; Lesson sequence provides differentiated instruction to meet the needs of all learners; Learning is cooperative and/or collaborative; Student ownership, voice and involvement encouraged.
Cultural/Place-Based Considerations	<ul style="list-style-type: none"> Creates connections to the cultural and physical world in which students are situated; Includes traditional or local knowledge of topic/theme; Encourages use of local expertise, especially Elders, as co-teachers whenever local cultural/traditional knowledge is being addressed;
Scientist/Researcher Interaction	<ul style="list-style-type: none"> Email, audio or video with Alaska research; Guest speakers.
Impact	<ul style="list-style-type: none"> Enduring value beyond classroom; Specific activities clearly described, easy to replicate or adapt for other classrooms.

Appendix H – Best Practices Draft Criteria

Criteria for Excellence for Ocean Science/Climate Change Education and Outreach to Alaska Communities and the General Public

Literacy	<ul style="list-style-type: none"> Addresses Ocean and Climate Literacy Principles
Assessment	<ul style="list-style-type: none"> Goals, objectives, and outcomes are specific and success is evaluated.
Case Studies/Stories	<ul style="list-style-type: none"> An intriguing story is told. Alaska Native stories are used appropriate.
Inquiry Based	<ul style="list-style-type: none"> Scientific method is explicit; audience is engaged inductively when possible. What has been done is explained as well as why it was done in terms of the larger context for the work.
Practices	<ul style="list-style-type: none"> The methods of delivery are geared to meet the needs of the specific audience. 21st century technology integrated when appropriate. Jargon is minimized; technical terms are defined clearly. Analogies, metaphors, and popular cultural references are used to explain phenomena in terms of the familiar. Photographs show people doing fieldwork, instruments, and the plants, animals, waves, rocks, etc. being studied and what is shown is clearly explained. Plots, diagrams, and complex animations are used sparingly. Audience has ownership; their involvement is encouraged.
Cultural/Place-Based Considerations	<ul style="list-style-type: none"> Creates connections to the cultural and physical world in which the audience or the research occurs; Includes traditional or local knowledge of topic/theme, where appropriate; Encourages use of local expertise, especially Elders, as co-presenters whenever local cultural/traditional knowledge is being addressed.
Scientist/Researcher Interaction (employs one or more of these methods)	<ul style="list-style-type: none"> Provide email, audio or video about Alaska research Serve as a guest speaker Mentor students for science fair project or career development Involve a student or educator in research Serve as a scientist-in-residence at school, science center, etc. Coach a NOSB team Interact with teachers as a professional development workshop Consult in the development of exhibits or public programs at a museum, aquarium, etc. Provide an interview to a journalist. Be a content expert for curriculum development Develop online resources, including visualizations tailored for classroom or educational use.
Impact	<ul style="list-style-type: none"> Who was reached (number and demographics) Goals and objectives were met Enduring Value – what, if any, outcome, in terms of understanding or action, was inspired?

Appendix I – Ocean Science Fair Teacher Workshop Agenda



Center for Cross-Cultural Studies

Fairbanks, Alaska 99775

(907) 474-1902 • (Fax) 474-1957

ALASKA CENTER FOR OCEAN SCIENCE EDUCATION EXCELLENCE

COSEE Planning Workshop

October 10-11, 2008

Alaska Ocean Observing Systems Conference Room

1007 West Third Avenue (907-644-6707)

Tentative Agenda

Thursday, Oct. 9	Travel to Anchorage Check in to Captain Cook Hotel (276-6000)
Friday, Oct. 10	AOOS Conference Room (1007 West 3rd Ave.)
9:00-12:00 am	Introductions Overview of Alaska COSEE UAF School of Fisheries and Ocean Science (Mike Castellini and Ruth Post) Alaska Ocean Observing Systems (Molly McCammon) Alaska Sea Life Center (Nora Deans) Marine Advisory Program (Paula Cullenberg) Soundview Evaluation (Andrea Anderson) UAF Alaska Native Knowledge Network (Ray Barnhardt) D9a Consultants (Alan Dick)
12:00-1:00	Lunch
1:00-5:00	Review of Native Science Fair features and resources (Alan and Ray) Alaska State Science Fair (Texas Gail Raymond) Ocean Science Bowl (Jack Adams) Professional development needs/opportunities (Ray and Alan)
6:00-8:00	Dinner at Glacier Brew Pub
Saturday, Oct. 11	AOOS Conference Room
9:00-12:00	School/District role in COSEE Ocean Science Fairs
12:00-1:00	Lunch
1:00-4:30	Develop 2008-09 schedule and work plan for COSEE fairs
Sunday, Oct. 12	Depart Anchorage

Appendix J - Ocean Science Fair Calendar

COSEE Science Fair Calendar

Sites	Nov./Dec.	January	February	March	April	May	June-July	August +
Statewide	OSB LoI due Nov. 15.	AK Marine Sci. Symp. 19-23 Capt. Cook	Ocean Sci. Bowl 6-8 Seward	AK State Affair 27-29 SE Sci. Fair 13-15	Reconvene Dist. Reps.	Teacher's Domain Workshop Anchorage	Old Minto Camp	AK Science and Math Conference Oct. 14-17 Juneau
Sitka						Sitka SF Mt. Edge?		
Unalaska			USD SF					Unangan Cult. Camp
BSSD/W M.			OSB (Jack) BSSD SF					
Kodiak				Skype Fair				
Juneau			SeaPerch teach wkshp Juneau/Anch				Ocean Day	
LYSD		Mt. Vlg SF	LYSD. SF					
YFSD	Pilot fair						Camp ?	
Kuspuk					KSD SF			
D9a (Alan)		Project idea compilation						
SFOS (Ruth)								

OSB – Ocean Science Bowl

SF – Science Fair

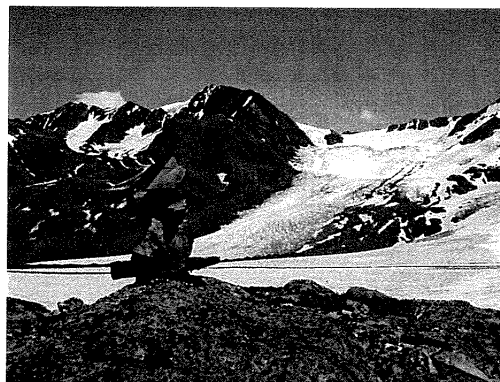
Appendix K – 2009 Summer Institute Agenda

Alaska Staff Development Network - WGBH Public Television Education Foundation
Alaska Native Science Commission - Alaska Native Knowledge Network

2009 Summer Institute for 7-12 Science Educators Indigenous and Western Science Observations on Climate Change: Resources for Teachers

Dates: May 27-30, Hosted within the ASD Summer Academy at Dimond High School
Credit: Earn 2 free 500-level graded credits from UAA
Class size: Class size is limited to 40
Stipends: Travel stipends are available for 20 rural educators to attend.
Apply for travel stipends online at www.asdn.org. Click on "Summer Institutes"

- ★ Increase your content knowledge using active learning and hands-on exploration with scientists and indigenous experts engaged in climate change research
- ★ Learn place-based strategies to make content more meaningful to your students
- ★ Explore the interaction between western and Alaska Native ways of knowing; see how they complement and intersect on climate change issues
- ★ Investigate strategies and resources for incorporating indigenous world views into the science classroom
- ★ Discover new, high-quality, free online resources to augment your lessons and engage visual learners
- ★ Find out about the explosion in Alaska-focused climate change and resources that are available to classroom teachers
- ★ Field Trips! We will be on the move so that you can gain ideas for meaningful outdoor exploration with your students in your own backyard.
- ★ Have a chance to put it all together. Discuss content, cultural competency and new classroom resources with your colleagues. Share ideas for inquiry-based lesson plans, place-based exploration, and strategies for encouraging Alaska Native student's engagement in the geosciences
- ★ Keynote presenters Dr. Oscar Kawagley, UAF and Patricia Cochran, Alaska Native Science Commission



Questions? Call Alaska Staff Development Network 907-364-3809 or e-mail asdn@ptialaska.net website: www.asdn.org

Appendix K – 2009 Summer Institute Agenda - continued

2009 Summer Institute for 7-12 Science Educators Indigenous and Western Science Observations on Climate Change: Resources for Teachers

Goals of the Institute

To share with participants the Teachers Domain (TD) resources.

To increase the content knowledge of the teachers using active learning and hands-on exploration with scientists and indigenous experts engaged in climate change research.

To provide strategies to participants to make content more meaningful to students.

To provide lessons and strategies to the participants for incorporating inquiry into their science teaching.

To provide strategies to the participants for incorporating formative assessment into their science teaching.

To provide strategies and resources to the participants for incorporating indigenous world views into science teaching.

To use the experience, content and resources of the institute to develop an online course on Geosciences.

Appendix K – 2009 Summer Institute Agenda - continued

2009 Summer Institute for 7-12 Science Educators Indigenous and Western Science Observations on Climate Change: Resources for Teachers

Institute
May 27-30, 2009
Dimond High School
Rooms A211, A212 and the A2 Commons (Second Floor)

Purpose: Promoting the active participation of Alaska Natives in the atmospheric, Earth, and ocean sciences and increasing the perceived relevance of the Geosciences among the population as a whole”

Focus on the Hydrosphere

AGENDA

Wednesday, May 27th, 2009 8:00 A.M.

7:35 – 7:55 Registration A2 Commons (Second Floor)

8:00 A.M.– 9:00 A.M. Keynote Speaker for Academy
Cultural Responsiveness Dr. Brokenleg

9:25 A.M. – 9:35 A.M. Blessings from Tlingit Elder Elaine Abraham
Permission from Elder Elaine Abraham

9:35 A.M. – 9:45 A.M. Welcome to the Institute—Emma Walton

9:45 A.M. – 9:55 A.M. Pre-Institute Survey

10:00 A.M. – 10:15 A.M. BREAK

10:15 A.M. – 10:35 A.M. Getting to Know Each Other

10:35 A.M. – 11:00 A.M. Overview of the Institute-Setting the Stage -- Ray Barnhardt

11:00 A.M. -- 11:25 A.M. Keynote Speakers
Patricia Cochran & Oscar Kawagley

11:25– 12:05 P.M. Lunch

12:10 P.M. – 12:35 P.M. Teachers Domain (T.D.) Presentation Ted Sicker and Chris Dietlin—Introducing participants to T.D. and how to access the program.

Appendix K – 2009 Summer Institute Agenda - continued

12:35 P.M. – 1:00 P.M. Preparation for Participant Project Clay Good & Troy Choquette

1:00 P.M. Field Trip—UAA Geoscience of the Turnagain Arm
Glaciology—Laura Le Blanc Travel log on the bus.

2:00 P.M. – 4:00 P.M. Exploring glaciers at Portage Valley. Laura Le Blanc and Jim Sumner

4:00 P.M. – 5:00 P.M. Travel back to Anchorage with Laura Le Blanc doing a review of the field trip with Questions & Answers. Participants will fill out a Daily 1-page feedback form.

Thursday, May 28th, 2009

8:00 A.M. – 8:15 A.M. Welcome—feedback from participants

8:15 A.M. – 8:45 A.M. Overview of a Learning Cycle—Texas Gail Raymond

8:45 A.M. – 9:30 A.M. Climate Change, including Sea Ice, Observing and forecasting, lake changes, permafrost—Orville Huntington and Henry Huntington set the stage. Participants will access Teachers Domain as part of the presentation. An Unpredictable Environment (3m10s)

<http://www.teachersdomain.org/resource/ean08.sci.life.eco.unpredictability>

9:30 A.M. – 9:45 A.M. Break

9:45 A.M. – 11:25 P.M. Activity on Weather/Climate
Introduction of Resources—Marilyn Sigman

11:25 – 12:05 P.M. Lunch

12:10 P.M. – 3:00 P.M. Sea Ice Presentation and Activity
Martin Jeffries and Kim Morris

The Science of Sea Ice—Martin Jeffries & Kim Morris

Arctic Sea Ice Observations

<http://www.teachersdomain.org/resource/ipy07.sci.ess.eiu.nasadata/Screen>

Appendix K – 2009 Summer Institute Agenda - continued

3:00 P.M. – 3:15 P.M. Break

3:15 P.M. – 3:45 P.M. Weather/Climate Scientist Presentation Orville Huntington. Understanding the difference between weather and climate.

3:45 P.M. – 4:15 Permafrost—Orville Huntington and Henry Huntington
Melting Permafrost (3M56s)
<http://www.teachersdomain.org/resource/ean08.sci.ess.earthsys.permafrost/>
Losing Permafrost in Alaska(4m13s)
<http://www.teachersdomain.org/resource/ean08.sci.ess.watcyc.bakedalaska>

4:30 P.M. Field Trip to Polaris K – 12 School to see the frost tube, arrive at the Campbell Creek Science Center for dinner and a speaker. Joette Storm, President of the Campbell Creek Friends of the Science Center will give an overview of the Center. Sean will play the drums.

Participants will fill out a Daily 1-page feedback form.

Friday May 29th, 2009

8:00 A.M. – 8:15 A.M. Welcome—Participant Feedback

Continuation of In-Depth Study

8:15 A.M. – 9:15 A.M. The Science of Lake and River Ice, Martin Jeffries and Kim Morris

Students Measure Changes in Lake Ice and Snow (1M56s)
<http://www.teachersdomain.org/resource/ean08.sci.ess.watcyc.lakesnow/>

9:15 A.M. – 10:15 A.M. Activity on Lake & River Ice Martin Jeffries and Kim Morris

10:15 A.M. – 10:30 Break

10:30 A.M. – 11:25 P.M. Lake and River Ice Continuation with Martin Jeffries and Kim Morris

11:25 A.M. – 1:05 P.M. Lunch

1:10 P.M. – 2:00 P.M. Making sense of Global Change—Orville Huntington

2:00 P.M. -- 4:00 P.M. Exploring Teachers Domain and Participants to work on their assignments

Participants will fill out a Daily 1-page feedback form.

Appendix K – 2009 Summer Institute Agenda - continued

Saturday May 30th, 2009

8:00 A.M. Sharing of Resources for the Study of GeoSciences. The day will be spent with examining resources, working on their projects, activities and the final evaluation survey. Breaks will be taken as needed and lunch will be served at 11:25 A.M.

8:15 -- Alaska Center for Ocean Science Education Excellence (COSEE)—Ray Barnhardt

Palooza Student Activity—Texas Gail Raymond

Continuation of exploration of WGBH/Teachers' Domain

Google Earth—Clay Good

Native Ways of Knowing

10:45 AM NASA/3-D View, IPY SPRINTT—Glen Schuster. This will be via computer/audio conference etc. 30 minutes.

The following resources can be shared with handouts &/or information about web-sites

- Native Science Fairs
- Geophysical Institute
- Alaska Center for Ocean Science Education Excellence (COSEE)
- National Science Teachers Association (NSTA)
- Alaska Science Teachers Association (ASTA)
- Alaska Science Consortium (ASC)
- Alaska Seas and Rivers Curriculum
- Arctic Climate Modeling Project (ACMP)
- MapTeach
- Alaska Native Knowledge Network
- NASA
- NOAA

Nitty Gritty—Reimbursement forms and other information

Plans for Online Cours

Questions/Answers

Final Evaluation Survey

The End!!

Appendix K – 2009 Summer Institute Agenda - continued

Bates, Fannie	Lower Yukon School District
Brown, James	Lower Yukon School District
Casassa, Linda	Kuspuk School District
Casper, Kyle	Southwest Regional School District
Cotter-Lyford, Rose	MatSu Borough School District/Colony High School
Dompierre, Bonnie	Alaska Gateway School District
Emery, Dave	Kenai Peninsula Borough School District
<u>Everett, Robbie</u>	Nprthwest Arctic
<u>Fisher, Charleen</u>	Yukon Flats School District
Green, Dave	North Slope Borough School District
Harris, William	Dillingham City School District
Harsch, James	Lower Kuskokwim School District
Maglinao, Raphia	Lower Yukon School District
<u>Maslen, Walt</u>	Northwest Arctic
Matoush, Leonard	Lower Yukon School District
Meckel, Kathleen	Fairbanks Northstar Borough SD
<u>Moore, Lori</u>	Northwest Arctic
Papoi, Brenda	Sitka School District
Ramirez, Lucia	Northwest Arctic
<u>Rife, Bruce</u>	Kenai Peninsula Borough Sch Dist
Ronnander, Todd	Nenana City Public School
Sandstrom, Jane	Fairbanks North Star Borough
Schmitt, Marlene	Lower Kuskokwim School District
Shannon, Toni	Lower Yukon School District
Silcox, Cheryl	Bering Strait School District
Simkins, Joseph	Mat - Su, Colony High School
Talcot, Cynthia	Lower Kuskokwim School District
Walters, Hazel	Lower Yukon School District

ACTIVITY EVALUATION: Summer Institute for 7-12 Science Educators

By Andrea V. Anderson, Ph.D.

COSEE Alaska Evaluator

Event Date: May 27-30,2009

Abstract

COSEE Alaska participated in the ASD-hosted summer academy focused on indigenous and western science observations about climate change. Forty teachers attended the institute. The focal point of this evaluation is the hands-on workshop about ocean climate change. The session was highly relevant to the teachers, with 89% of respondents rating the workshop a 4 or 5(high). The other significant “take away” was to connect with tribal elders as a knowledgeable resource about changing climate. Resources and connections were deeply appreciated. Finding time with the curriculum requirements remains the major barrier to including climate change information.

Context

COSEE Alaska: People, Oceans and Climate Change is one of twelve NSF-funded Centers for Ocean Science Education Excellence. COSEE Alaska is in its first year of operation and is targeting the increased awareness and understanding of the oceans and climate change among critical stakeholder groups, including teachers, students and the public. Alaska is already experiencing the impact of climate change. COSEE Alaska draws upon the understanding of polar scientists and the native peoples’ traditional knowledge, to communicate the issues to the broadest audiences possible. Many strategies are employed, including teacher workshops, web casts, and formal and informal events.

Event Description

The Summer Institute for 7-12 Science Educators promised resources for teachers on the focal topic: Indigenous and Western Science Observations on Climate Change. Several representatives from the COSEE Alaska: People, Oceans and Climate Change project contributed to the workshop. The focus for the evaluation was the workshop on ocean climate change held on the second day of the workshop. It involved hands-on activities for teachers and a sharing of resources.

Evaluation Methodology

The workshop instructor distributed a short survey at the conclusion of her section of the workshop. Teachers answered a set of four questions about the workshop as well as providing some demographic data. Forty teachers attended the workshop, and 20 of them returned the survey to the instructor. The surveys were provided to the evaluator upon completion of the event.

Findings

1. Teachers found the workshop to be highly relevant

On a rating scale of 1 (low) to 5 (high), 89% of respondents rating the workshop a 4 or 5 (high). Teachers also commented on how they would apply what they learned in their own classrooms. Some of the comments are included below.

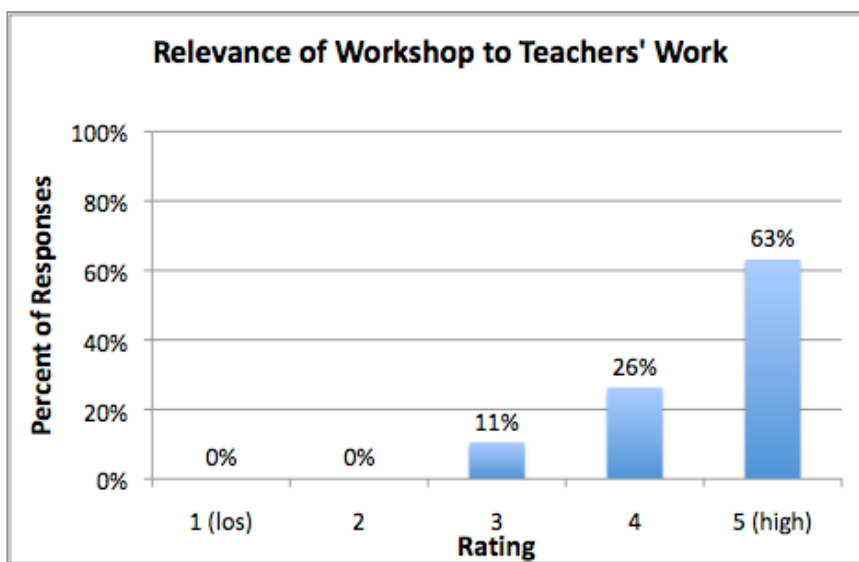
I appreciate getting the scientific data, ideas for activities with my students and the video resources from Teachers Domain. I am particularly pleased to have the traditional native perspectives from other parts of Alaska and the world. Marilyn led the best tide pooling trip that it's been my pleasure to take part in. Thank you!

Will use sea ice info now that I am comfortable with it!

I will apply to my marine science

I intend to do a unit on climate change with my class in the fall. I will use elements from our

work with Marilyn at the Alaska Seas and Rivers workshop at Kasitsna Bay last summer.



2. Many teachers plan to integrate traditional knowledge into climate change lesson plans.

Twenty five percent of the teachers explicitly said they would include traditional knowledge in their science classes about climate change. Several suggested they would bring in village elders to talk with students. Others thought they would integrate western science and native ways of knowing, in particular focused on changes in climate.

Appendix L – 2009 Summer Institute - continued

The use of elders as speakers who will bring local knowledge to our students

Culture-based information (and) experience connected to theoretical concepts; integrate climate change/oceans topics in science activities

During our school's "culture days" incorporate western science with native ways of knowing

For Inupiac studies/general studies - interview elders about the climate change that they have observed. Step further winter-summer solstice change

3. Curricular requirements and little free time challenge teachers to include climate change lessons.

Teachers said they were required to follow a particular curriculum and had to prepare their students for tests, which made it difficult for them to include lessons about climate change. Another challenge is getting access to the necessary equipment and resources they would need in their schools. Teachers expressed great appreciation for online teacher resources, yet were concerned about having sufficient computers, projectors and access. Some teachers felt a modest concern about having sufficient knowledge about the topic.

The time to integrate all the resources. Staying current and up-to-date on the ever-changing science

equipment/integrating into curriculum

simply learning more information about the content to feel comfortable presenting it to students

my challenges are connecting my river students to the oceans, but our salmon will help with this

using teacher domain as a tool for instruction in my class with limited computers and no projector

4. The teachers reflected the diversity of Alaska and represented districts from across the State.

While some teachers declined filling out the optional demographic section on the survey, those who did provide a view of the diversity of the teacher corps. A dozen teachers held Masters degrees and at least three said they

were Native American. There were 10 women and 7 men who filled out the demographic information. Twelve identified themselves as “Educator” using the new COSEE categories, while 4 said they were “Scientist and Educator4.” At least 15 districts were represented.

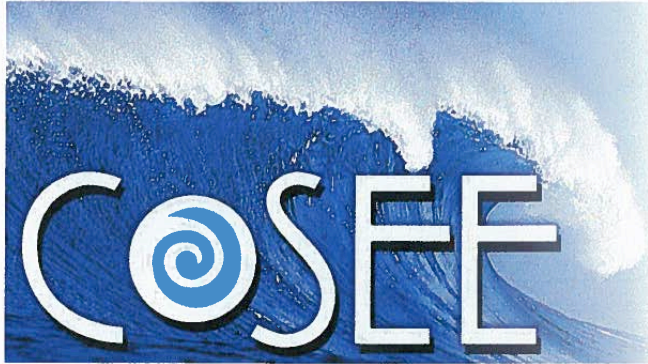
Recommendations

1. COSEE Alaska might consider doing additional teacher workshops.

As COSEE Alaska expands its work on communicating climate change and the integration of western science and traditional knowledge, this type of teacher workshop is critical. Those in attendance are the ones who can and will take the knowledge to their communities. It is natural to suggest COSEE Alaska participate in other workshops along this line. It may be that COSEE Alaska offer this workshop in other urban areas (like Fairbanks or Juneau) that could draw teachers from surrounding rural communities.

2. COSEE Alaska might consider this workshop session as an opportunity to recruit teachers for the ocean science fair project.

COSEE Alaska launched a science fair project to engage Native American students in doing culturally relevant, ocean science investigations. The pilot year saw successful completion by a few schools, but the program would benefit from reaching more teachers. This workshop is a natural venue for talking about science fairs that expand student understand of oceans and climate change.



COSEE ALASKA

People, Oceans,
and Climate Change

A New Alaska Center for Ocean
Science Education Excellence

coseealaska.net

"[Alaska] really is the bellwether, the canary in the mine. What we see over the next decade here and in the Arctic, the rest of the world will see in the next 25 years." —Robert Corell, chair of the Arctic Climate Impact Assessment for the International Arctic Council

What is COSEE Alaska?

The Centers for Ocean Science Education Excellence (COSEE) is a national initiative funded through the National Science Foundation. COSEE Alaska will move between ocean science researchers and educators to:

- Foster integration of ocean research into educational materials;
- Allow ocean researchers to better understand educational organizations and pedagogy;
- Provide educators with greater capacity to deliver high-quality educational programs in the ocean sciences; and
- Provide material to the public that promotes a deeper understanding of the ocean and its influence on our quality of life and national prosperity.



UAF School of Fisheries and Ocean Sciences/Alaska Sea Grant

What will COSEE Alaska do?

Weave

Link scientists, educators and coastal communities in Alaska and nationwide with emphasis on ocean climate change. Examples: annual Communicating Ocean Science workshop and the Scientists' and Educators' Network (SEANET).

Bridge

Communicate Western science and traditional knowledge about ocean climate change to Alaska and the nation. Example: Create publications and video clips for use with informal audiences in Alaska and throughout the nation.

Invite

Increase participation in ocean sciences by underrepresented and underserved audiences. Example: Rural student participation in ocean science fairs.

Pathfind

Provide tools and services to ocean scientists for effective outreach with focus on ocean climate change literacy. Example: Online guides, directories, and other publications.

Share

Enhance teacher capabilities for incorporating ocean climate change and place-based knowledge into curricula. Example: Teacher guides to support Ocean Science Fairs and Virtual Field Trips.

Advisory Board

The COSEE Alaska Advisory Board includes prominent representatives from research, formal and informal education, and the private sector.

The COSEE Model

Partnerships must involve at least one research institution, one formal education entity, and one informal education provider.

COSEE Alaska Partners

- Alaska Ocean Observing System (research)
Molly McCammon, Lead PI
Nora Deans, COSEE Director
- University of Alaska Fairbanks Alaska Sea Grant (informal education)
Paula Cullenberg, PI
- UAF School of Fisheries and Ocean Sciences (research)
Dr. Michael Castellini, PI
- UAF Center for Cross-Cultural Studies; Alaska Native Knowledge Network (formal education)
Dr. Ray Barnhardt, PI
- Alaska SeaLife Center (informal education)
Jessica Ryan, PI
- Anchorage School District (formal education)
Texas Gail Raymond

COSEE Alaska was established in Fall 2008 with a five-year, \$2.6 million award.

Find us online
coseealaska.net



CENTERS FOR OCEAN SCIENCES EDUCATION EXCELLENCE

- **Principal Investigator:** Molly McCammon, Alaska Ocean Observing System
- **Location:** COSEE Alaska is based in Anchorage, Alaska
- **Website:** www.coseealaska.net
- **Collaborators/Partners:** Alaska Ocean Observing System; Alaska Sea Grant; University of Alaska Fairbanks; Alaska SeaLife Center; Anchorage School District; North Pacific Research Board
- **Co-Principal Investigators and Key Project Partners:** Nora Deans, Alaska Ocean Observing System, North Pacific Research Board; Michael Castellini, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences; Ray Barnhardt, University of Alaska Fairbanks, Center for Cross-Cultural Studies; Paula Cullenberg, Alaska Sea Grant; Jessica Ryan, Alaska SeaLife Center; Texas Gail Raymond, Anchorage School District; Andrea Anderson, Soundview Evaluation; Ruth Post, University of Alaska Fairbanks; Alan Dick, Curriculum Consultant



COSEE ALASKA

Mission: To help ocean scientists achieve their broader impacts and share place-based knowledge of ocean climate change with the COSEE network.

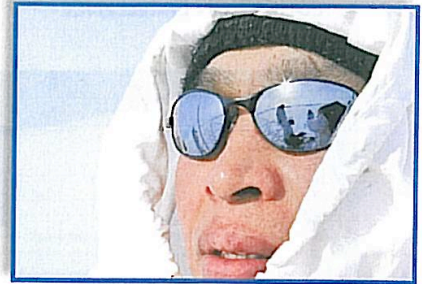
What We Do: Work closely with ocean scientists, educators and coastal community members to enhance ocean and climate change literacy in formal and informal audiences and the public:

- **Weave:** Link scientists, educators and coastal communities in Alaska and nationwide with emphasis on ocean climate change
- **Bridge:** Communicate western science and traditional knowledge about ocean climate change to Alaska and the nation
- **Invite:** Increase participation in ocean sciences by underrepresented and under-served audiences.
- **Pathfind:** Provide tools and services to ocean scientists for effective outreach with focus on ocean climate change literacy
- **Share:** Enhance teacher capabilities for incorporating ocean climate change and place-based knowledge into curricula

Who We Are: COSEE Alaska consists of a team of ocean scientists, communicators and educators from the Alaska Ocean Observing System, the University of Alaska Fairbanks-School of Fisheries and Ocean Sciences and Center for Cross-Cultural Studies, Alaska SeaLife Center, Alaska Sea Grant and the Anchorage School District.

Audience: Ocean scientists, formal/informal educators, coastal communities around Alaska and national public audiences.

Date Established: Fall 2008



Why We Were Established: COSEE Alaska was established as both a regional (Alaska) and thematic center (People, Oceans and Climate Change) to weave together traditional knowledge and western science about ocean climate change in the north.

History: The newest COSEE center, COSEE Alaska was established September 2008. In October, we held a workshop for coastal school districts to launch ocean science fairs. We hosted a one-day Communicating Ocean Science workshop at the annual Alaska Marine Science Symposium, where more than 650 ocean scientists shared their research in Alaska's seas. We also created SEANET—a network of ocean scientists, educators, communicators and community members.

What We Offer...

COSEE Alaska will engage ocean scientists, teachers, informal educators and community members in a broad range of programs, including:

- Statewide ocean science fairs, where science projects are judged by elders and scientists for both cultural merit and scientific rigor
- Teacher professional development workshops
- Expanded Communicating Ocean Science Workshops and hands-on sessions for scientists at the Alaska Marine Science Symposium

- **SEANET** – a network of ocean scientists, educators, communications experts and community members
- **Regional directory** of ocean education/ocean science programs and experts
- **Multimedia, virtual field trips and distance learning programs**
- **Web portal** rich with multimedia on ocean climate change
- **National conference** networking marine scientists and marine educators in 2012

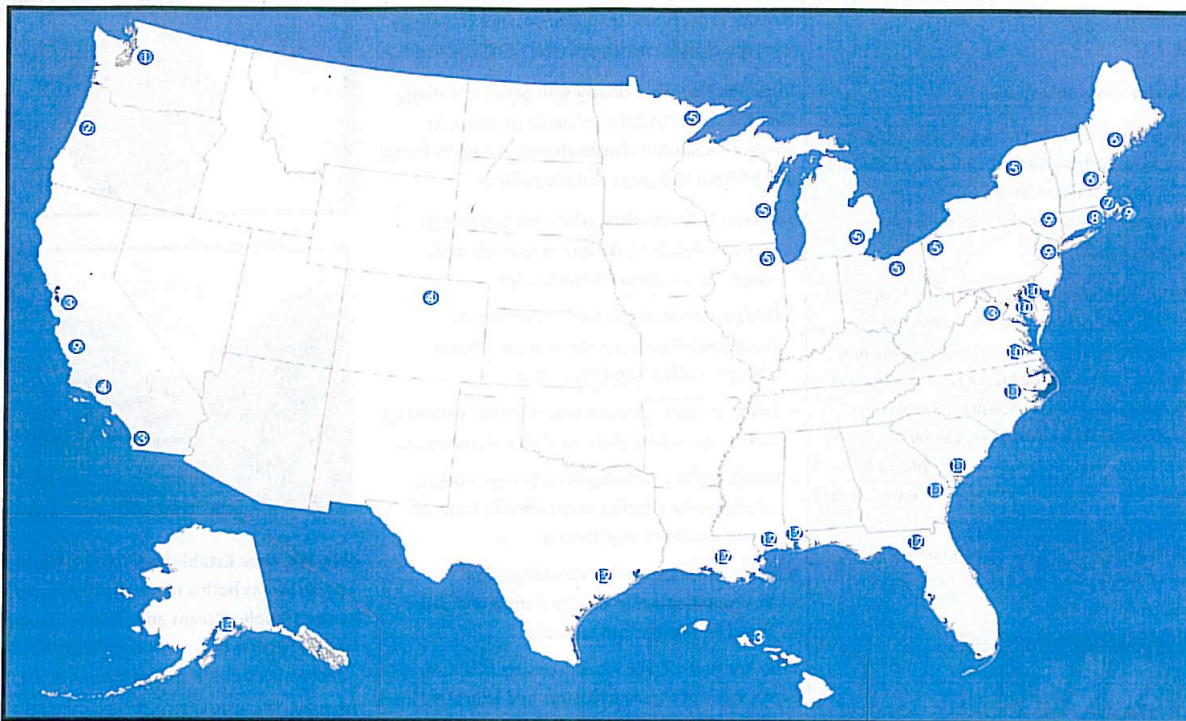
Example Offerings...

- Communicating Ocean Science Workshop
- Ocean Science Fairs in coastal communities





With 12 Centers and a Central Coordinating Office located throughout the United States, each Center is a consortium of one or more ocean science research institutions, informal science education organizations, and formal education entities. The COSEE program is funded primarily by the National Science Foundation with support from the National Oceanic and Atmospheric Administration.



① COSEE Ocean Learning Communities
Washington

② COSEE Pacific Partnerships
Oregon, Washington, California, Hawaii

③ COSEE California
California, Hawaii, Virginia

④ COSEE West
California, Colorado

⑤ COSEE Great Lakes
Illinois, Wisconsin, Michigan, Ohio, New York,
Pennsylvania, Minnesota, Indiana

⑥ COSEE Ocean Systems
Maine, New Hampshire

⑦ COSEE New England
Connecticut, Maine, Massachusetts, New Hampshire,
Rhode Island

⑧ COSEE Central Coordinating Office
Rhode Island, Maine, Massachusetts

⑨ COSEE Networked Ocean World
New Jersey, Massachusetts, Virginia, New York, California

⑩ COSEE Coastal Trends
Maryland, Delaware, Virginia

⑪ COSEE Southeast
North Carolina, South Carolina, Georgia

⑫ COSEE Central Gulf of Mexico
Mississippi, Alabama, Florida, Louisiana, Texas

⑬ COSEE Alaska
Alaska



Ocean Literacy provides an understanding of the ocean's influence on you and your influence on the ocean.

WWW.COSEE.NET



AOOS

The Eye on Alaska's Coasts and Oceans

www.aoot.org

Update
Winter 2009



"[COSEE] provides a great opportunity to share with the world the dramatic changes we're experiencing in our region due to climate change and to help the Arctic research community connect directly with Alaskans, from fishermen, boaters, teachers and students to other marine stakeholders and the public."

Molly McCammon,
AOOS director and leader of
COSEE Alaska planning



Alaska Ocean Observing System

1007 West 3rd Avenue
Suite 100
Anchorage, AK 99501
907-644-6703

www.aoot.org



COSEE Alaska: People, Oceans and Climate Change

In August 2008, the Ocean Sciences Division of the National Science Foundation announced the award of a Center for Ocean Science Education Excellence (COSEE) in Alaska. AOOS led the effort to bring COSEE north as a major component of its education and outreach effort, creating the 12th center in the national COSEE network, www.cosee.net.

COSEE Alaska is a partnership involving AOOS, the Alaska SeaLife Center, the University of Alaska Fairbanks (UAF) School of Fisheries and Ocean Sciences, the UAF Center for Cross-Cultural Studies, the Anchorage School District, and the Alaska Sea Grant Marine Advisory Program.

With both a regional (Alaska's arctic) and thematic (People, Oceans and Climate Change) focus, COSEE Alaska seeks to increase ocean literacy both within and outside Alaska and to weave together western science and traditional knowledge about ocean climate change to share with the nation.

The COSEE designation is especially timely, given the rapidly changing Arctic climate being blamed for storms that are eroding the seacoast, altering fisheries, thawing permafrost, and melting sea ice that polar bears, walrus and seals need for survival.

Ocean Science Fairs in Rural Coastal Communities

COSEE Alaska outreach activities will include workshops among scientists, teachers, and students, real and virtual field trips, and the creation of statewide Ocean Science Fairs. In October 2008, co-PI Dr. Ray Barnhardt and science fair consultant Alan Dick hosted an initial meeting of representatives from Alaska school districts to identify ocean science projects with substance and currency and to develop plans for establishing science fairs in remote rural coastal districts the first year. Three fairs are already underway: Lower Yukon-Kuskokwim, Unalaska and Sitka, and ocean scientists in the region are working on science fair project ideas for these communities.

COSEE
CENTERS FOR OCEAN SCIENCES
EDUCATION EXCELLENCE



SEANET: Scientists and Educators of Alaska NETWORK

COSEE Alaska will also expand the annual Communicating Ocean Science workshop at the Alaska Marine Science Symposium that draws more than 600 ocean scientists working in Alaska seas. We will use the workshop as an opportunity to formalize SEANET, a network of ocean scientists, marine educators, students, and community members involved in communicating about research in Alaska's seas. SEANET establishes long-lasting collaborations among these interest groups and strengthens communication among scientists and informal and formal educators and the public.

The COSEE Alaska grant culminates in a national ocean education and communication conference to be held in Alaska in 2012.

Appendix P - Presentations, publications and exhibits

Presentations

Indigenous and Western Science Observations on Climate Change: resources for teachers – week-long professional development course for teachers included a two hour presentation introducing C two hour course introducing COSEE Alaska, climate change and Alaska Seas and Rivers curriculum presented by Marilyn Sigman for 7-12 grade teachers.

Resources for Climate Change and Sustainability Education: lessons from Alaska presented by Marilyn Sigman to 50 Wisconsin educators at the 8th Annual International Bioethics Forum: sustainability, April 23-24, 2009 at the ProMega BioPharmaceutical Technology Center in Madison Wisconsin.

SEANET, presentation by Nora Deans at the 2008 Communicating Ocean Science Workshop, Alaska Marine Science Symposium, January 20, 2008, Anchorage, Alaska

Ocean Literacy at the Dawn of Climate Change overview of proposed COSEE Alaska, presentation by Nora Deans at the National Marine Educators Association, Portland, Maine, July 2007

COSEE Alaska: People, Oceans and Climate Change, by Marilyn Sigman and Nora Deans, Northwest Aquatic and Marine Educators, July 22, Vancouver, British Columbia.

Indigenous Knowledge, Climate Change and Education, keynote presentation by Ray Barnhardt at International Polar Year conference, sponsored by the Northwest Research Alliance, March 2009 in Fairbanks, Alaska.

Upcoming presentations

COSEE Alaska: Ways of Knowing Ocean Climate Change, by Marilyn Sigman and Nora Deans, Alaska Science Teachers Association, October 15, 2009 Juneau Alaska

COSEE Alaska: Ways of Knowing Ocean Climate Change by Marilyn Sigman and Nora Deans, proposed for National Science Teachers Association national conference, March 2010, Philadelphia, Pennsylvania

Publications

SEANET: Collaborations in Communicating Ocean Science, poster presentation by Nora Deans, Molly McCammon and Francis Wiese, Ocean Sciences 2008, Orlando, Florida.

COSEE Alaska: People, Oceans and Climate Change, by Nora Deans, Northwest Center for Sustainable Resources newsletter, February 2008

Alaska Ocean Science Notebook by Marilyn Sigman, activity book for children, 200 copies distributed at the Alaska Ocean Festival, June, 2009

Upcoming publication

Indigenous Contributions to Sustainability, article by Ray Barnhardt as chapter of book summarizing International Polar Year conference sponsored by the Northwest Research Alliance, March 2009, Fairbanks, Alaska.

Exhibits

Alaska Forum on the Environment, February 2-6, 2009, Anchorage, Alaska

Alaska Ocean Festival 2009, June 6, 2009 Anchorage Alaska