

FOREST TO SEAS

*A Report on Outreach Efforts Aligned with the
University of Washington's College of the Environment*



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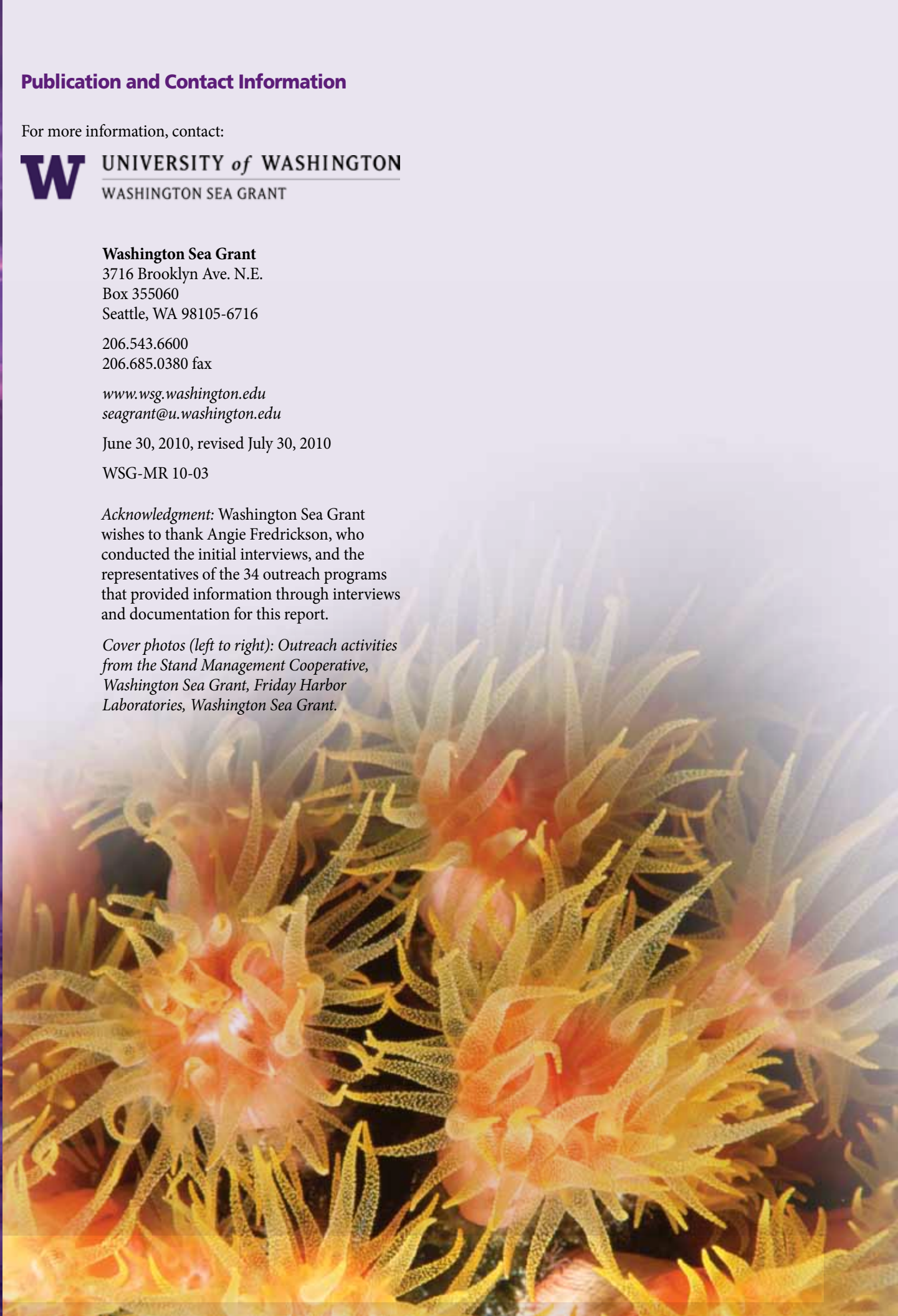
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Cover photos (left to right): Outreach activities from the Stand Management Cooperative, Washington Sea Grant, Friday Harbor Laboratories, Washington Sea Grant.



STILL IN ITS FORMATIVE STAGES, the College of the Environment is already beginning to fuse the University of Washington's unrivalled diversity of environmental disciplines into a cohesive science-based, environment-focused academic and outreach organization.



The College is strongly positioned to advance the contributions of academia to the very concrete problems of the world around us. Its structure combines an operational academic framework for supporting fundamental education and research with a flexible institute model that forges innovative partnerships that initiate and define emerging areas of research needs and pragmatic solutions.

Fundamental to the College is the concept of creating science-based tools and products for a broad range of stakeholders. We provide these tools to our region and the world through strong collaborations with industry, government and grassroots organizations. This outreach component is the vital link that makes the entire spectrum of the University's environmental research, development and application available to those who use, manage and safeguard our natural resources.

This report provides a synthesis of the astonishing array of outreach activities being carried out by 29 programs within the College of the Environment and five programs associated with or related to the mission of the College. It also provides insight into the potential benefits of a more coordinated and focused outreach approach.

Browsing through the document will give the reader an excellent sense of the depth and breadth of the College's expertise and its impact on the communities it serves. Truly, the reach of the College of the Environment stretches "from forest to seas."

A handwritten signature in black ink that reads "Phyllis M. Wise".

Phyllis M. Wise
Provost and Executive Vice President
University of Washington

ABBREVIATIONS IN THIS REPORT

Abbreviation Full Name

AOG Lab	Aquatic Organic Geochemistry Laboratory
ATMS	Department of Atmospheric Sciences
Burke Museum	The Burke Museum of Natural History and Culture
CAFS	Center for Advanced Forestry Systems
CIG	Climate Impacts Group
CINTRAFOR	Center for International Trade in Forest Products
CoCoRaHs	Community Collaborative Rain, Hail, and Snow Network
COASST	Coastal Observation and Seabird Survey Team
CoEnv	College of the Environment
COS	Communicating Ocean Science
COSEE-OLC	Centers for Ocean Sciences Education Excellence — Ocean Learning Communities
CSES	Center for Sciences in the Earth System
CSF-PF	Center for Sustainable Forestry at Pack Forest
CUH	Center for Urban Horticulture
DNR	Washington State Department of Natural Resources
DO-IT	Disabilities, Opportunities, Internetworking, and Technology
ESS	Department of Earth and Space Sciences
FHL	Friday Harbor Laboratories
FHLSOP	Friday Harbor Labs Science Outreach Program
GCeCS	Graduate Certificate in Climate Science
Gear Up	Gaining Early Awareness and Readiness for Undergraduate Programs
GIS	Geographic Information System
GPS	Global Positioning System
Hyde Herbarium	The Otis Douglas Hyde Herbarium
IOOS	Integrated Ocean Observing System
IPCC	Intergovernmental Panel on Climate Change
JISAO	Joint Institute for the Study of the Atmosphere and Ocean
LMS	Landscape Management System
MAS	Marine Advisory Services
Miller Library	The Elizabeth C. Miller Library
MRC	Marine Resources Committee
NANOOS	Northwest Association of Networked Ocean Observing Systems
NASA	National Aeronautics and Space Administration
<i>NatureMapping</i>	The <i>NatureMapping</i> Program
NOAA	National Oceanic and Atmospheric Administration
NSC	NOAA Science Camp
NSF	National Science Foundation
NWEF	Northwest Environmental Forum

Abbreviation Full Name

OACIS GK-12	Ocean and Coastal Interdisciplinary Science Graduate STEM Fellows in K-12 Education
Oceanography	School of Oceanography
OIP	Ocean Inquiry Project
ONRC	Olympic Natural Resource Center
OWSC	Office of the Washington State Climatologist
PCC	Program on Climate Change
PFC	Precision Forestry Cooperative
PMEL	Pacific Marine Environmental Laboratory
PNSN	Pacific Northwest Seismic Network
PNW Research Station	U.S. Forest Service Pacific Northwest Research Station
PoE	Program on the Environment
PRISM	Puget Sound Regional Synthesis Model
Project CAT	Cougar and Teaching
PSMEM	Puget Sound Marine Environmental Monitoring
Rare Care	Washington Rare Plant Care and Conservation Program
RTI	Rural Technology Initiative
SAFS	School of Aquatic and Fishery Sciences
SFR	School of Forest Resources
SJNI	San Juan Nature Institute
SMA	School of Marine Affairs
SMC	Stand Management Cooperative
Space Grant	Washington NASA Space Grant Consortium
STEM	Science, Technology, Engineering, and Mathematics
UBNA	Union Bay Natural Area
UNESCO	United Nations Educational, Scientific and Cultural Organization
UO	University of Oregon
USFS	United States Forest Service
USGS	United States Geological Survey
UW	University of Washington
UWBG	UW Botanic Gardens
UW-REN	UW Restoration Ecology Network
WDFW	Washington Department of Fish and Wildlife
WPA	Washington Park Arboretum
WRCCRF	Wind River Canopy Crane Research Facility
WSG	Washington Sea Grant
WSU Extension	Washington State University Extension Program

In May 2008, WSG provided safety-at-sea training for more than 400 employees of American Seafoods.



CONTENTS

Report Overview	1
Introduction	1
An Informal Survey	2
Overview of Outreach Programs	3
General Approaches to Outreach.....	8
General Outreach Focus Areas	9
Outreach Activities	10
Investment in Outreach.....	11
Outreach Priorities.....	12
Conclusion	13
Tables	14
Outreach Program Summaries	16
Contact Information	67





Kindergartners from Forks Elementary School get a close look at a state Department of Natural Resources fire truck during Nature Day at the Olympic Natural Resources Center, School of Forest Resources.



UW College of Forest Resources alumni Ben Harrison (left) and Pat Cummins tour the Rosmond arboretum at ONRC.



At Nature Day, a retired DNR forester points out skeletal characteristics of wildlife common to the Forks area.



Kindergartners from Forks listen to bird songs as a way to identify bird species.

Middle-schoolers get a chance to explore marine sciences every summer at NOAA's Sand Point facility in Seattle. WSG operates the science camp; the Joint Institute for the Study of the Atmosphere and Ocean is a major sponsor.



REPORT OVERVIEW

INTRODUCTION

THE COLLEGE OF THE ENVIRONMENT

(CoEnv) will bring together diverse environmental disciplines at the University of Washington (UW) into one of the largest science-based, environmentally focused academic organizations in the world. It will strategically invest in building capacity to advance interdisciplinary understanding of natural systems and human interactions with them and positively influence outcomes of complex environmental problems at regional, national and global scales. Essential elements¹ are:

- a mandate for broad environmental education to encourage significant student participation in the college curriculum;
- core degree-granting units for organizational strength and vibrancy;
- a central interdisciplinary institute that catalyzes new interactions and collaborations; and
- facilitation of better engagement with external stakeholders, driving the translation of research and scholarship into practical solutions.

JISAO scientist Sonya Noor helps NOAA Science Camp students read data collected from a Tropical Atmosphere Ocean buoy.

Students in GEAR UP (Gaining Early Awareness and Readiness for Undergraduate Programs) visit a portable lab at the NOAA Northwest Regional Center.

¹ Proposal to the UW Board of Regents to Establish a College of the Environment at the University of Washington (June 2008), 5.

By mid-2010, CoEnv is expected to include six academic units (School of Aquatic and Fishery Sciences, Department of Atmospheric Sciences, Department of Earth and Space Sciences, School of Forest Resources, School of Marine Affairs and School of Oceanography), two interdisciplinary programs (Program on Climate Change and Program on the Environment), two major research units (Joint Institute for the Study of the Atmosphere and Ocean and Quaternary Research Center), two major outreach units (Washington Sea Grant and Washington NASA Space Grant Consortium) and a major research station (Friday Harbor Laboratories). Although initial planning has focused primarily on academic issues, better stakeholder engagement and translation of scientific findings into practical solutions will require strengthened outreach efforts.

Budget fluctuations and other factors may alter specific outreach programs over time. This report presents a snapshot of CoEnv outreach as of the beginning of 2010 and an overview of the current outreach framework and approach across CoEnv's many units.



AN INFORMAL SURVEY

THIS REPORT IS A FIRST STEP TOWARD

understanding current capabilities, assessing needs and organizing activities into comprehensive and efficient tools for delivering UW science to broader audiences. It includes information from an informal survey of 29 programs within CoEnv and an additional five programs that were identified as associated with or related to the mission of the college (a list with contact information for the programs is included at the end of this report). Although CoEnv staff and unit directors identified these programs as important outreach efforts, this survey was not intended to be comprehensive, and not all relevant efforts are likely to be included.

For the purposes of the survey, outreach was broadly defined as UW engagement with external communities or the public. Each organization included in the survey is referred to as a program, regardless of size or structure. Programs may represent the efforts of a few graduate-student volunteers, UW schools and departments, interdisciplinary programs involving multiple schools and departments, formally affiliated organizations or independent entities that partner with UW.

It should be noted that people regularly contact faculty, staff and students and organizations for information, technical advice and outreach assistance. Such interactions are an important element of university life; however, they are difficult to characterize and quantify and, as a result, their inclusion in the survey was limited. In addition, some faculty, staff and students contribute to broad UW outreach programs, such as UW in the High School. Although these contributions are significant and important outreach activities, the scope of this survey was limited to outreach programs aligned with and within CoEnv.

The survey approach relied on interviews with key members of each program. Interviewees provided information on outreach approaches, resources, impetus for activities, trends and priority needs. Discussions focused on eight categories of outreach activities.

- K-12 (kindergarten-12th grade) education: working directly with K-12 students; engaging in K-12 school programming; and providing training and services for K-12 educators
- Informal education: activities in informal settings, such as volunteer programs (except citizen science programs, which are identified separately); classes and workshops for non-UW audiences; and activity and summer camps
- Presentations or talks to non-scientific audiences
- Technical assistance and training: direct transfer of technical knowledge or skills (excluding training for K-12 teachers and volunteers)
- Policy-making and management support: scientific or policy expertise and advice provided to decision-makers
- Communications: program documents/non-Web resources; listservs; and contact with media outlets
- Web-based resources: an online or listserv presence
- Citizen science: engaging the public in data collection

Information from program Web sites and printed materials was also included, where relevant.



Volunteer-guide training at the Washington Park Arboretum.

OVERVIEW OF OUTREACH PROGRAMS

SUMMARIES OF COENV AND RELATED OUTREACH programs are provided in Tables 1 and 2, and programs in each unit are described briefly in this section. Detailed summaries of these programs begin on page 16 of this report. Descriptions are limited to outreach activities (as defined in the previous section of this report) and are not necessarily comprehensive program summaries.

Outreach activities at the *Department of Atmospheric Sciences (ATMS)* are organized through the department's graduate student outreach program. Two graduate students run the program, which features K-12 outreach activities such as school-group tours of the department's facilities, classroom visits, science fair judging and demonstrations at family science nights. Graduate-student volunteers perform all outreach activities.

The *Department of Earth and Space Sciences (ESS)* supports three primary efforts: the Pacific Northwest Seismic Network (PNSN), the "Rock"ing Out program, and Washington NASA Space Grant Consortium (Space Grant).

PNSN engages in a wide variety of outreach activities pertaining to earthquakes and seismology. Activities include: seismology lab tours; K-12 classroom presentations; assisting with informal education exhibit content and design; training, technical support and real-time information products for state agencies, local emergency planners and other city, county and state planners; consultation services and briefings for elected officials and other policy makers; outreach to the media; a Web site with maps and information about recent earthquake activity; and the opportunity for citizens to contribute information to Community Internet Intensity Maps.

Launched by graduate students within the department in 2008, "Rock"ing Out currently includes five lesson plans and specializes in K-12 outreach, including hands-on classroom activities. Graduate-student volunteers perform all activities.

Space Grant provides opportunities for K-12 teacher professional development. It offers informal education opportunities for the public through consortium members such as the Pacific Science Center and Museum of Flight. Space Grant also provides online resources and a monthly newsletter for K-12 teachers.

Both the *Joint Institute for the Study of the Atmosphere and Ocean (JISAO)* and its Climate Impacts Group (CIG) support outreach programs. JISAO outreach activities include partnerships with K-12 education programs such as the UW Gaining Early Awareness and Readiness for Undergraduate Programs and the Disabilities, Opportunities, Internetworking, and Technology program. Informal education partnerships include: National Oceanic and Atmospheric Administration (NOAA) Science Camp; a Web portal for K-12 classroom curricula and instructional materials; an annual lecture series; collaborations with the Pacific Science Center; and additional public presentations upon request. The Office of the Washington State Climatologist, part of JISAO, serves as the Washington State Coordinator for the Community Collaborative Rain, Hail, and Snow Network, a national citizen science program. JISAO is launching a *Science in 180* video series that will include short educational videos on topics related to JISAO's research, made available on the program's Web site.

CIG provides scientific information, data and planning tools related to Pacific Northwest climate variability and change to a variety of audiences through meetings, workshops, presentations, published literature, a listserv, seminars and other means. CIG researchers often work directly with resource managers and policymakers to help them integrate climate information and planning tools in decision-making. This may include participating in planning studies or research collaborations, one-on-one technical consultations, technical briefings and other forms of assistance.



Christina Saloutos is a student in Space Grant's undergraduate research program.



The 2009 Space Grant awards reception and poster session.



Students in the interdisciplinary Program on the Environment work on a habitat restoration project on Coal Creek.



Environmental Studies student Emily Danford participates in an environmental art project for youth in West Seattle.



Atmospheric Sciences graduate students use an aquarium to explain the Earth's hydrological cycle of evaporation and condensation.



Participants in the Rural Technology Initiative's forest software training view and measure actual forest conditions.

Through the *Program on Climate Change (PCC)* speaker outreach program, graduate students receive training in public presentations and climate-change issues and provide presentations and hands-on activities to K-12 students, Rotary clubs, church groups and others upon request. The PCC graduate certificate program includes a focus on communicating climate science and culminates in a capstone project delivering climate science to a non-science audience. The program's Web site provides links to resources for K-12 teachers, including climate-change-related curricula and activities. The program also hosts an annual public lecture series and partners with other organizations on events and exhibits aimed at increasing public understanding and awareness of climate change. PCC is one of five programs in this survey to build outreach capacity by training graduate students and hosting an annual outreach open house.

The Program on the Environment (PoE) has served as a major focal point for environmental education and issues at UW, organizing symposia, seminar series and other public events. In addition, graduate students in the environmental management certificate program provide expertise and advice to outside community partners through graduate keystone projects. PoE developed an on- and off-campus online environmental events calendar, which CoEnv now maintains.

Outreach activities of 13 centers and programs within the *School of Forest Resources (SFR)* were included in the survey:

SFR is home to three specialized programs — the Center for International Trade in Forest Products, Precision Forestry Cooperative and Stand Management Cooperative — that provide targeted outreach to the forest industry, including marketing assistance, training and assistance in the use of technological tools, and data and information on forest marketing and management issues. It also includes two programs targeting forest management and policy issues: the Northwest Environmental Forum, which convenes forums on current forest management issues to provide scientific

and policy expertise and advice to decision-makers, and the Rural Technology Initiative, which provides tools, training and technical assistance to landowners in forest-resource-based communities.

The Center for Sustainable Forestry at Pack Forest (CSF-PF) and the Olympic Natural Resource Center (ONRC) are located off campus, near Mount Rainier and on the Olympic Peninsula respectively, and provide public outreach and recreation opportunities. CSF-PF has an interpretive program, including naturalist-led walks, forest tours and pre-field-trip and on-site activities for K-12 classes. ONRC hosts an annual Nature Day event for K-3 students and provides professional development training for K-12 teachers. Both centers provide technical assistance and training and scientific and policy expertise to a variety of groups. CSF-PF activities include forestry demonstrations; ONRC provides technical training and support for tribes and local agencies.

Through *The NatureMapping Program (NatureMapping)* and its focus on biodiversity, K-12 students and volunteers collect data on biodiversity throughout the nation. The program offers K-12 curricula, NatureTracker data collection software and training for monitoring projects and bioblitzes, sponsors other outreach activities through a network of environmental education organizations certified as *NatureMapping Centers*, and provides expertise and advice to local jurisdictions and natural resource managers to meet the Growth Management Act requirements for fish and wildlife.

The Restoration Ecology Network (UW-REN) is a tri-campus program (UW Seattle/Bothell/Tacoma) integrating student, faculty and community interests in ecological conservation and restoration. Through the UW-REN certificate program, undergraduate and graduate students complete restoration projects for community partners and provide training and informal education in restoration techniques for community partners and the public.



Lucretia Fairchild of COASST measures the bill of a northern fulmar on Cape Glazenap in the Bering Sea.



COASST Executive Director Julia Parrish (right) examines a bird foot with a new volunteer at a training session in Homer, Alaska.



Jonathan Kellogg, from the School of Oceanography's graduate student outreach program, explains "The Great Plankton Race" to a Science Night audience at Echo Lake Elementary School.

One of SFR's largest outreach programs is the UW Botanic Gardens (UWBG), a \$1.6 million program that includes the Center for Urban Horticulture, the Elisabeth C. Miller Library, the Otis Douglas Hyde Herbarium, demonstration gardens, greenhouses, nursery space, the Union Bay Natural Area and the Washington Park Arboretum plant collections. UWBG outreach activities target K-12 students, adults, families, professional horticulturists and other groups. Outreach activities include gardening classes for adults, events and programs for families, self-guided activities, tours, public recreation opportunities, programs for preschoolers and K-12 students and online and in-person assistance with gardening questions and plant identification, plus classes for professional horticulturists and other related professionals. Housed within UWBG, the Washington Rare Plant Care and Conservation Program (Rare Care) is a research and citizen science program. Rare Care engages volunteers as rare plant monitors and seed collectors and uses a variety of outreach activities to educate the public about rare plant conservation.

The Water Center provides outreach on water resource issues through weekly seminars and an annual review of research open to the public and often attended by consultants, natural resource managers and nonprofit groups. The Water Center offers training and technical assistance for members and information about water-related events.

Located in the Gifford Pinchot National Forest, the Wind River Canopy Crane Research Facility (WRCCRF) includes a full-size construction crane as a platform from which to study and learn about the old growth forest system. Tours are offered to professional groups and organizations. The crane is outfitted with webcams for online outreach.

At *Friday Harbor Laboratories (FHL)*, K-12 and citizen science outreach activities are organized through the Science Outreach Program, which provides classroom and field-based projects for elementary, middle-school and high-school students, including ongoing citizen science projects for high-school students. FHL also participates in the Ocean and Coastal Interdisciplinary Science GK-12 Program (described in this document's *Other Partnerships and Programs* section). Other outreach activities include open houses, lab tours, public presentations and scientific expertise and advice provided to local agencies and organizations.

The *School of Aquatic and Fishery Sciences (SAFS)* hosts a citizen science program — the Coastal Observation and Seabird Survey Team (COASST).

COASST has more than 500 volunteers who regularly survey approximately 300 beaches in Washington, Oregon, northern California and Alaska and collect data on beached birds, physical beach characteristics and human use of the beaches. COASST also engages in a number of additional outreach activities to educate and provide information to natural-resource managers and the public about marine bird and coastal environmental health issues.



Seattle Youth Garden Works students plant native ferns in bioswales at the UW Botanic Gardens.



Top: Students with the Student Conservation Association propagate sword ferns for the Native Plant Propagation Program at the UW Botanic Gardens. Bottom: "Rock"ing Out volunteers teach students about rocks and minerals at a local elementary school science night.



The *School of Marine Affairs (SMA)* does not have an organized outreach program. Faculty and students undertake outreach activities on an *ad-hoc* basis. Most often, faculty provide scientific and policy expertise and advice on marine policy and resource management at local, regional, national and international levels. SMA faculty and students also give public presentations upon request.

Two programs within the *School of Oceanography (Oceanography)* were included in this survey: the Graduate Student Outreach Program and SoundCitizen.

The Graduate Student Outreach Program, organized through a graduate student outreach coordinator, takes requests and coordinates student, faculty and staff volunteers to host K-12 field trips, provide presentations and demonstrations in K-12 classrooms and for the public, participate in family science nights, mentor and judge for science fairs and host high-school students for job-shadowing.

The SoundCitizen program is based in the Aquatic Organic Geochemistry Lab. Volunteers collect water samples from streams, lakes, storm drains and marine waters for lab testing. Current research focuses on the detection of environmental spices, such as vanilla and cinnamon, to demonstrate the connections between household activities and Puget Sound waters. SoundCitizen also develops presentations and curricula for K-12 classrooms and engages in other outreach activities to educate a wider public audience.

Washington Sea Grant (WSG) is a catalyst for innovative marine research, education and outreach. Three core WSG programs were included in this survey: Communications, Education and Marine Advisory Services (MAS). WSG supports additional outreach through research and program development funding.

WSG Communications helps agencies, organizations, businesses, schools and individuals better understand and manage marine resources and the environment. Its outreach activities include the production of numerous publications, including a quarterly newsletter, annual reports, program brochures and special pieces on topics such as safe shellfish harvesting and seabird bycatch reduction. It maintains the WSG Web site, engages in public education and media campaigns and assists partners on and off campus with their communications needs.

WSG Education coordinates flagship K-12 and informal education events such as Orca Bowl (a regional ocean sciences competition) and NOAA Science Camp. It has also developed Washington on Water, an online clearinghouse of regional marine education programs and resource for K-12 and informal educators in the state. WSG Education activities also include professional development opportunities for educators. All WSG Education programs are geared toward educating students of all ages to further an understanding of the complex nature of Washington watersheds and to improve ocean literacy.

MAS is a statewide marine outreach and technology transfer program, providing university resources and technical expertise for decisions about local, regional and national issues. Its outreach activities include informal education opportunities such as participating in community festivals and beach walks, making public presentations to non-scientific audiences, hosting technical meetings, workshops and conferences, and providing technical assistance and expertise for a variety of audiences. The MAS network of more than 10 campus- and community-based specialists assists constituents in aquaculture, fisheries, coastal economic development, coastal tourism, ports and marine transportation, safety at sea, marine technology training, water quality, shoreline protection and restoration, small oil spill prevention, aquatic invasive species control and citizen science.

Five *Other Partnerships and Programs* were included in this survey. *The Burke Museum of Natural History and Culture (Burke Museum)* is not officially part of CoEnv, but its mission is closely aligned with CoEnv. Centers for Ocean Sciences Education Excellence — Ocean Learning Communities (COSEE-OLC) and the Ocean and Coastal Interdisciplinary Science Graduate STEM (Science Technology, Engineering and Mathematics) Fellows in K-12 Education Program (OACIS GK-12) are partnerships among multiple UW units and outside organizations. The Northwest Association of Networked Ocean Observing Systems (NANOOS) and the Ocean Inquiry Project (OIP) are independent programs with UW faculty and staff serving in leadership roles.

The Burke Museum presents an opportunity for expanded and coordinated outreach. Approximately half of its \$5 million annual operating budget is dedicated to outreach and education. Ten education and two public outreach staff members coordinate activities targeting the public, K-20 students and educators, enthusiasts and indigenous peoples. Outreach activities include exhibits, tours,



lectures, workshops, summer camps and family events. K-12 education includes on-site programs, curricula, Burke Boxes (portable boxes of scientific specimens and cultural artifacts) and the Burkemobile, which brings interactive, object-based lessons into classrooms around the state. The museum offers professional development opportunities for K-12 teachers, and its volunteer programs provide citizen science opportunities by training volunteers to collect, catalogue and maintain objects in the museum's collection.

COSEE-OLC was established as a partnership among the UW College of Ocean and Fishery Sciences, the UW College of Education and the Seattle Aquarium. It is affiliated with CoEnv but spans multiple units. Outreach activities include public events that bring together scientists, marine volunteers, educators and citizens to foster discussion and networking pertaining to marine science. COSEE-OLC also works to build outreach capacity through training in scientific learning, communications and instruction on developing the broader impacts of research proposals.

NANOOS is the regional association of the national Integrated Ocean Observing System. It is not an official UW program but has significant connections to UW faculty and staff, with activities that are relevant to CoEnv. NANOOS provides coastal and ocean observational and model data and forecasts, decision-making tools and new data products. Users include mariners, fishermen, search-and-rescue personnel, oil spill responders, port authorities, state resource managers, tribes, fish, wildlife and coastal managers, Federal Emergency Management Agency, local governments, teachers, students and the general public. Outreach activities include K-12 classroom and public presentations, Web links to K-12 curricula, lesson plans and learning tools and training on the use of NANOOS information and products.

OACIS GK-12 is a program of FHL, the UW Department of Biology, SAFS and Oceanography. It pairs graduate student fellows with high-school teachers in the Seattle (urban) and San Juan County (rural) public schools. Graduate fellows gain teaching experience and related mentorship from their teacher partners and provide marine science content to teachers and their students. The OACIS GK-12 program includes direct outreach in classrooms, as well as courses, seminars and workshops focused on capacity building for outreach.

OIP is an independent non-profit organization connecting researchers, teachers and students through scientific inquiry on Puget Sound. It is not an official UW program but, like NANOOS, has significant connections to UW faculty and staff, with activities that are relevant to CoEnv. OIP offers oceanographic education and data collection cruises for K-16 classes and the public.

Elementary school students inspect minerals at a "Rock"ing Out presentation.

GENERAL APPROACHES TO OUTREACH

THE PROGRAMS IN THIS REPORT TAKE AN array of general approaches to outreach. Because these approaches are not necessarily discrete, the following generalized descriptions represent what, in practice, are likely to be variations on the themes identified in this section.

Many academic units (e.g., SAFS, Oceanography, ATMS, SFR) are not specifically represented at the unit level in this report, although, as previously noted, significant outreach occurs in an opportunistic manner as the public, media, schools, industry, managers and decision-makers contact individual faculty, staff and students for advice, to schedule speaking engagements, request technical assistance or expert testimony, etc. Because this type of outreach is diffuse, the level of investment is difficult to track and quantify; however, for some units, this approach may represent the most common type of outreach and may have significant impacts on the community at large. Most units also offer seminar series and occasional special events that are open to the public.

*First-grade students
from Thurgood Marshall
Elementary pose during a
field trip at the Department
of Atmospheric Sciences.*

Some programs were established to serve identified societal needs, and outreach is integrated into program activities in general. Built into the operating model of these programs is close collaboration and communication with relevant audiences and constituents. Many or all affiliated faculty, staff and students have some degree of outreach responsibility as part of their involvement in the program. For example, SFR has established numerous centers and cooperatives specifically to conduct applied research that informs forestry practices and policy.

Other programs with academic or research foci have resources specifically dedicated to outreach activities without having established formal outreach programs that are distinct from other operations. For example, PNSN and WRCCRF support staff positions or partial staff time dedicated to outreach activities.

For some programs, outreach is a primary or sole component of their missions. Dedicated outreach programs vary tremendously in size, from a cadre of graduate student volunteers (e.g., ATMS Outreach Program and ESS “Rock”ing Out program) to extensive programming, sometimes at the investment level of millions of dollars (e.g., Burke Museum, UWBG and WSG).



GENERAL OUTREACH FOCUS AREAS

PROGRAMS CAN ALSO BE CHARACTERIZED

by their outreach focus and the strategies they use to interact with the broader community (Table 1; for additional detail on individual programs, see Table 2). Many programs pursue outreach with multiple audiences. For example, CIG and WSG interact with many constituents about climate and marine resources, respectively. These groups tend to use a wide variety of strategies to reach their audiences, ranging from offering public presentations or engaging citizens in the collection of data to acting as advisors to resource managers or decision-makers.

Some programs conduct outreach to more targeted audiences. Most of these programs are in SFR, and many were established to foster and translate applied forestry research to industry, resource managers and policy makers. They tend to use fewer outreach strategies, preferring to limit their approaches to those that most effectively engage their target audiences.

Other programs focus primarily on citizen science efforts, involving the public in the collection of scientific information. In addition, they use a wide variety of strategies to inform the public about the scientific questions their citizen science programs are addressing. Another specialized focus area is K-12 education, which includes activities for school children as well as teacher-training efforts. K-12 outreach programs use a limited number of strategies relevant for students and teachers.

A small number of programs are designed or provide some support specifically for training the scientific community to more effectively engage in outreach activities. These include COSEE-OLC, JISAO, OACIS GK-12, PCC and WSG Education.



Kelly McCusker, Atmospheric Sciences, talks about air pressure to students at Lake Forest Park Elementary School.



The Seismology Laboratory, Earth and Space Sciences Department, takes its outreach program to Horace Mann Elementary School.



Undergraduates at SoundCitizen learn how to analyze water samples collected by citizens across Puget Sound.



NANOOS attends public events to share information on the technology used and information available from ocean observing systems.



Stand Management Cooperative faculty, staff and members view four-year tree growth at a test site.

OUTREACH ACTIVITIES

THE PROGRAMS SURVEYED UTILIZED THE eight categories of outreach activities to varying degrees (Table 1). All but one outreach program has an online presence, although Web site sophistication and program resources vary dramatically. For example, PNSN and NANOOS provide real-time (or near-real-time) data, interactive features and specialized tools for user communities. The vast majority of programs provide presentations and talks to audiences of non-scientists, although some offer them infrequently upon request and others routinely provide more than 100 presentations annually. Almost all programs also have some form of communications (program documents, listservs, contact with media), which ranges from developing simple program flyers to maintaining diverse publication portfolios. An example of an ambitious communications approach is WSG Communications, which annually produces dozens of publications, including technical reports, brochures, fact sheets, posters and newsletters, for its own use and that of numerous UW and external partners.

More than half the programs engage in informal education. For example, CSF-PF has an interpretive program with displays and self-guided trails, naturalist-led group activities and guided tours of demonstration plots. Many programs also engage in K-12 education — the Burke Museum, for instance, which reaches students and teachers through on-site programs, portable Burke Boxes of scientific specimens and its Burkemobile. Others, such as CIG (which routinely advises resource managers and policy-makers working to address climate change in their jurisdictions), directly support resource management and decision-making. Approximately two-thirds of programs surveyed offer technical assistance and training. To local agencies and tribes, for example, ONRC offers geographic information system services and training and technical support for monitoring, planning and analysis of both forest and marine ecosystems.

Lastly, some programs use citizen science as a strategy for engaging a broader community. COASST is the largest beached bird survey network in the world, with more than 500 volunteers regularly monitoring approximately 300 beaches in Washington, Oregon, California and Alaska. *NatureMapping* has a national network with nine states actively involved.



Sixth graders learn marine science from Friday Harbor Laboratories mentors on a rocky shore at Deadman Bay.



Above and right: Eighth graders gain lessons in the field through the FHL science outreach program.



WSG safety-at-sea training extends to tribal communities on the state's outer coast.



INVESTMENT IN OUTREACH

THERE IS TREMENDOUS DIVERSITY IN THE levels of investment in outreach efforts by programs represented in this survey. Although financial resource data for survey participants are incomplete, a very rough estimate can be made, suggesting that *at least* \$10 million annually is devoted to outreach efforts by programs in and potentially associated with CoEnv.

One coarse metric is the contribution of time by program personnel (Table 1). As indicated above, there are many units that provide expertise opportunistically in response to requests from the broader community. These efforts are not represented here or quantifiable without significant additional survey efforts, and likely vary significantly at the program and individual level. The only program in this inventory for which efforts of this nature were included is SMA.

Programs focused on applied research usually lack dedicated outreach staff; however most or all faculty, staff and students are involved in the targeted outreach efforts that define the mission of the program to some degree. Of the programs surveyed, two (the ATMS Outreach Program and the ESS “Rock”ing Out program) function solely on volunteer staff.

Approximately half of the programs surveyed have fewer than two full-time equivalent (FTE) employees dedicated to outreach, and several have two to five FTEs dedicated to outreach, either in the form of full- or part-time outreach positions, or other positions with partial commitment to outreach. Two programs — the Burke Museum and WSG MAS — have 10 or more FTEs dedicated to outreach activities. For many programs with dedicated outreach staffs, additional program faculty, staff and students may also participate to varying degrees in outreach activities.



Above: High-school teams from around the state compete at Orca Bowl, coordinated by WSG. The winning team gets a trip to the National Ocean Sciences Bowl.



Left: Tom Touse (far right, green cap), of the Center for Sustainable Forestry at Pack Forest, leads a school group on a tour of old-growth forest.

Right: COASST volunteer recording data on a beach in Alaska.



OUTREACH PRIORITIES

INTERVIEWEES IDENTIFIED PRIORITY

needs (Table 1) and, from these, two common priorities emerged: expanding or developing new programs, and providing compensation for staff, program participants (e.g., K-12 teachers) and volunteers. These priorities are interrelated, in that expanding and developing new programs often require additional staff. In some instances, however, the priority is to provide or increase compensation for current program staff, assistants or participants. Other priorities for funding included the

purchase/development of additional hands-on materials, tools, displays and demonstration kits for use with outreach audiences, as well as the investment of staff time and program capital in creating or enhancing Web resources. All but one program currently has a Web presence, yet many identified Web site improvements (including the addition of podcasts, webinars, social networking and other expansions) as important. Less common priorities included basic maintenance of current outreach offerings (e.g., compensating for budget cuts) and physical space.



Elsa Carlisle, a graduate of the School of Marine Affairs, gets her hands dirty doing field work.



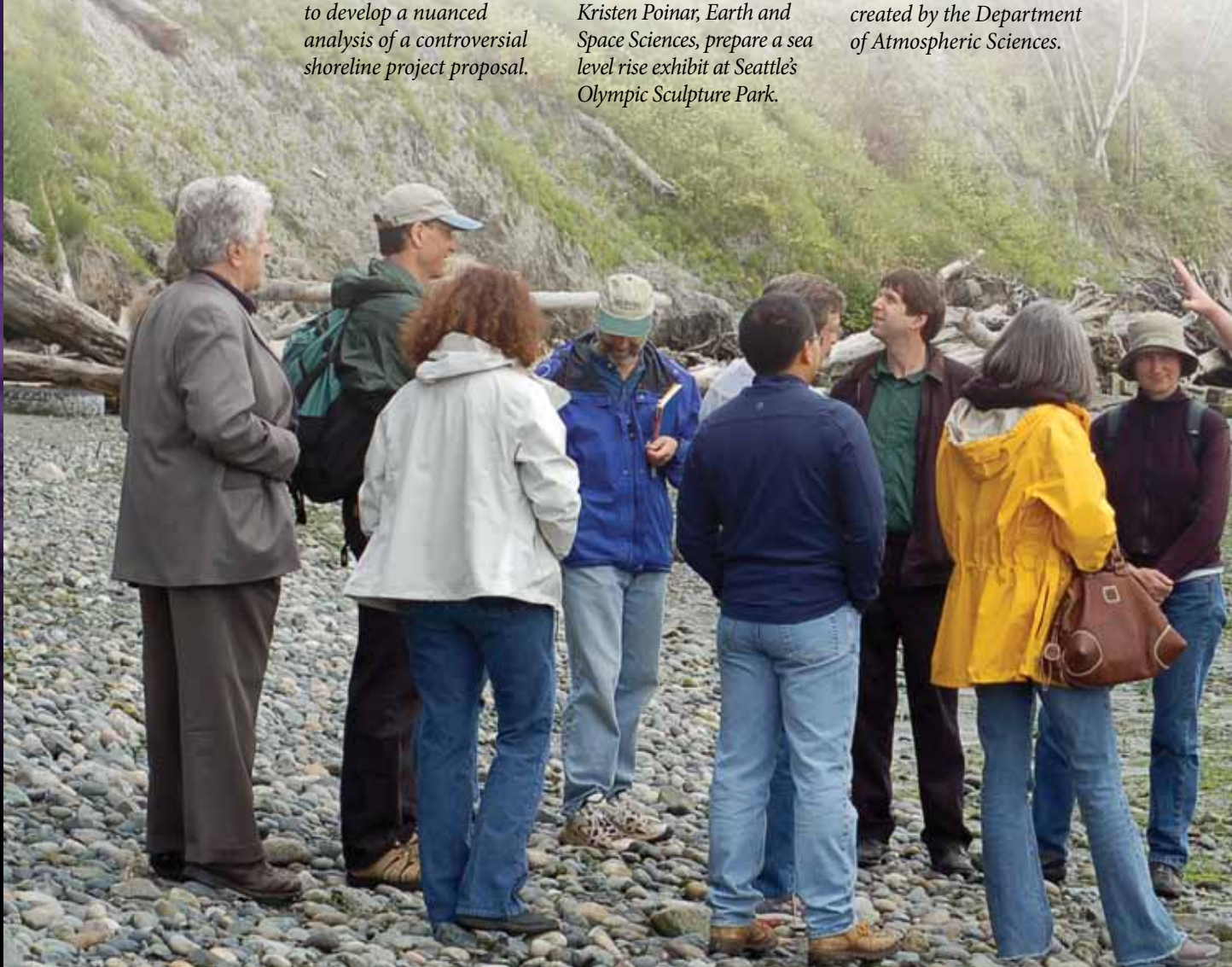
SMA graduate students reach out into the community to industry proponents and opponents to develop a nuanced analysis of a controversial shoreline project proposal.



Working with the Program on Climate Change, Cecilia Bitz and Paul Hezel, Atmospheric Sciences, and Kristen Poinar, Earth and Space Sciences, prepare a sea level rise exhibit at Seattle's Olympic Sculpture Park.



Students at Bennett Elementary School play with an air-pressure demonstration device created by the Department of Atmospheric Sciences.



CONCLUSION

EXISTING OUTREACH PROGRAMS WITHIN

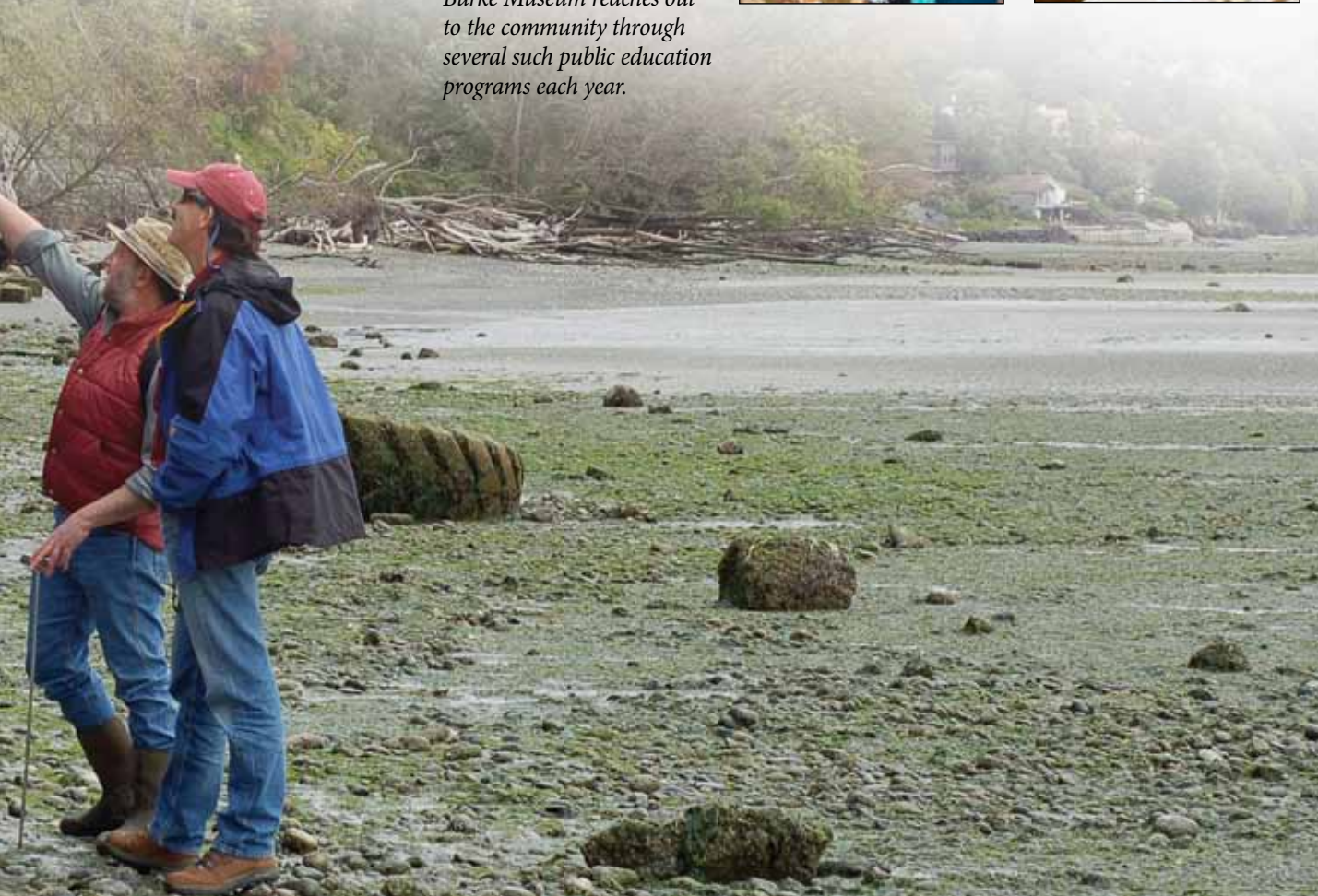
CoEnv are engaging diverse audiences in a variety of ways and, in turn, those audiences are recognizing CoEnv expertise and seeking out CoEnv experts. CoEnv may wish to consider centralizing information about these resources through a single CoEnv Web page or other platform to gain access to general and targeted audiences. For example, the existing CoEnv “K-12 Opportunities” suite of Web pages could be expanded to include other audiences and more activities for each audience.

Enhanced coordination of activities and cooperation among programs also could offer a more effective approach to serve target audiences, especially for those with well-defined interests (such as K-12 students or citizen scientists) or specific issue areas (such as habitat restoration or climate). It is likely that, as CoEnv tackles complex environmental topics, coordinated outreach efforts among multiple disciplines will be needed to thoroughly address all facets of each related issue.

Below: WSG Marine Habitat Specialist Jim Brennan (far right, red cap) conducts beach walks about habitat, beach processes and other marine science topics.

Top left: Burke Museum collections and staff educators engage people at Salmon Homecoming on the Seattle waterfront.

All other photos above: Children of all ages like to “Meet the Mammals.” The Burke Museum reaches out to the community through several such public education programs each year.



TABLES

Table 1. Summary of outreach focus areas, activities, resources and priorities.

Outreach Focus	<i># of programs</i>
Multiple Audiences	17
Target Audience	8
Citizen Science	5
K-12	4

Outreach Activity	
Web-Based Resources	33
Presentations or Talks	31
Communications	30
Informal Education	24
Technical Assistance and Training +	21
K-12 Education	21
Policy-Making and Management Support	20
Citizen Science	11

FTEs Devoted To Outreach	
Less than 2	15
2-5	8
No Dedicated Staff (Integrated and Opportunistic)	7
All Volunteer	2
More than 10	2

Priorities	
Expanding/New Programs	20
Staff/Participant Support	15
Web Resources	11
Outreach Materials	9
Program Maintenance	3
Physical Space	3

+ includes outreach capacity-building

Table 2. Details of outreach activities for 34 programs within, associated with or related to the College of the Environment.

COLLEGE OF THE ENVIRONMENT UNITS

Earth and Climate

	Focus
Department of Atmospheric Sciences	
Department of Atmospheric Sciences Outreach Program	K-12
Department of Earth and Space Sciences	
Pacific Northwest Seismic Network	multiple
"Rock"ing Out	K-12
Washington NASA Space Grant Consortium	multiple

Joint Institute for the Study of the

Atmosphere and Ocean	multiple
Climate Impacts Group	multiple
Program on Climate Change	multiple
Program on the Environment	multiple

Forests

School of Forest Resources

Center for International Trade in Forest Products	targeted
Center for Sustainable Forestry at Pack Forest	multiple
The <i>NatureMapping</i> Program	citizen science
Northwest Environmental Forum	targeted
Olympic Natural Resource Center	multiple
Precision Forestry Cooperative	targeted
Restoration Ecology Network	targeted
Rural Technology Initiative	targeted
Stand Management Cooperative	targeted
University of Washington Botanic Gardens	multiple
Washington Rare Plant Care and Conservation Program	citizen science
The Water Center	multiple
Wind River Canopy Crane Research Facility	targeted

Oceans

Friday Harbor Laboratories	multiple
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School of Aquatic and Fishery Sciences

Coastal Observation and Seabird Survey Team	citizen science
School of Marine Affairs	targeted

School of Oceanography

School of Oceanography Graduate Student Outreach Program	K-12
SoundCitizen	citizen science

Washington Sea Grant

Washington Sea Grant Communications	multiple
Washington Sea Grant Education	multiple
Marine Advisory Services	multiple

OTHER PARTNERSHIPS AND PROGRAMS

The Burke Museum of Natural History and Culture	multiple
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Centers for Ocean Sciences Education Excellence — Ocean Learning Communities	multiple
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Northwest Association of Networked Ocean Observing Systems	multiple
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Ocean and Coastal Interdisciplinary Science GK-12 Program	K-12
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Ocean Inquiry Project	citizen science
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Topic Area	FTEs Devoted to Outreach	K-12 Education	Informal Education	Presentations or Talks	Technical Assistance and Training	Policy-making and Management Support	Communications	Web-based Resources	Citizen Science
atmospheric sciences	all volunteer	■	■					■	
seismology	<2	■	■	■	■	■	■	■	■
earth and spaces sciences	all volunteer	■						■	
science, technology, engineering, mathematics	<2	■	■	■			■	■	
atmosphere and ocean	2-5	■	■	■	■+	■	■	■	■
climate	<2			■	■	■	■	■	
climate	no dedicated staff (integrated)	■	■	■	■+		■	■	
environmental issues	<2			■		■	■	■	
forest industry practices	no dedicated staff (integrated)			■	■	■	■	■	
forestry	<2	■	■	■	■	■	■	■	
biodiversity	<2	■	■	■		■	■	■	■
forest policy	<2		■	■		■	■	■	
forestry and marine resources	<2	■	■	■	■	■	■	■	
forest industry practices	no dedicated staff (integrated)			■	■	■	■	■	
ecological restoration	no dedicated staff (integrated)	■	■	■	■		■	■	
forest-resource based communities	no dedicated staff (integrated)			■	■	■	■	■	
forest industry practices	no dedicated staff (integrated)			■	■	■	■	■	
botany	2-5*	■	■	■	■		■	■	■*
botany	2-5		■	■		■	■	■	■
water resources	<2			■	■		■	■	
forest research	<2		■	■	■	■	■	■	
marine sciences	2-5	■	■	■		■	■	■	■
ocean health	2-5	■	■	■		■	■	■	■
marine policy	no dedicated staff (opportunistic)			■	■	■	■	■	
oceanography	<2	■	■	■					
water quality	<2	■	■	■			■	■	■
ocean and coastal issues	2-5		■	■			■	■	
ocean and coastal issues	<2	■	■		■+	■		■	
ocean and coastal issues	>10		■	■	■	■	■	■	■
natural history and culture	>10	■	■	■	■		■	■	■
ocean and learning sciences	2-5	■	■	■	+		■	■	
ocean observing	<2	■	■	■	■	■	■	■	
ocean and coastal sciences	2-5	■		■	+		■	■	
oceanography	<2	■	■	■			■	■	■

+ indicates outreach capacity-building

* Includes Washington Rare Plant Care and Conservation Program

OUTREACH PROGRAM SUMMARIES

College of the Environment Units

Earth and Climate

Department of Atmospheric Sciences

The Department of Atmospheric Sciences (ATMS) plays a leadership role in planning and executing regional, national and international scientific research programs pertaining to weather, climate and air quality. Current research emphases include the role of natural and human-produced aerosols in climate change, the role of clouds in climate change and precipitation in mountainous regions, including models to predict weather and clear-air turbulence in regions of complex terrain. ATMS also played a central role in defining the Pacific Decadal Oscillation and the Arctic Oscillation, which have major influences on year-to-year climate variability in North America. ATMS grants Bachelor of Science, Master of Science and Doctor of Philosophy degrees and offers a minor in atmospheric sciences. It offers the only atmospheric sciences undergraduate program in the Pacific Northwest.

Department of Atmospheric Sciences Outreach Program

ATMS has maintained an organized Outreach Program since 1989. Outreach activities organized through this program are described in this summary. Many of the department's faculty, staff and students also participate in independent outreach activities. Because these interactions are difficult to track, they are not included here.

Types of Outreach

1. K-12 Education

Class field trips to ATMS; classroom visits; science fair judging; Expanding Your Horizons events; demonstrations at family science nights.

2. Informal Education

Participation in Pacific Science Center events (such as Polar Science Weekend); assistance with the National Oceanic and Atmospheric Administration (NOAA) Science Camp.

3. Presentations or Talks to Non-Scientific Audiences

None.

4. Technical Assistance and Training

None.

5. Policy-making and Management Support

None.

6. Communications

None.

7. Web-based Resources

Web site, including calendar of upcoming outreach events, link for teachers to schedule subject-specific tours for school groups, and photos and descriptions of previous outreach events; online educational video series, including a collaboration with the Joint Institute for the Study of the Atmosphere and Ocean (JISAO) on *Science in 180* video series.

8. Citizen Science

None.

Outreach Overview

The ATMS Outreach Program provides graduate-student volunteers with the opportunity to share their knowledge with K-12 students by **hosting school groups** in the department on the University of Washington (UW) campus, **visiting classrooms**, **judging science fairs**, and participating in other events. **K-12 field trips** to ATMS include a tour in which students are shown instrumentation and general atmospheric science demonstrations. Outreach volunteers show visiting students how to use tools that monitor weather. Students measure wind speed, look at the rain gauge, etc. School groups are also shown real-time data from the roof of the Atmospheric Sciences-Geophysics Building. The ages of students who come for field trips vary; most groups tend to be K-6, but high-school field trips also occur. Students with learning disabilities and physical disabilities also participate. During the 2008-09 academic year, the program received **40 outreach requests** and approximately **32 were for tours** of the department's facilities.

Graduate-student volunteers also respond to requests for **lectures and demonstrations in the classroom**. However, this type of outreach is less common, as it is more challenging for the graduate students in terms of preparation, schedule and travel time. Volunteers are also available to **judge science fairs** and present demonstrations at **family science nights**.

Outreach Program students also participate in events at the **Pacific Science Center** and the **Burke Museum of Natural History and Culture** (Burke Museum), such as the Pacific Science Center's annual Polar Science Weekend. ATMS graduate students presented three to four workshops at **Expanding Your Horizons in Science and Mathematics** events in 2008 and 2009. Held at local community colleges, these one-day events are focused on nurturing girls' interests in science and math courses and encouraging them to consider careers in science, technology, engineering and math. Students have also volunteered to assist in **NOAA Science Camp** in the summer.

Students at ATMS launched into educational video production through a collaboration with JISAO to create a three-minute video on one or two principles of atmospheric science as part of JISAO's *Science in 180 video series*. Since then, the ATMS Outreach Program has started its own video series, with the first video on atmospheric pressure and can crushing completed and a second video in production.

The Outreach Program Web site includes a form for **K-12 teachers to submit outreach requests**. Teachers can choose the type of outreach they would like (field trip to ATMS, science fair judging, science night demonstration table, request for outreach materials). They can also choose a topic to focus on (general weather, climate change, careers in atmospheric sciences, Pacific Northwest weather, storms and severe weather). The Web site also has a **calendar of outreach activities**, which is kept up-to-date, and photos and descriptions of previous outreach events.

Resources Devoted to Outreach

Two graduate student volunteers coordinate the program's volunteers and outreach activities. Twenty to 30 graduate student volunteers (and a few faculty and staff) are part of the program's listserv. While there is no funding dedicated to outreach, the Outreach Program is reimbursed for nominal costs by ATMS. Many of the demonstration materials used by the program are also used for two of the department's introductory courses: ATMS 101 Weather and ATMS 111 Global Warming—Understanding the Issues.

Impetus for Outreach

The Outreach Program serves the K-12 community in the greater Seattle area. Most of the schools that visit the department return with their classes every year. It is a well-established and reputable field trip for K-12 classes to take when they are studying weather or climate. Graduate students volunteer for the program for a number of reasons. Some recognize that giving tours gives them an opportunity to practice speaking about atmospheric sciences to diverse audiences. Others enjoy communicating the work of atmospheric scientists to younger students.

Trends in Outreach

Climate has become a much larger issue in recent years, and this is sometimes reflected in the interests of the student groups. Many school groups continue to be interested only in the weather, but some older students will have an interest in global climate change.

The Outreach Program is slowly phasing out travel to classrooms to give demonstrations and lectures. It is challenging to find graduate students who have time in their schedules to make trips to the schools. Instead, the program is focusing on bringing school groups to the UW campus for tours and demonstrations.

The program's Web site is continuously evolving; recent features include a link that allows teachers to make outreach requests online.

Outreach Priorities

With additional resources, the Outreach Program would develop better visual aids and demonstration tools for the tours. The program is also interested in making T-shirts for outreach volunteers, as some type of uniform would make the program appear more professional. In addition, a small stipend for the coordinators of the Outreach Program likely would be appreciated.

Department of Earth and Space Sciences

In 2001, the Department of Geological Sciences and the Geophysics Program merged to become the Department of Earth and Space Sciences (ESS). ESS combines expertise in physics, chemistry, biology, geology and mathematics to further the understanding of Earth and the solar system and their histories. ESS currently includes more than 40 faculty, an additional 36 adjunct and affiliate faculty, more than 75 graduate students and more than 100 undergraduate majors. It has four broad and overlapping focus areas: the solid earth, surface processes, geobiology and space/planetary studies.

The following three summaries describe the Pacific Northwest Seismic Network (PNSN), the "Rock"ing Out program and Washington NASA Space Grant Consortium (Space Grant). ESS faculty, staff and students also engage in additional outreach activities not centrally organized or contribute to broader UW outreach programs, such as UW in the High School. Although these contributions are important, the scope of this survey was limited to outreach programs within or aligned with the College of the Environment (CoEnv).

The Pacific Northwest Seismic Network

The Pacific Northwest is an area of well-known seismic activity. PNSN was installed in 1969 to monitor regional earthquake activity, following a magnitude 6.5 earthquake that shook the Seattle area in 1965, causing substantial damage and seven deaths.

PNSN is a member of the Advanced National Seismic System and is housed in ESS. It is operated jointly by the UW and the University of Oregon (UO) and is funded by the U.S. Geological Survey (USGS), U.S. Department of Energy, and the state of Washington.

PNSN collects and analyzes data to provide rapid and accurate information on earthquakes and volcanic activity in Washington and Oregon. Starting with five seismometers in 1969, PNSN has grown to include more than 250 seismograph stations. Data from the PNSN

are used for research, daily monitoring, and to provide information to emergency managers and the public following events. PNSN data help scientists understand Pacific Northwest earthquake hazards, predict volcanic eruptions at Mount St. Helens and determine the location of faults and volcanic magma chambers. PNSN provides an educational outreach program on current seismicity and the potential damage from future earthquakes. PNSN data are combined with other geological and geophysical studies to assess Pacific Northwest earthquake hazards. The engineering and business communities, policy makers and the public use this information to develop disaster mitigation plans, inform earthquake response and build post-earthquake recovery strategies.

Types of Outreach

1. K-12 Education

Education resources for students and teachers; classroom presentations; participation in science nights and science fairs.

2. Informal Education

Tours of the PNSN Seismology Lab and Cascade Volcano Observatory; assistance developing museum and visitor center exhibits.

3. Presentations or Talks to Non-Scientific Audiences

Presentations for the general public, emergency managers, businesses and professional groups.

4. Technical Assistance and Training

Training and technical support to local and state agencies and planners.

5. Policy-making and Management Support

Continual engagement with local emergency planners and other city, county and state planners; real-time information products for managers, decision-makers, and others.

6. Communications

Fact sheets; hazard maps; quarterly and annual reports; close engagement with news media (especially local television) whenever a seismologic event occurs.

7. Web-based Resources

Web site with information on “Latest Quakes,” “Cascade Volcanoes” and “Hazards and Preparedness” and links to PNSN’s education resources, including a virtual tour of the Seismology Lab.

8. Citizen Science

Citizens can submit reports of seismic activity on the PNSN Web site to create Community Internet Intensity Maps; volunteers also serve as hosts for strong motion seismometers for the *NetQuakes* program.

Outreach Overview

PNSN offers **real-time information products** from the approximately 250 seismograph stations currently operated by the PNSN in Washington and Oregon. These stations stream more than 500 channels of ground motion data to the Seismology Lab, and a number of programs can access information to locate earthquakes, estimate magnitude and perform other tasks. Real-time information products provided by the PNSN include **maps and information about recent earthquake activity, digital seismograms**, which are redrawn every two to five minutes to show ground motion at seismograph stations across the region, and **ShakeMaps**, which display the instrument-measured intensity of ground-shaking produced by earthquakes. Other near real-time information products include links to **summaries of earthquake activity at Cascade Volcanoes** and a link to earthquake information from monitoring stations worldwide. The PNSN also provides California Integrated Seismic Network Display with **earthquake alarm software registrations for emergency managers** and operations centers.

Other real-time information products that utilize **citizen science** activities include the **Community Internet Intensity Maps**. These maps, which are also known as “Did you feel it?” maps, compute and display shaking from reports submitted by citizens online.

PNSN’s outreach to communities includes workshops with USGS on numerous topics, including earthquakes and other public hazards. PNSN also works through USGS to **provide technical training and scientific expertise** to civic organizations and emergency managers. PNSN faculty and staff give **presentations** frequently to educate city and county planners and the general public. PNSN staff engages continually with local emergency planners and provides **technical support** to cities and counties by preparing **earthquake scenario exercises** and simulating emergency drills.

PNSN has collaborated with its partners to develop many **earthquake-related information products** for a variety of users. These products include hazards maps and fact sheets, maps of historic earthquakes and major faults in the Pacific Northwest, seismicity maps, earthquake scenarios and tsunami inundation modeling and LIDAR (Light Detection and Ranging) and geologic maps, as well as quarterly and annual reports.

The PNSN Web site is a popular resource for the public. During the recent eruption of Mount St. Helens, the PNSN Web site attracted more than 1 million visits per day. The Web site also provides education resources for students and teachers to explore seismology and related earth sciences. The PNSN's Seismology Lab on the UW campus provides approximately 150 **presentations and tours** of its facility. Age-appropriate discussions on a variety of topics have been developed for K-12 lab tours. Students and teachers can also take a **virtual tour** of the Seismology Lab on the PNSN Web site. Another PNSN facility, the **Cascade Volcano Observatory** in Vancouver, Wash., gives tours through its labs to K-12 groups several times a week. PNSN undergraduates also give talks in classrooms, judge science fairs and present at family science nights.

PNSN engages with the **media** whenever a seismological event occurs. PNSN staff also arranges for media access to researchers in the field, publicizes research findings and assists the media with referrals to content experts to assist in the development of interesting and accurate stories.

Resources Devoted to Outreach

Washington state traditionally provided \$500,000 in funding to PNSN, but this was cut by 8 to 10 percent in 2009. PNSN has a \$1 million operating budget from the USGS. In addition to these funds, five to 10 USGS staff members work at PNSN on the UW campus. Staff and faculty at the UW also work with Pacific Northwest National Labs and UO. The PNSN will benefit from \$5 million from the National Science Foundation to improve global positioning systems and seismometers in Oregon and Washington. PNSN may also receive up to \$1 million in federal stimulus funding for hardware for seismic and volcanic monitoring for the downtown Seattle area.

PNSN has three principal investigators and a director of public information. The network has broad faculty involvement in diverse departments at the UW. Six to eight doctoral students and postdoctoral researchers are working with the network at any given time. Several emeritus faculty members also maintain a close affiliation with PNSN. PNSN also employs four undergraduates as part-time student research assistants who deliver most of the K-12 presentations and tours.

Impetus for Outreach

PNSN monitors earthquakes and communicates with state and federal governments, including the USGS, Federal Emergency Management Agency, Washington Emergency Management, the Washington Department of Natural Resources (DNR), Oregon Emergency Management and the Oregon Department of Geology and Mineral Industries. This communication occurs by training agency staff to use PNSN tools, providing scientific expertise to management and providing the "best science" to decision-makers to aid in the formulation of public policy. PNSN benefits from receiving feedback and suggestions on how to improve communication and information products.

PNSN is also dedicated to reducing the loss of life and property from earthquake and volcanic hazards in the region. To achieve this, the public needs to be aware of these hazards and to use that information to make wise decisions for themselves and their families. PNSN reaches many thousands of citizens annually by working closely with the media to develop high quality programs and dedicating resources to educating K-12 teachers and students. The PNSN Web site is an increasingly important tool for communicating with both professional audiences and the general public.

Trends in Outreach

Public interest in seismology generally spikes when seismological incidents occur. Focus on emergency preparedness is sporadic, depending on the public's perception of how real the threat of an earthquake or volcanic activity may be. PNSN uses distant earthquakes and new research findings as "teachable moments," providing information to the public when it is most ready to receive it.

Outreach Priorities

The PNSN Web site is in need of an upgrade, including the addition of interactive functions. It is vitally important to have information readily available on a modern, easy-to-navigate Web site so that it is available when the interest is there. Research and monitoring funding agencies are reluctant to support such efforts, so other avenues of support must be identified. PNSN would also be able to create better educational demonstrations, developing virtual kiosks and other outreach tools for use at sites such as the Pacific Science Center and the Burke Museum. With additional funding, PNSN could also send more undergraduates to local schools to give presentations and other hands-on demonstrations.

“Rock”ing Out

This summary describes the K-12 outreach activities in ESS that are coordinated through the “Rock”ing Out program. Department graduate students launched the program in 2008.

Types of Outreach

1. **K-12 Education**
Hands-on activities in K-12 classrooms; demonstrations at family science nights.
2. **Informal Education**
None.
3. **Presentations or Talks to Non-Scientific Audiences**
None.
4. **Technical Assistance and Training**
None.
5. **Policy-making and Management Support**
None.
6. **Communications**
None.
7. **Web-based Resources**
Web site with information about the program, lesson plans, a calendar of “Rock”ing Out events, and photos from classroom visits and science night demonstrations.
8. **Citizen Science**
None.

Outreach Overview

With the understanding that learning occurs by seeing and doing, this outreach program focuses on teaching **hands-on activities in K-12 classrooms** and gives pre-service teachers much-needed experience in the classroom. Current lesson plans include comparing rocks (for grades K-4), rocks from Mars (for grades K-6), identifying rocks (for grades 4-7), planetary exploration (for grades 5-8) and glaciers (for grades 7-12). Additional lesson plans are in development.

Through “Rock”ing Out, volunteer graduate students are available to visit classrooms across the state at no cost to the K-12 schools. In addition to classroom visits, “Rock”ing Out will provide **displays and demonstrations** for school science nights.

The “Rock”ing Out Web site provides general information about the program, links to lesson plans, a calendar of “Rock”ing Out events and photos of past activities in schools.

Resources Devoted to Outreach

“Rock”ing Out receives some funding from Space Grant for lesson-plan equipment and materials. Graduate student participants are all volunteers.

Impetus for Outreach

Graduate students launched “Rock”ing Out with the mission of introducing science to today’s youth in an energetic and entertaining fashion.

Trends in Outreach

“Rock”ing Out is too new to report trends in outreach.

Outreach Priorities

With additional resources, the “Rock”ing Out program would develop additional educational tools for classroom visits and could expand its programs into more schools across the state.

Washington NASA Space Grant Consortium

Space Grant was established in 1989 with a grant from the National Aeronautics and Space Administration (NASA) and is housed in ESS at UW. Space Grant is modeled after the land grant university model, with a mission to further science, mathematics and technology education, aerospace science and engineering research for diverse learners of all ages in Washington.

Space Grant includes more than 15 universities, colleges and community colleges and organizations such as the Office of the Superintendent of Public Instruction, Museum of Flight and Pacific Science Center. Space Grant also has four industry affiliates including The Boeing Company. Washington Space Grant is one of 52 consortia in the nation.

Types of Outreach

1. **K-12 Education**
Online resources and newsletter for K-12 teachers; professional development for in-service teachers through programs at the Pacific Science Center, Museum of Flight, North Central Educational Service District and Washington Science Teachers Association; support for K-12 education through the ESS “Rock”ing Out program.
2. **Informal Education**
Informal education through the Pacific Science Center and Museum of Flight consortium members.
3. **Presentations or Talks to Non-Scientific Audiences**
Occasionally sponsors public presentations.
4. **Technical Assistance and Training**
None.
5. **Policy-making and Management Support**
None.

6. Communications

Expanding Frontiers (newsletter) published three times per year; semimonthly online newsletter for teachers.

7. Web-based Resources

Web site with information on professional development opportunities and online resources for K-12 teachers, calendar of current events, newsletters and links to additional resources.

8. Citizen Science

None.

Outreach Overview

Space Grant outreach activities focus on providing resources for K-12 teachers and on informal education through member organizations. The Space Grant program sponsors **professional development workshops for K-12 teachers** through some of the consortium members, including the Pacific Science Center and Museum of Flight. The program also provides access to **online resources** for K-12 teachers and publishes a semimonthly **newsletter for teachers**. Space Grant Consortium members such as the Pacific Science Center and Museum of Flight also offer informal education opportunities for the public.

While Space Grant does not directly provide outreach activities in K-12 classrooms, it supports the **“Rock”ing Out K-12 program** in ESS (described in the previous summary in this document).

In addition, Space Grant publishes a general program **newsletter** three times per year, maintains an online **calendar of events** and provides information about education and research opportunities and links to other resources on the program **Web site**.

Resources Devoted to Outreach

Space Grant receives approximately \$800,000 per year from the national program. Approximately 40 percent is distributed to consortium members, some of which use funding to provide informal education opportunities and workshops for K-12 teachers. Funding at UW is devoted to staff—including a public information/communications specialist, a student adviser and a fiscal specialist—and scholarships, fellowships, research internships, newsletters, resources for K-12 teachers and outreach support for partner organizations.

Impetus for Outreach

The National Space Grant College and Fellowship Program was established to increase interest in aeronautics, space exploration and related fields; encourage cooperation among the aerospace industry, government and universities; encourage interdisciplinary training, research and public service programs related to aerospace; recruit and train professionals, especially women and under-represented minorities, for careers in aerospace science; and promote a strong educational base in science, math, engineering and technology (STEM) from the elementary grades through the university levels. The goal is to develop a pipeline for K-12 students to higher education and, eventually, careers focused on STEM and ensuring that this pipeline ensures geographic and ethnic diversity.

Trends in Outreach

Some outreach products and services at Space Grant have shifted over time. For example, the program once ran a resource center for teachers; now all of these resources are available online.

Outreach Priorities

With additional resources, Space Grant would like to greatly enhance the programs offered and the number of students that can participate in meaningful activities that enhance their experiences in STEM, to ensure a workforce that is vital and ready to forge ahead in science and technology.

Joint Institute for the Study of the Atmosphere and Ocean

Established in 1977, JISAO is a cooperative institute of NOAA and UW that fosters collaborative research on climate, environmental chemistry, marine ecosystems and coastal oceanography. JISAO involves more than 100 researchers at UW and NOAA. The Institute collaborates with many units at the UW, including ATMS, ESS, Civil and Environmental Engineering, the Applied Physics Laboratory, the Program on Climate Change (PCC), the Evans School of Public Affairs and the schools of Oceanography, Forest Resources, Marine Affairs and Aquatic and Fishery Sciences. JISAO also works with many NOAA offices, including the Alaska Fisheries Science Center and Northwest Fisheries Science Center, the Emergency Response Program and the Pacific Marine Environmental Laboratory (PMEL) and is part of a national network of 23 institutes across the U.S.

Funding for the core program at JISAO supports two to three postdoctoral fellows, senior visiting scientists, short-term visiting researchers and education and outreach activities. JISAO is home to the Center for Sciences in the Earth System (CSES), which includes the Climate Impacts Group (CIG) and Office of the Washington State Climatologist (OWSC). Outreach activities specific to CIG are discussed in a separate summary in this document.

Types of Outreach

1. K-12 Education

Participation in the UW Gaining Early Awareness and Readiness for Undergraduate Programs (Gear Up) and Disabilities, Opportunities, Internetworking, and Technology (DO-IT) activities for high school students; K-12 classroom visits; demonstrations at family science nights.

2. Informal Education

Participation in NOAA Science Camp; partnership with the Pacific Science Center on events such as Around the Americas; Science on Tap, a science café.

3. Presentations or Talks to Non-Scientific Audiences

Annual lecture series; partnership with the Pacific Science Center on public lectures; additional presentations upon request.

4. Technical Assistance and Training

Faculty, staff and student assistance and training for constituencies in the private and public sectors, helping communities plan for climate change adaptation; professional development training for JISAO research staff on communicating science to the public.

5. Policy-making and Management Support

Faculty, staff and students scientific expertise for policy makers in local and tribal governments in the areas of climate change impacts to natural resources, agriculture, fisheries and urban infrastructure.

6. Communications

Annual reports; media communication about important research outcomes; worldwide media coverage of institute researchers.

7. Web-based Resources

Web site with information about research, publications, data, education and outreach opportunities, media coverage and an information portal with links to additional resources for teachers; *Science in 180* short educational videos currently in production.

8. Citizen Science

OWSC is Washington state coordinator for the Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS), a national citizen science program.

Outreach Overview

In response to NOAA's environmental literacy goal, JISAO supports educational and diversity outreach through its **K-12 partnerships, annual lecture series** and a variety of yearly **community events**. Primary K-12 outreach activities include support for and participation in NOAA Science Camp, partnership with the UW Gear Up and DO-IT programs and information and resources for K-12 teachers.

JISAO scientists participate in **NOAA Science Camp** to provide students with opportunities to explore the chemical and physical aspects of the ocean environment. Students go out on the Research Vessel *Stanley P. Hayes* to experience some of the activities of a typical research cruise. They also learn how buoys collect atmospheric and oceanographic data. In addition, JISAO funds 10 need-based scholarships for NOAA Science Camp each year.

Through **UW Gear Up**, JISAO partners with local school districts to provide learning labs for the Summer Institute, a program for at-risk students from low-income communities. At the Summer Institute, middle- and high-school pupils learn about a range of scientific topics related to JISAO's research themes, including global warming, atmospheric science, fisheries and the health of Puget Sound. JISAO has also worked with the **UW DO-IT** program to develop a workshop for high school students with disabilities.

Outreach activities for the public include an **annual lecture series**, typically drawing 80 to 120 audience members, **events such as Around the Americas**, in partnership with the **Pacific Science Center**, and additional **public presentations** upon request. JISAO frequently partners with the Pacific Science Center to deliver significant science content to a wide audience

in Seattle and greater King County communities. The Around the Americas project includes a circumnavigation by sailboat of the North American and South American continents. Other projects with the Pacific Science Center have included “Earth Revealed: A View of Our Planet from Space” and “Marine Exploration Weekend.”

JISAO faculty, staff and students provide **technical assistance and training** to constituencies in private and public sectors, helping communities plan for climate change adaptation. Faculty, staff and students also provide **scientific expertise for policy makers** in local and tribal governments in the areas of climate change impacts to natural resources, agriculture, fisheries and urban infrastructure. In addition, JISAO offers professional development training for research staff on communicating science to the public.

Part of the JISAO CSES, OWSC serves as the Washington state coordinator for CoCoRaHS, a national **citizen science program** that engages members of the public in measuring and mapping precipitation (rain, hail and snow) around the country. Volunteers receive training on how to set up a rain gauge and the fundamentals of measuring precipitation. All data are available on the national CoCoRaHS Web site (www.cocorahs.org). Begun in June 2008, the Washington program has more than 400 volunteers and is actively recruiting additional volunteers and local coordinators.

The JISAO **Web site** includes information about research, education and outreach opportunities, an information portal with links to additional resources for teachers and links to publications and data. JISAO is launching a **Science in 180 video series** that will eventually be available on the Web site. These will be 180-second videos on topics related to JISAO’s research themes and programs. The videos will target middle-school pupils as well as adult audiences.

Resources Devoted to Outreach

JISAO dedicates at least \$40,000 annually to outreach, and many staff, faculty and students participate in outreach activities. In addition, JISAO contributes to other outreach programs. For example, JISAO contributes \$3,500 to NOAA Science Camp scholarships and \$1,000 to PCC for the annual graduate student climate conference.

Impetus for Outreach

One of the primary goals of JISAO is to offer educational and outreach activities to local and regional communities through K-12 programs, public outreach, media contacts and publications. JISAO outreach activities stem from the program mission and respond to requests from the communities it serves. JISAO’s outreach program exists in part to further NOAA’s environmental literacy goal.

Trends in Outreach

JISAO has experienced an increasing trend in requests for outreach activities and an increase in referrals, likely due in part to improvements in the Web site providing more information and encouraging contact.

Outreach Priorities

With additional resources, JISAO would develop collaborative educational projects with other NOAA Cooperative Institutes, UW units and community partners.

Climate Impacts Group

CIG is an interdisciplinary research group studying the impacts of natural climate variability and global climate change in the Pacific Northwest. Through research and interaction with regional stakeholders, CIG works to increase the resilience of the Pacific Northwest to fluctuations in climate. CIG is part of CSES at JISAO.

CIG includes two co-directors, an associate director, three administrative staff, an outreach specialist and more than 40 affiliated faculty, research scientists, graduate students, consultants and other staff. CIG research and outreach efforts focus on climate impacts of four diverse yet interconnected natural systems of the Pacific Northwest—water, forests, salmon and coasts—and the human socioeconomic and/or political systems associated with each.

Additional outreach activities of JISAO are discussed in a separate summary in this document.

Types of Outreach

1. **K-12 Education**
None.
2. **Informal Education**
None.
3. **Presentations or Talks to Non-Scientific Audiences**
More than 150 presentations annually.
4. **Technical Assistance and Training**
One-on-one technical guidance for resource managers and policy makers; data provided to local jurisdictions and others; several sector-specific workshops and conferences annually; participation in and organization of climate change training classes for resource managers.
5. **Policy-making and Management Support**
On a routine basis, scientific expertise and advice to governmental entities that are working to address the impacts of climate variability and change in their jurisdictions.

6. Communications

Reports and fact sheets translating climate-related scientific information for various audiences; quarterly electronic newsletter; e-mail via listserv, with regular program updates; “media room” on Web site, with information about CIG and CIG research; general resource for the media for topics related to climate, climate science and climate impacts.

7. Web-based Resources

Web site with basic information about Pacific Northwest climate, access to research information and results; forecasts and planning tools, publications, data and links to other resources.

8. Citizen Science

None.

Outreach Overview

A primary goal of CIG is to communicate scientific information, data and planning tools on climate variability and climate change to a variety of audiences. All outreach activities at CIG are targeted toward stakeholders—ranging from interested members of the general public to professional technicians, planners and managers. Primary outreach activities include:

- convening **meetings, workshops and conferences** to bring together scientific experts and stakeholders;
- providing **technical assistance, data, planning tools, scientific expertise and advice** to regional planners, decision makers and natural resource managers; and
- providing **presentations for a variety of audiences**.

CIG typically holds **two to three meetings and workshops per year** to provide natural resource managers, policy makers and others with up-to-date information about the impacts of climate variability and climate change in the Pacific Northwest and to discuss policy options for preparing for and coping with these impacts. Recent meeting and workshop topics have included regional climate and water resource forecasts, scenarios of future climate change and climate impacts on Olympic Peninsula salmon. Fifty to 60 people usually attend these sector-specific meetings and workshops. CIG occasionally organizes larger events, such as the February 2009 Washington Climate Change Impacts Assessment Conference, attended by more than 600 people.

CIG researchers often **work directly with resource managers and policymakers** to assist with the use of **climate forecasts and planning tools**, participate in **planning studies** and answer general questions upon request. The program produces **reports, forecasts and planning tools** to assist planners and managers with planning and managing risk and opportunities from projected climate changes and impacts. Forecasts and planning tools include a comprehensive dataset of climate-change adjusted stream flows for more than 300 locations in the Columbia River basin, a coho

salmon survival forecast, climate change temperature and precipitation scenarios, a climate change adaptation case study database and a guidebook for local, regional and state planners for preparing for climate change.

CIG also participates in, and sometimes organizes, **climate change training classes** for resource managers. Recent examples include the U.S. Forest Service “Climate 101” series, U.S. Environmental Protection Agency Region X “Climate Change 101” brownbags and the Coastal Training Program/Washington Sea Grant (WSG) “Adapting to Climate Change” course.

CIG researchers and staff regularly give **presentations** on the implications of climate variability and climate change to policymakers, resource managers, researchers, students and others at federal, state and local levels. CIG typically gives more than 150 presentations annually. The program often gets more requests for presentations than it is able to satisfy. Presentation materials are also available on the CIG Web site for use by others.

In addition to these primary outreach activities, CIG’s weekly seminar series is open to the public and features speakers presenting on a variety of topics related to the scientific and social dimensions of climate variability, climate change, climate impacts assessment and adaptation to climate impacts. CIG also produces a quarterly **electronic newsletter** and provides regular **e-mail updates** via a listserv. It also provides information to local media on topics related to climate, climate science and climate impacts and maintains a “media room” on its Web site. The CIG Web site provides a portal to information about research and outreach activities. The Web site includes basic information about: Pacific Northwest climate; CIG research; forecasts, planning tools, data and publications; CIG outreach, classes and seminars, including an online form for presentation requests; and links to additional resources.

Resources Devoted to Outreach

CIG supports one full-time outreach specialist. The associate director also devotes a portion of her time to outreach activities. All CIG researchers are involved in outreach to some degree—providing technical assistance, consultation, presentations and participation in seminars, workshops and conferences.

Impetus for Outreach

Outreach and communication to stakeholders is a central part of CIG’s mission. CIG has developed close connections with public, private and tribal entities responsible for managing the region’s water, forest, fishery and coastal resources in order to ensure research results, information and products are useful in helping shape decisions in the Pacific Northwest. CIG outreach efforts seek to gain information from stakeholders to shape information and product development priorities and translate and deliver information to stakeholders on research results, forecast tools and region- and resource-specific information on global climate change.

Trends in Outreach

Beginning with the 1996-1998 El Niño events, awareness, interest and action on climate-related issues from the general public and within state and local agencies have steadily increased. This has resulted in increasing requests for outreach and information. In 2006-2008, CIG experienced a large spike in demand for public presentations, likely associated with increased publicity of climate change issues from the release of the film *An Inconvenient Truth*, the release of the Intergovernmental Panel on Climate Change (IPCC)'s Fourth Assessment Report and the awarding of the Nobel Peace Prize to Al Gore and the IPCC. In the past year, requests for technical assistance by state and local agencies have increased significantly.

Outreach Priorities

With additional resources, CIG outreach would focus on:

- developing the capacity for Webinars, podcasts and other online methods for sharing information on climate impacts with stakeholders;
- producing (and keeping current) a series of climate change “mini lectures” on Pacific Northwest climate variability and change that would be available for download from the CIG Web site;
- enhancing CIG’s new climate change adaptation case study database and library;
- obtaining technical support for maintaining and enhancing the CIG Web site to increase its value as an outreach tool, including development of more interactive features; and
- designing (and keeping current) a series of non-technical fact sheets and brochures on Pacific Northwest climate variability and change.

Program on Climate Change

PCC is an interdisciplinary program in climate science that integrates education, research and outreach activities on campus. Faculty and students from more than 10 graduate departments and four research institutes within UW are represented in the PCC. The core academic units are the School of Oceanography (Oceanography), ATMS and ESS. The four research institutes are the Quaternary Research Center, the Applied Physics Lab, JISAO (including CIG) and NOAA’s PMEL. The goals of the program are to: create a strong sense of community among faculty and students interested in climate change; develop new courses that focus on the issues of climate change; create an intellectual atmosphere (through seminars, research and special topic institutes) that establishes UW as a place where important questions about how interactions among climate, the natural world and human society are formulated and addressed; and to make the whole of the climate change effort at the

UW a powerful force in the training of future scientists and policy makers and in the understanding of the past, present and future climate.

Community outreach is an important component of PCC. It continually works to develop a coordinated outreach effort to broaden the community’s awareness of climate change, address community needs for speakers on topics related to climate change and educate the next generation of climate scientists in communication and outreach.

Types of Outreach

1. K-12 Education

Web site links to K-12 curricula, activities and opportunities for students to learn about climate change; graduate certificate capstone projects in communicating climate science.

2. Informal Education

Public events (such as Focus the Nation) and exhibits, sometimes in collaboration with other UW departments and outside partners, such as the Seattle Art Museum.

3. Presentations or Talks to Non-Scientific Audiences

Talks to nonscientific audiences through Speaker Outreach Program, with communication tools for speakers; annual public lecture series.

4. Technical Assistance and Training

Annual informal training event for UW faculty, students and staff interested in public outreach; apprentice opportunities for those inexperienced in public speaking; delivery of scientific information and sometimes technical assistance for local agencies through graduate certificate capstone projects.

5. Policy-making and Management Support

None.

6. Communications

Newsletter; posters; media advertising of public lectures.

7. Web-based Resources

Web site with information on outreach, calendar of upcoming climate change-related events, speaker request form and links to other organizations’ climate change-related outreach and education.

8. Citizen Science

None.

Outreach Overview

Through the PCC **Speaker Outreach Program**, initiated in 2006, trained graduate students are available for public presentations on climate change issues. PCC provides **resources for speakers**, including a slide library, hands-on activities, a communications portal to other speakers and links to other informative Web sites. To date, it has responded to requests for speakers from elementary schools, middle and high schools, community colleges, Rotary clubs, church groups and others. PCC also staffs booths at **fairs and conferences** and provides panelists for discussions (e.g., in association with screenings of the film *An Inconvenient Truth*).

PCC also has an **annual public lecture series**. 2010 will mark the series' ninth year. PCC also organizes the **Current Research in Climate Change Seminar**, which focuses on a different issue each fall.

At the K-12 level, the PCC Web site provides links to **climate change-related curricula** offered by organizations like Facing the Future and the Climate Literacy Network, as well as activities and opportunities such as the UW's Climate Quest summer camp and the Puget Sound Clean Air Agency's Cool School Challenge. The graduate student capstone projects sometimes involve development and application of **K-12 curricula**.

PCC partners with other organizations to put on **events and exhibits** aimed at furthering public knowledge and increasing awareness of climate change. For example, in October 2009, PCC partnered with the Seattle Art Museum's Olympic Sculpture Park to create an exhibit on sea level rise and the Seattle shoreline. PCC publishes a **quarterly newsletter**, *Climate Change News*, which is available on its Web site.

PCC is one of a few programs that actively works to build outreach capacity. The program hosts an **annual outreach open house** that addresses different outreach needs. In 2008, PCC faculty gathered informally with the climate outreach group and other groups engaged in related physical science outreach to discuss the value of outreach in their careers. The open house provides a valuable opportunity for outreach participants. The PCC **Graduate Certificate in Climate Science** (GCeCS) maintains a central focus on interdisciplinary training in climate science as well as outreach. The GCeCS includes a **seminar course in communicating climate science** and culminates with a **capstone project in communicating climate science** for a variety of audiences. Capstone projects have included the development of curriculum for a carbon-masters science module and the creation of a local climate impacts booklet for Mount Rainier. In addition, PCC is currently developing a program that includes a workshop for graduate students to communicate and translate NASA-funded science to educators and to enable teachers to deliver climate curriculum in high schools as part of UW in the High School program. There are also **apprentice opportunities** for those inexperienced in public speaking.

The PCC **Web site** provides information on outreach efforts, a calendar of **climate change-related events**, links to other climate change-related organizations and pertinent information and news items. **Requests for speakers** on climate change can be made online.

Resources Devoted to Outreach

No portion of the PCC budget is presently allocated specifically to outreach activities. UW students, faculty and staff who are affiliated with PCC volunteer their time to respond to requests for speakers and participate in other forms of outreach. PCC works to ensure that speakers are reimbursed for their travel expenses. The PCC program manager coordinates outreach activities.

PCC also supports the efforts of a faculty advisor for the certificate program. The advisor coordinates the PCC seminar in communicating climate science and advises students on their capstone projects.

Impetus for Outreach

The PCC Speaker Outreach Program was developed when CIG was overwhelmed with requests for general climate change presentations (described in this document's CIG summary). The public information specialist for CIG and OWSC teamed with other staff to train graduate students to give basic climate change presentations. Other aspects of PCC outreach are integral to the program's goal of creating an intellectual atmosphere (through seminars, research and special-topic institutes) that establishes the UW as a forum for climate-related thought. PCC outreach efforts continue to be driven by demand from school groups and the public.

Trends in Outreach

The nature of presentation requests received by PCC has changed in recent years. The huge amount of public interest and corresponding demand for climate-change presentations that was observed in 2007 has waned somewhat. In 2008 and 2009, the trend shifted to more targeted requests from government entities seeking specific information to begin addressing climate change in their jurisdictions.

Outreach Priorities

Generally, PCC seeks to integrate outreach and climate science communication into graduate student education and to provide a venue for addressing National Science Foundation (NSF) and other agencies' interests in broader impacts.

Specifically, PCC would like to be able to pursue the development of targeted programs, such as the newly funded program to connect UW research with high school classrooms, and provide one academic quarter of funding for graduate students to focus on capstone projects. It would also like to update and expand its suite of teaching and speaking materials (PowerPoint presentations/slides, hands-on learning activities, etc.) for diverse audiences.

Program on the Environment

Launched in 1997, the Program on the Environment (PoE) is one of the UW's largest interdisciplinary academic programs. PoE offers a Bachelor of Arts degree in Environmental Studies, a minor in Environmental Studies and a graduate certificate program. As of 2008, PoE had 225 undergraduate majors and 55 minors in Environmental Studies.

PoE consists of a faculty director, associate director, undergraduate program coordinator, undergraduate advisor, graduate program coordinator, program operations assistant, teaching postdoctoral fellows and a capstone coordinator. As an interdisciplinary program without a faculty of its own, PoE partners with faculty and units across all three UW campuses to serve as the focal point for information on environmental education opportunities at the UW.

Types of Outreach

1. **K-12 Education**
None.
2. **Informal Education**
None.
3. **Presentations or Talks to Non-Scientific Audience**
Public presentations; symposia, seminar series and other events, such as the Coffee Lecture Series; occasional presentations by undergraduate capstone students to community partners.
4. **Technical Assistance and Training**
None.
5. **Policy-making and Management Support**
Advice, recommendations, and/or consultation for local decision-makers and other community partners through keystone projects by graduate students.
6. **Communications**
Weekly e-mails to listserv, with a digest of environmental news and events.
7. **Web-based Resources**
Web site with program information and calendar of environment-related events, currently maintained by CoEnv.
8. **Citizen Science**
None.

Outreach Overview

Since 1997, PoE has been the central gathering point for environmental education and issues at the UW. PoE organizes **symposia, seminar series and other events** that are open to the public. Public lectures often feature internationally acclaimed guest speakers. In spring 2009, the *Coffee: From the Grounds Up* lecture series featured presentations and panel discussions on the history of coffee and human communities, the ecology and environmental impacts of coffee and related topics. PoE events bring together experts, students and the public and provide a forum for networking and formal and informal exchanges of information on important environmental topics.

PoE graduate keystone projects often involve **work with outside community partners on policy issues** pertaining to current regionally significant environmental issues. Recent keystone projects have included developing guidelines for the ports of Seattle and Tacoma on short-haul trucking in the Puget Sound region and helping the City of Bellevue create a plan to meet its target for greenhouse gas emissions by 2015. In addition, undergraduate capstone students often work with community partners through internships, research projects and service-learning projects and give **presentations** on their experiences.

PoE developed an **online calendar** with environmentally related events on and off campus that is now maintained by CoEnv. The PoE Web site includes program information and a link to the online calendar of events. The program also sends out a **weekly digest** of information to its listserv.

PoE occasionally partners with other programs on additional outreach activities. It has worked with Upward Bound, a program for disadvantaged junior-high and high-school students, but does not currently engage in K-12 outreach activities.

Resources Devoted to Outreach

PoE has a part-time director and six staff. One of the support staff positions is responsible for event planning, outreach and communications. The director, additional staff and affiliated faculty and students all participate in outreach activities.

Impetus for Outreach

Outreach is one of the core components of PoE.

Trends in Outreach

PoE has grown significantly in the 10 years since its inception. Outreach activities have increased as the program has grown.

Outreach Priorities

With additional resources, PoE would like to endow and expand the graduate keystone project model.

Forests

School of Forest Resources

The College of Forest Resources was established in 1907 as one of the first natural resource programs in the country. On July 1, 2009, it became the School of Forest Resources (SFR) within the new CoEnv. SFR is dedicated to generating and disseminating knowledge for the stewardship of natural and managed environments and the sustainable use of products and services through teaching, research and outreach. Forty-eight teaching faculty, three research faculty, more than 100 staff and more than 300 undergraduate and graduate students focus on the integrating theme of sustainability in natural and managed environments, which include wilderness and park-like ecosystems, intensively managed planted forests and urban landscapes. The SFR vision is to provide world-class, internationally recognized knowledge and leadership for environmental and natural resource issues.

SFR outreach and technical transfer programs provide knowledge and training focusing on international trade in forest products, precision forestry, regional natural resources, urban ecosystems and environmental horticulture. Outreach summaries for 13 centers and programs in SFR are included in this document.

Center for International Trade in Forest Products

The Center for International Trade in Forest Products (CINTRAFOR) is one of three applied research centers in SFR. The Washington State Legislature established CINTRAFOR in 1984 to provide marketing and economic assistance to the forest products industry in the state. The mission of CINTRAFOR, as set by the Legislature, is three-fold: to collect and distribute information on rapidly changing foreign markets, including consumption trends, distribution channels, trading systems, codes/standards and the regulatory environment; to apply research findings to technical, environmental, economic, social and resource management problems that impede exports of specific products; and to train forest products professionals by providing funding for graduate-level research on the international trade of forest products.

Types of Outreach

1. K-12 Education

None.

2. Informal Education

None.

3. Presentations or Talks to Non-Scientific Audiences

Public presentations upon request.

4. Technical Assistance and Training

Marketing assistance for Intertribal Timber Council; workshops and conferences; international marketing training; referrals and consultations upon request.

5. Policy-making and Management Support

Testimony to committees, including those of the State Legislature; trade mission sponsorships.

6. Communications

Quarterly newsletter distributed to more than 6,000 companies; communication with media upon request.

7. Web-based Resources

Web site with information about research, education, and outreach opportunities, plus links to publications.

8. Citizen Science

None.

Outreach Overview

CINTRAFOR was created to conduct research, education and outreach to provide timely information and assistance to the forest products industry in Washington. To serve this audience, CINTRAFOR engages in the following outreach activities:

- provides **marketing assistance**;
- convenes and participates in **workshops and conferences**;
- provides **referrals, consultation and advice** upon request; and
- publishes a **quarterly newsletter, working papers and fact sheets**.

Research at CINTRAFOR focuses on forest economics and policy impacts, international marketing, technology developments, green building programs and value-added forest products. Results are used to provide marketing and other assistance to the forest products industry. CINTRAFOR provides **marketing assistance** for the Intertribal Timber Council and small and medium-sized enterprises, including manufacturers, consolidators, exporters and industry associations. It is currently working with the Intertribal Timber Council to develop a **tribal brand** for forest products and conduct a survey of all tribal sawmills.

CINTRAFOR sponsors **workshops and conferences**, including the **International Forest Products Marketing Conference** and **International Conference on Housing and Building Materials Exports**. Through these events, it brings together highly knowledgeable government specialists, business practitioners, industry association experts and academic research to provide insight on the latest developments, trends and predictions. **International marketing training** with the Warm Springs Tribe in Oregon on international markets for Douglas-fir and working in the Japanese market has resulted in the creation of 80 new jobs to date.

CINTRAFOR staff provides **testimony** to the Washington State Legislature, **meets with state and federal legislators** annually and serves on the board of groups such as the Softwood Export Council and the Evergreen Building Products Association. CINTRAFOR also provides **scientific and policy expertise** to industry groups and state and federal legislators and their staffs upon request. It serves as a primary point of contact for **referrals and consultations** for the industry. For example, someone from the industry may call to find out how to export logs to China, where to find Alaska yellow cedar or whom to talk to about a specific forest products issue.

In addition, CINTRAFOR is currently participating in **international collaborations** to build marketing and trade research capacity in Ghana, the Philippines, Vietnam, China and Japan. It also sponsors **international trade missions** to China and Japan. CINTRAFOR is working with the Sustainable Forestry Initiative to actively **promote green building** and expand the initiative internationally.

All research results are published in **working papers** available for purchase. CINTRAFOR also publishes a **quarterly newsletter** that is distributed electronically to more than 6,000 companies and is available on its Web site. **Fact sheets** on topics such as materials use in the United States deck market, structural panel use in residential construction in 2005 and 2008 and opportunities for United States building materials markets in China are available for download from the CINTRAFOR Web site.

In addition to these primary outreach activities, CINTRAFOR presents talks for non-industry audiences upon request, responds to media requests and is currently in the process of updating its Web site.

Resources Devoted to Outreach

CINTRAFOR is supported by federal funding (40%), state funding (20%), funding from industry (5-10%), and competitive grants (30-35%). Funding is dedicated to annual outreach events such as the International Forest Products Marketing Conference and the International Conference on Housing and Building Materials Exports. Current grant funding includes support for a small trade show. CINTRAFOR funding also supports the publication of fact sheets, reports and newsletters.

Impetus for Outreach

Outreach to the forestry industry is a central part of the Legislative mandate for CINTRAFOR. All research is required to be applied, and CINTRAFOR is supposed to be generating information for use by the industry. Outreach activities have resulted in direct benefits for the industry. For example, \$45 million in export orders were a direct result of CINTRAFOR-managed U.S.-China Build trade missions to China.

Trends in Outreach

Activities at CINTRAFOR have shifted toward direct outreach to industry over the past few decades. Outreach activities, including additional outreach to Washington tribes, have increased.

Outreach Priorities

With additional resources, CINTRAFOR would like to add another faculty member, postdoctoral research associate or additional graduate students. It would also like to expand research on emerging topics such as green building programs and certified wood chain-of-custody issues.

Center for Sustainable Forestry at Pack Forest

The Center for Sustainable Forestry at Pack Forest (CSF-PF) was established as a center in SFR in 2004 in the Charles L. Pack Experimental Forest at the foot of Mount Rainier near Eatonville. The experimental forest property, with 4,300 acres of working forestland, has belonged to SFR for more than 70 years. The Center was established to discover, teach and demonstrate the concepts of sustainable forestry, with a special focus on advancing the strategic themes of SFR including: watershed and community development; forestry extension, with a focus on sustainability; forest certification services; landscape management system; public participation in resource management; and forestry forums.

The CSF-PF location has 56,000 square feet of buildings that include a forestry camp, conference center and headquarters for Pack Forest operations. CSF-PF works closely with both the conference center and forest operations. CSF-PF programs in the fields of natural resource management and environmental science involve research, continuing education and outreach, demonstration and service. The vision of CSF-PF is to provide internationally recognized leadership for sustainable forestland management through research, demonstration and technology transfer.

Types of Outreach

- 1. K-12 Education**
Field trip site for K-12 classes; pre-trip and on-site activities for K-12 students.
- 2. Informal Education**
Interpretive program including self-guided trails, displays and naturalist-led walks; tours of Pack Forest.
- 3. Presentations or Talks to Non-Scientific Audiences**
Presentations to groups, including the Washington Native Plant Society and greater Eatonville community, upon request.



4. Technical Assistance and Training

Demonstrations of forestry operations, including regeneration, forest certification, methods of competitive control, effects of spacing on growth, biosolids issues, etc.

5. Policy-making and Management Support

Scientific and policy expertise for the Nisqually River Basin Council, Washington State Parks and Recreation Commission and other groups.

6. Communications

Newsletter; special papers; fact sheets.

7. Web-based Resources

Web site with information on research, forestry operations, education and public-use opportunities and upcoming events, plus links to publications.

8. Citizen Science

None.

Outreach Overview

Outreach activities at CSF-PF are targeted for K-12 students, the public and the forest operations industry. It offers a **field trip location** for local K-12 schools. CSF-PF provides **curriculum** on forest ecology (*Where the River Meets the Forest*) for elementary and middle school pupils, including **pre-trip and on-site activities**. On-site activities include a Hugo Peak scavenger hunt.

The **interpretive program** at Pack Forest serves the K-12 audience and the public, providing information about forest ecology, forest management and new ideas and directions in forestry. Pack Forest is open to the public for **hiking, biking, horseback riding and hunting** (during hunting season). The site includes **self-guided trails, displays and interpretive signage**. CSF-PF also offers **naturalist-led group programs** of varying lengths and degrees of difficulty, including an introductory program on what is in a forest, a tour through various stages of the forest lifecycle, a hike up Hugo Peak and a specialized program exploring the Pack Forest demonstration forest areas. More than 800 people participated in tours in 2008, including school groups, international visitors from Korea and Japan and elected officials.

In working to advance the concepts and practice of sustainable forestry, CSF-PF maintains **demonstrations** to link research findings to the everyday world of forest operations. Pack Forest is open for **tours** for forest industry groups. CSF-PF staff provides **technical assistance and scientific and policy expertise** upon request. Center staff is actively involved with many forestry-related groups, including the Nisqually River Basin Council, Pierce County Noxious Weeds Control Board, Nisqually Land Trust Advisory Committee and the Sustainable Forestry Initiative for Washington. CSF-PF is currently working with the Washington State Parks and Recreation Commission to create Forest Health Plans for

five of Washington's state parks and with Mount Rainier National Park to establish the Mount Rainier Institute, which would include an outdoor education center.

In addition to these primary outreach activities, the CSF-PF Web site includes information on research, forestry operations, education and public use opportunities, educational materials, a trail map, upcoming events and links to publications.

Resources Devoted to Outreach

CSF-PF includes a director and 10 staff members. The director and part-time interpretive education coordinator conduct the majority of outreach activities. The interpretive education coordinator focuses on K-12 outreach. With the appointment of a UW faculty member as director in 2006, the availability of scientific and policy expertise outreach at CSF-PF has expanded. The current director devotes at least 10 percent of his time to these sorts of outreach activities.

In addition, Pack Forest is open for the public to hike, bike, horseback ride, stroll or roll along a barrier-free, self-guided trail and to hunt during hunting seasons.

Impetus for Outreach

Outreach is central to the mission of CSF-PF and continues to be an important part of the Pack Forest mission, defined more than 80 years ago. Outreach efforts have been both proactive in developing new programs and materials and reactive in responding to requests from K-12 schools and the community.

Trends in Outreach

Outreach at Pack Forest was well established prior to the creation of CSF-PF. For decades, the experimental forest site has included the conference center, classrooms and dormitories. Research and education opportunities for UW and K-12 students, K-12 teachers, community groups and the general public have been ongoing, with specific investment in educational outreach and interpretive programs beginning in the 1990s.

Pack Forest once contributed significantly to the annual UW Arbor Day celebration, providing a major outreach opportunity for children. With no dedicated budget from UW, however, CSF-PF decided that it was a contradiction to sell timber to fund this event; thus the UW no longer offers the Arbor Day event.

Outreach Priorities

With additional resources, CSF-PF would hire a full-time outreach program coordinator. This would enable CSF-PF to expand outreach activities (including curriculum development) and increase engagement with groups such as the Washington Master Naturalist Program and Mount Rainier Institute. In addition, CSF-PF would like to be the future home of the Nisqually Interpretive Center.

The NatureMapping Program

Nationally, the *NatureMapping* Program (*NatureMapping*) works to promote citizen science and biodiversity conservation by involving communities in the collection of biodiversity data in their area. The vision of *NatureMapping* is to engage citizens of all ages in conducting meaningful science for the benefit of their local communities and biodiversity. The mission of *NatureMapping* is threefold: to have a state and national biodiversity database created by the public for all to use; to engage informal science education organizations that qualify as *NatureMapping* Learning Centers to provide training and support to citizens and to have scientists working together on local research projects; and to train NatureMappers to apply their research data to local conservation efforts.

NatureMapping was initiated in Washington state in 1992 when the Washington Department of Fish and Wildlife (WDFW) and UW's Cooperative Fish and Wildlife Research Unit began a pilot project to engage the public in collecting data for a statewide biological database. This effort recognized that there was need for data on common species, that landscapes were changing rapidly and that there were not enough professionals available to collect biodiversity data. To address these issues, *NatureMapping* was conceived with the goal of using public data to assess maps of the predicted range of vertebrate species.

NatureMapping has five areas of focus: National Public Database, with interactive mapping and data query capabilities; K-12 Literate about Biodiversity Program, with workshops, curricula and online resources; Network of Centers Program that recruits informal education organizations as certified *NatureMapping* Centers to provide workshops, materials, field projects, bioblitzes and support to their local communities; the County Biodiversity Network Project that develops biodiversity networks to meet state requirements for Comprehensive Plans, Open Space and Growth Management for fish and wildlife; and the Biodiversity Inventory Project, a statewide inventory and monitoring project in partnership with WDFW and DNR to address the State Wildlife Action Plan, using schools and Centers for data collection.

Types of Outreach

1. K-12 Education

Curriculum development; data collection software on handheld global positioning system (GPS) devices for use in K-12 classrooms; teacher training.

2. Informal Education

Training workshops, monitoring projects and community support through partner *NatureMapping* Centers.

3. **Presentations or Talks to Non-Scientific Audiences**
NatureMapping Centers host talks and presentations; presentations to specific audiences upon request.

4. **Technical Assistance and Training**
None.

5. **Policy-making and Management Support**
Species reports and other information and advice for city and county planners and natural resource managers.

6. **Communications**
Program background documents; special reports, including species, project and bioblitz reports; program stories in local and national media; one of four programs highlighted by the George Lucas Education Foundation's Edutopia Web site.

7. **Web-based Resources**
Web site with information and education materials for *NatureMapping* participants and K-12 educators; online data entry for wildlife, nearshore, plants, invertebrates and water quality; interactive GIS mapping and querying; animal fact sheets; and links to projects and *NatureMapping* Centers around the country.

8. **Citizen Science**
Ongoing biodiversity data collection by *NatureMapping* participants; student and public training in data collection and monitoring, use of NatureTracker data collection and mapping software, GPS and geographic information systems (GIS); *NatureMapping* is the designated citizen science education program for all state fish and wildlife agencies through the American Association of Fish and Wildlife Agencies.

Outreach Overview

The backbone of *NatureMapping* has always been **citizen science**—training members of the public to collect, monitor and input data. **Wildlife monitoring** is the primary focus of *NatureMapping* citizen science efforts. Volunteers monitor wildlife in their areas by making observations of their backyards or neighborhoods, stations established in the community (e.g., a local school) or summer or holiday destinations.

NatureMapping and its partners have developed **biodiversity modules** that include protocols and the tools to learn various observational, data-collecting and interpretive skill sets. They also provide information about the complexities of biodiversity and the wildlife, habitats and water quality conditions in different regions of Washington. Modules are available for **wildlife, water and nearshore biodiversity**. The wildlife module is used nationally.

NatureMapping uses the modules to provide training workshops and projects for **K-12 teachers and community groups**, primarily through *NatureMapping*

Centers. *NatureMapping* Centers are informal education organizations whose missions align with *NatureMapping*, such as nature centers, zoos and aquariums, state and national parks and county extension offices. The centers serve as hubs for the program's outreach activities, enabling communities and schools to interact with state and federal fish and wildlife biologists. The program has developed complementary **K-12 curricula** for use by teachers and their students. Once trained by the program, the centers and teachers provide opportunities for volunteers and students to engage in a variety of citizen science efforts, from simple monitoring to more complex projects involving various technologies.

NatureMapping has developed several **school/community field research projects**, which engage both K-12 students and the broader community. For example, **Project CAT** (Cougar and Teaching) trains pre- and in-service teachers throughout the Cle Elum/Roslyn School District to integrate K-12 students and the community in an eight-year research study to better understand the dynamics of human-cougar interactions. **Literate About Biodiversity** is a five-year project with the Waterville School District, area farmers and conservation districts to develop a baseline biodiversity inventory of the Waterville Plateau. Literate About Biodiversity has now become the name of the K-12 program based on the same progressive skill sets developed in Waterville.

NatureMapping regularly **provides advice to local planners and elected officials**. Recently, the program worked with several counties in Washington to develop **County Biodiversity Networks** and comprehensive plans for maintaining these biodiversity networks by working with private landowners and other community members. *NatureMapping* has been featured in local and national print media. More than 380,000 people from 9,770 cities around the world visited the *NatureMapping* Web site during 2008. The Web site provides extensive information and resources for *NatureMapping* participants, including access to Wildlife Distribution Maps for Washington and California. Information for teachers on complementary curriculum resources is also available. The Web site received 5.1 million hits in 2009 and is experiencing 25 percent annual growth.

Resources Devoted to Outreach

NatureMapping has a budget from the UW of \$100,000 for the 2009-2010 academic year. Funded staff positions include one part-time staff member for Web site maintenance and a continuing education coordinator/national director. The program receives approximately \$300,000 in annual in-kind support from the centers, WDFW (which also provides \$5,000 in annual travel funds) and Pacific Education Institute.

Impetus for Outreach

Because of *NatureMapping's* vision of environmental stewardship through school, community, agencies and business partners, outreach has always been an integral part of the program.

Trends in Outreach

NatureMapping has grown from 10 teachers and four farmers in 1992 to *NatureMapping* Centers and state programs across the country, engaging communities and developing many valuable projects. There is increasing interest from organizations that could be certified as *NatureMapping* Centers, from state fish and wildlife agencies that want to begin the program and from teachers across the country who have viewed the *NatureMapping* curriculum on the Edutopia Web site. Despite this level of interest, the outreach component of the program has slowed significantly because of diminishing budgets for the program and its associated centers.

Outreach Priorities

The primary program priority is to secure funding to increase UW staff to handle the increasing demand for the program's areas of focus. A secondary priority is to integrate the multiple data collection software projects under way (e.g., NatureTracker's desktop version and android phones) and the work of UW Computer Sciences through a grant to develop an annotated belief-system database for *NatureMapping*. The third priority is to provide more support to *NatureMapping* Centers, through semi-annual retreats or webinars, for their work in local communities via training workshops and field research projects.

Northwest Environmental Forum

The Northwest Environmental Forum (NWEF) was created in 2003 to expand UW's ability to apply science and technology research to natural resource and environmental policy issues. Commencing in 2004, NWEF has convened at least annual one-to-two day forums on forest issues in Washington state. In response to a request from the Washington State Legislature, the first three forums addressed the state and economics of the forest industries, resulting in *The Future of Washington's Forests and Forest Industries* report in 2007. The 2007 Legislature then commissioned another set of studies on losses of forestland to urban development and bio-energy from wood. In response, the 2007 and 2008 forums addressed a statewide strategy for working forest retention through incentives to forest landowners. One forum in 2009 addressed eastside forest health and climate change issues, and a second one followed from the 2008 forum, providing new recommendations to the Legislature for forest land incentives. The 2010 forum will continue efforts to determine how to generate and administer revenue for the payment of ecosystem services and how to increase landowners' willingness to maintain

their lands in forests or manage their properties to provide desired ecosystem services.

Types of Outreach

1. K-12 Education

None.

2. Informal Education

Forums as “Educational Observatories” of innovative policy-making, through interactions and dialogue among technical- and decision-focused people; networking opportunities for forum participants.

3. Presentations or Talks to Non-Scientific Audiences

Presentations to the public and the Legislature by forum participants.

4. Technical Assistance and Training

None.

5. Policy-making and Management Support

Forums that bring together a variety of experts to develop solutions to current natural resource issues; some recommendations to the Legislature, with a number enacted into law; local planners, forest owners, conservation groups and others informed by research reports, funded by the Legislature as a result of forum recommendations.

6. Communications

SFR research reports; forum reports; forums, forum topics, forum reports and research regularly receive coverage in various media outlets, including print, radio, television and online and are cited in major media outlets.

7. Web-based Resources

Web site with forum proceedings, streaming videos and research reports prepared for various forums.

8. Citizen Science

None.

Outreach Overview

NWEEF creates a dialogue that brings together scientific experts, research results and policy decision-makers to address challenging natural resource issues. Participation in forums is by invitation to those with a stake in the issues who are knowledgeable about the subjects at hand. Forums typically begin with panels of speakers to frame the issues for discussion. Subsequently, the majority of forum time is spent in breakout sessions to work through the issues. At the conclusion of each forum, participants determine their degrees of agreement on findings from the forum and decide on future actions to address those issues.

Through forum discussions and resulting forum reports, NWEEF provides **scientific and policy expertise and advice to decision makers**. The Washington State Legislature has taken the recommendations of forums very seriously and provided funding (more than \$1.9 million to date) to SFR for further research. The research, in turn, has informed subsequent forums.

Forums provide a venue for participants to **network** and gain a better understanding of the multiple perspectives on an issue. Forums have also provided opportunities for small forest owners, tribes and others who may feel marginalized by traditional policy processes to participate.

Forum participants often give **public presentations** on the issues. **Reports** on issues specific to forum topics are published and made available on the NWEEF Web site. There has been **media coverage** of forum topics.

Resources Devoted to Outreach

Two part-time staff members—the forum leader and forum logistics manager—run NWEEF. Annual forums are wholly funded by registration charges for participants. More than 40 organizations have contributed approximately \$250,000 to date to run the Forum. The forums are the primary outreach activity of NWEEF. There are no resources available for additional outreach activities.

Impetus for Outreach

NWEEF was created with the view that the UW should be a catalyst for science-focused dialogues about natural resources, with the goal to assemble the best science to help activate the dialogue. Its founders also recognized that the National Environmental Policy Act process is insufficient at engaging stakeholders and achieving long-term solutions to tough problems.

Trends in Outreach

Participation in NWEEF annual forums has ranged from 60 to 90 participants, depending on the subject. Nongovernmental organizations have been active in requesting and participating in forums since the beginning and provide a bridge between industry and traditional environmental organizations. Although all forum participation is by invitation, there has been an increase in participation by local land trusts, tribes and county planners.

Outreach Priorities

With additional resources, NWEEF would prioritize internal outreach within CoEnv to identify the new forum issues that bring into play the extensive capabilities of CoEnv. In addition, NWEEF would like to support ongoing work in SFR to develop a land parcel database for the entire state, including land type, landowner information and critical resource information. The completion and maintenance of this database would provide a valuable resource for CoEnv and inform future forum issues.

NWEEF was originally conceived to include a 6,000-square-foot physical space, providing neutral-ground opportunities for collaboration and dialogue that would include teaching and case-study research opportunities. Additional resources could allow NWEEF to fulfill this vision and increase engagement and outreach around a broader range of environmental topics.



Olympic Natural Resource Center

The Olympic Natural Resource Center (ONRC) is a center of SFR, located on the Olympic Peninsula in Forks, Wash. ONRC provides scientific information to address critical issues and solve problems concerning forestry and marine sciences in the region. The Washington State Legislature created ONRC in 1989, based on a recommendation by the Commission on Old Growth Alternatives for Washington's Forest Trust Lands. It was created to conduct research and education on natural resource management practices that integrate ecological and economic values with a focus on strategic priorities in a forestry program and a marine program.

ONRC consists of a center director and more than 10 staff members at the Conference Center and in the forestry and marine programs. A policy advisory board appointed by the governor advises on policies for ONRC.

Types of Outreach

1. K-12 Education

Annual Nature Day event for K-3 students; professional development for K-12 teachers.

2. Informal Education

Recreation amenities for the public, including nature trails and interpretive signs.

3. Presentations or Talks to Non-Scientific Audiences

Seminars and symposia for the general public.

4. Technical Assistance and Training

Continuing education for professionals; training for tribal technicians; technical support for local agencies and tribes, including GIS services, monitoring and planning and analysis work.

5. Policy-making and Management Support

Scientific and policy expertise for community groups, such as the Willapa Shellfish Growers and Olympic Forest Coalition; technical and policy information on climate change and other issues for international business leaders.

6. Communications

Bimonthly newsletter; frequent contact from the media.

7. Web-based Resources

Web site with information about Forestry and Marine Program research, education and outreach programs, the Conference Center and GIS services and products.

8. Citizen Science

None directly; worked with local Stream Keepers group to develop protocols for citizen science water monitoring.

Outreach Overview

Under directive from the Washington State Legislature, ONRC has had a significant focus on outreach and

service since it was established. Outreach activities at ONRC target three primary audiences:

- natural resource managers and natural resource-related community and industry groups;
- the K-12 community, including teachers and students; and
- the general public, particularly in natural resource-dependent communities on the Olympic Peninsula and Pacific Ocean coast of Washington.

ONRC provides continuing education opportunities for professionals through **conferences and workshops** on topics such as riparian management strategies. It provides **training for tribal technicians** on topics such as shellfish monitoring and protocol development. ONRC faculty and staff frequently provide **technical support** to local government agencies. For example, staff provides GIS services for the City of Forks, regularly performs planning and analysis work for the DNR regional office and provides technical mapping and monitoring services for the Willapa National Wildlife Refuge to assist with invasive *Spartina* cordgrass control efforts.

ONRC faculty and staff regularly provide **scientific and policy expertise** to community groups such as the Willapa Shellfish Growers, Olympia Forest Coalition and North Olympic Timber Action Committee. ONRC also receives requests for review of policy positions, peer reviews and technical reviews.

The primary outreach activity for K-12 students is ONRC's annual **Nature Day event**. This two-day event typically engages more than 300 K-3 students each year. ONRC also offers continuing education opportunities for K-12 teachers. It hosts one- to two-week seminars in math instruction for approximately 60 teachers each year.

Through an endowment for community education, ONRC provides **seminar series and symposia** for the general public. The ONRC campus includes **public nature trails with interpretive signs**. Other facilities, including computer teaching labs, are also available for community use.

In addition to these primary outreach activities, ONRC produces a **bimonthly newsletter** written for a general audience. It responds to requests from the media and maintains a Web site with information on the forestry and marine programs, education and outreach opportunities and access to GIS information and services. Many groups use the ONRC Conference Center frequently for meetings, conferences, workshops and other events. ONRC has also engaged in outreach with international student groups and business leaders. While it does not directly offer opportunities for citizen science engagement, ONRC has worked with the local Stream Keepers group to develop protocols for water quality monitoring.

Resources Devoted to Outreach

ONRC has an annual budget of approximately \$1.6 million, of which 40 percent comes from the state general fund. All ONRC research is applied research, intended to inform natural resource management. ONRC staff includes one full-time education and outreach director. Approximately half of all efforts at ONRC are focused on outreach and service activities. All ONRC staff members are encouraged to engage with the local community by participating in local groups and events.

Impetus for Outreach

ONRC was created by the Legislature with a specific outreach mandate to provide information on successfully integrating environmental and economic interests into the pragmatic management of forest and marine resources. ONRC research and outreach activities strive to recognize and be responsive to community issues. Activities are specifically intended to support the resource-dependent communities on the Olympic Peninsula and Pacific Ocean coast of Washington.

Trends in Outreach

ONRC has experienced a shift in topics of interest throughout the years. Ten years ago, the focus was on management of endangered species. Today, however, the focus is on climate change mitigation and energy independence.

Outreach Priorities

With additional resources, ONRC would focus on increasing capacity for policy analysis, specifically around energy policy in the state.

Precision Forestry Cooperative

The Precision Forestry Cooperative (PFC) was founded as part of the Washington State Advanced Technology Initiative and is funded by the Washington State Legislature. In collaboration with the College of Engineering, SFR created PFC to conduct pioneering research in forest production, management and manufacturing at a new scale of resolution and accuracy, with the goal of producing economic and environmental benefits to the forest industry. Cooperators include SFR, U.S. Forest Service's Pacific Northwest Research Station (PNW Research Station) and DNR. The mission of PFC is to develop advanced technologies to improve the quality and reliability of information needed for planning, implementation and monitoring of natural resource management, ensure sustainable forest management and increase the competitiveness of Washington's forest sector.

The work of PFC is guided and reviewed by an executive advisory board comprised of a diverse set of stakeholders in the public and private sector, including the Washington Farm Forestry Association, DNR, PNW Research Station, Weyerhaeuser Company, Hancock Forest Management's Northwest Division, Seattle Public Utilities, ImageTree

Corporation, Washington Forest Protection Association, Port Blakely Tree Farms, International Paper, Renlow Mapping Services, The Campbell Group and Terrapoint USA Inc. Advice from the board helps ensure success in creating sustainable economic and environmental benefits for the state.

Types of Outreach

- 1. K-12 Education**
None.
- 2. Informal Education**
None.
- 3. Presentations or Talks to Non-Scientific Audiences**
Workshop and symposium sponsorships.
- 4. Technical Assistance and Training**
Training and assistance in the use of technological tools provided by PFC.
- 5. Policy-making and Management Support**
Occasional legislative activities, mostly through DNR, Washington Farm Forestry Association, Washington Forest Protection Association and other entities.
- 6. Communications**
Fact sheets.
- 7. Web-based Resources**
Web site with program information.
- 8. Citizen Science**
None.

Outreach Overview

The primary outreach component of PFC is its **cooperative structure**. PFC faculty, staff and collaborators conduct extensive **technical training** for stakeholder groups throughout the region in the use of **measurement and monitoring tools** such as light detection and ranging, interferometric synthetic aperture radar, GPS, GIS and radio frequency identification tags on trees. PFC provides technical training in **decision-making tools** such as spatial optimization, multicriteria decision analysis and auction and game theory. It develops and provides training on **advanced operational planning tools** for activities such as road engineering and harvest system layout. PFC also conducts training on the use of **new technologies for non-destructive evaluation of wood properties** in standing trees and logs. The majority of outreach is to tribes, industry, agencies and other colleges.

PFC is occasionally involved in **legislative activities**, mostly through DNR and associations such as the Washington Farm Forestry Association and the Washington Forest Protection Association. PFC faculty, staff and collaborators provide **scientific and policy expertise and advice** upon request.

In addition, PFC often sponsors workshops, meetings and conferences, such as the Wood Quality and Forest Management workshop in Vancouver, Wash., in May

2008. The PFC **Web site** includes subject-specific fact sheets, video presentations, meeting presentations and information about upcoming events.

The scope of outreach at PFC has been expanded by its recent incorporation into an NSF Industry/University Cooperative Research program called the **Center for Advanced Forestry Systems (CAFS)**. CAFS brings the country's top forestry research programs together under a structured and supportive partnership. The mission of CAFS is to optimize genetic and cultural systems to produce high-quality raw forest materials for new and existing products by conducting collaborative research that transcends traditional species and disciplinary boundaries.

Resources Devoted to Outreach

PFC receives \$250,000 in state funding annually. This money funds two assistant professor positions and allows for the recruitment of some graduate students to the program. Industry does not provide funding to the PFC. Other PFC staff includes a faculty director and half-time administrative specialist. PFC faculty, staff, collaborators and students all participate in outreach activities.

Impetus for Outreach

PFC was founded as part of the Washington State Advanced Technology Initiative and is funded by the Washington State Legislature. The technical training and assistance it provides are part of PFC's mission, which is to use high technology sensing and analytic tools to support site-specific economic, environmental and sustainable decision making for the forestry sector.

Trends in Outreach

As the organizational structure of industry and agencies changes, and technical and scientific expertise with them diminishes, the expertise of PFC is becoming increasingly important. Agencies, industry, small private forest landowners and nongovernmental organizations rely on the tools developed at PFC to support the forest sector. The scope of outreach at PFC has recently been expanded through the cooperative's incorporation into CAFS.

Outreach Priorities

Current funding for PFC is insufficient to sustain current program priorities, including:

- investing in technological advancements in current areas of research and keeping pace with them;
- expanding into new areas of research;
- recruiting top students; and
- delivering additional outreach to stakeholders to meet increasing demands by forest sector stakeholders for training and information on advanced technologies.

PFC was funded at \$250,000 annually from the Washington State Legislature, starting in 1999. In contrast, most other Advanced Technology Initiative programs were funded at \$500,000 per year. The level of funding has not changed and was recently decreased by about 12 percent as part of mandated cuts associated with the current economic downturn. With additional funding, PFC would be able to remain current and expand its ability to transfer technology through traditional communications, workshops and newly trained students.

Restoration Ecology Network

The Restoration Ecology Network (UW-REN) is a tri-campus program (UW Seattle, Tacoma and Bothell) integrating student, faculty and community interests in ecological conservation and restoration across academic disciplines. UW-REN was established in 1999 and offers an undergraduate and graduate certificate in restoration ecology and a senior restoration capstone program. The program is affiliated with SFR and the Interdisciplinary Arts and Sciences programs at UW Bothell and UW Tacoma and overseen by a tri-campus steering committee of 10 faculty members.

Types of Outreach

1. K-12 Education

K-12 students engagement in local restoration projects.

2. Informal Education

Informal interaction with the public at restoration sites; restoration work parties.

3. Presentations or Talks to Non-Scientific Audiences

Capstone student presentations to city councils, planning commissions and others on their projects; faculty presentations for other audiences on occasion.

4. Technical Assistance and Training

Capstone students working with local jurisdictions to develop and complete restoration projects in various locations such as Saltwater Park in Shoreline, Cotton Hill Park in Kirkland and Terminal 105 at the Port of Seattle; training for community partners in state-of-the-art restoration approaches and techniques, monitoring and maintenance; training in local ecology, soils, erosion control, horticulture and planting, wildlife habitat features, tool use and safety for participants in restoration work parties.

5. Policy-making and Management Support

None.

6. Communications

Coverage in various media outlets, including newspapers in the Puget Sound region and the *Puget Sound Business Journal*; article about the program in *Science* education forum.

7. Web-based Resources

Web site with information for potential restoration clients and links to additional restoration resources; program featured on Web sites of some community partners.

8. Citizen Science

None directly; support citizen science through community partners (e.g., capstone students often develop monitoring plans for community partner data collection following project completion).

Outreach Overview

UW-REN matches **senior capstone** student groups with **community clients** to complete **ecological restoration projects**. Undergraduate and graduate students work with Seattle Parks and Recreation, local counties, tribes, ports and other community clients to design and implement restoration projects at community sites. More than 50 such restoration projects have been completed to date with 31 different community partners, including sites in five counties and three projects for private landowners. The majority of projects have been completed in city parks.

In addition to completing restoration projects in the community, UW-REN engages in a number of other outreach activities, including **K-12 and informal education** at restoration sites, **training in restoration techniques** and **presentations** to city councils, planning commissions, community groups and others.

When possible, UW-REN students engage local K-12 students as volunteers in restoration projects and encourage use of restoration sites for science and natural history classes. UW-REN students also engage in **informal education** with passersby at restoration sites. Some sites also include **interpretive signs** for visitors. Restoration projects include **training for community partners** in state-of-the-art restoration approaches and techniques, monitoring and site maintenance. Students develop **monitoring plans** for community partner data collection following project completion. Restoration work parties also include **training for participants** in all aspects of the restoration project including local ecology, soils, erosion control, horticulture and planting, wildlife habitat features, tool use and safety. UW-REN capstone students often make **presentations** about their projects to city councils, planning commissions and others. Faculty members provide presentations for community groups and other audiences on occasion.

The UW-REN Web site includes information for students and potential restoration clients, along with links to additional restoration resources. For developing this program, UW-REN co-directors received the John Rieger Award in 2004 from the Society for Ecological Restoration International. The program has also been featured on National Public Radio affiliate KPLU and in a paper in the Education Forum of *Science Magazine*.

Resources Devoted to Outreach

Although a Tools for Transformation grant from the UW Office of the Provost provided initial funding for the program, it is currently maintained as an academic certificate program with no additional funding for outreach activities. UW course fees are used to pay for plants and other restoration materials. In addition, many students apply for small grants to cover the cost of additional restoration supplies.

Impetus for Outreach

UW-REN was started in 1999 with a Tools for Transformation grant as a way to bring together all three UW campuses around ecological restoration issues. The community need for restoration outreach, particularly demonstrated by Seattle Parks and Recreation, provided the impetus for the creation of the program.

Trends in Outreach

The program has experienced an increase in interest about restoration. Annual client requests often exceed available student groups.

Outreach Priorities

With additional resources, UW-REN would like to support a restoration volunteer coordinator for UW campuses. UW-REN is also in discussions with UW Facilities Services about opportunities for restoration on UW grounds.

Rural Technology Initiative

The Rural Technology Initiative (RTI) was established in 2000 as a joint project of the UW College of Forest Resources (now SFR) and Washington State University Extension (WSU Extension) to accelerate the implementation of new technologies in rural forest resource-based communities. RTI was originally funded by a Congressional appropriation through U.S. Forest Service Cooperative Programs. RTI's focus is on technology transfer and modeling to shorten the lag time between new research findings and their implementation and to shrink the gap between urban and rural incomes. It is now primarily a UW program supported entirely on grant funding.

RTI staff includes a director, two silviculturalists, a wildlife scientist, two natural resource computer programmers, two GIS specialists and an information technology specialist. Program priorities are set annually by the Rural Advisory Board, which includes members representing industry groups, tribes, forestry consultants, trade groups, local jurisdictions, special-purpose districts and nonindustrial private forest owners.

Types of Outreach

1. K-12 Education

None.

2. Informal Education

None.

3. Presentations or Talks to Non-Scientific Audiences

Presentations at association meetings, conferences and symposia.

4. Technical Assistance and Training

Technical assistance and training for rural landowners; technology training workshops.

5. Policy-making and Management Support

Scientific and policy expertise to Washington State Legislature and others upon request.

6. Communications

Working papers; fact sheets; UW press releases.

7. Web-based Resources

Web site with project information, landscape management and other tools, GIS resources, streaming video of workshops and presentations, publications and information about training events.

8. Citizen Science

None.

Outreach Overview

RTI was established to provide resources, technical assistance and training for rural landowners in forest resource-based communities. While decreases in funding have limited program outreach capabilities, the initiative continues to engage in the following outreach activities:

- technical assistance for landowners;
- technology training workshops;
- development of GIS and other tools for use by landowners; and
- production of streaming video training and interpretive materials.

As originally established, initiative staff at the UW focused on the translation of science and development of tools and resources, and WSU Extension field agents provided information and technical assistance in the communities. Decreases in funding have reduced WSU Extension participation in the program, but UW staff continues to work with extension field agents whenever possible.

RTI offers two to three **workshops** per year in the use of **ArcGIS**, **landscape management system (LMS)**, and **GPS** as funding allows. Workshops are intended to help small landowners, tribal foresters, and others identify habitat and economic outcomes of management decisions. All RTI research results are published and widely available on the RTI Web site. RTI provides

GIS technology and resources for resource managers and landowners. RTI has supported the development of resources such as Pegger, a GIS-based automated preliminary road design tool for quickly evaluating road location alternatives, and LMS Analyst, an extension for Arcview GIS and the LMS that allows users to quickly calculate the slope, aspect and elevation parameters required for the model. RTI is also in the process of developing a **Washington state GIS dataset** for use by nonindustrial forest landowners and their consultants to assist in land management and planning. The dataset currently includes forest ownerships, townships and sections, hydrology, roads and elevation models.

To expand outreach capabilities, RTI has produced **streaming videos** of presentations and some training workshops, including the fundamental training and applications of the LMS version 3.1 workshops held in February 2009. These streaming videos are publicly available on the RTI Web site. The RTI Web site also includes information about RTI projects, links to LMS and GIS resources, fact sheets, publications, newsletter archives and information about training events.

RTI staff provides **scientific and policy expertise** to the Washington State Legislature, DNR, U.S. Forest Service, Bureau of Indian Affairs and others upon request. RTI periodically issues UW press releases on research and outreach activities.

Resources Devoted to Outreach

All research and activities at RTI are intended for application and outreach for resource problem solving. Specific tools, workshops, streaming videos and other activities are undertaken as current grant funding allows.

Impetus for Outreach

The mission of RTI is to empower the existing infrastructure to use better technologies in rural areas for managing forests for increased product and environmental values in support of local communities. The program was specifically developed to provide underserved communities of small landowners and tribes increased access to information and technology for land use management.

Trends in Outreach

Outreach at RTI has shifted with changes in funding. Original program funding was through earmark requests to Congress, but the program no longer receives reliable federal funding support. With decreasing funding, outreach activities have been scaled back. For example, the program once offered 15 to 20 workshops per year and now offers only two to three. In addition, RTI ceased publication of its quarterly newsletter. With current grant funding, RTI works primarily with tribes, state and federal agencies and a small number of private landowners. The focus of the program has shifted to include both rural and urban settings.

Outreach Priorities

Current funding has reduced the involvement of WSU Extension field agents in the program. With additional resources, RTI would like to increase the presence of the program in the field to be more in contact with rural communities and stakeholders and more successfully bridge the gap between academia and local communities.

Stand Management Cooperative

The Stand Management Cooperative (SMC) was founded in 1985 to provide a continuing source of high-quality information on the long-term effects of silvicultural treatments and treatment regimes on stand and tree growth and development and wood and product quality. SMC evolved from earlier cooperative initiatives, such as the Regional Forest Nutrition Research Program, and was targeted to industry needs and research interests. SMC is composed of forest industry, state, provincial and federal agencies, suppliers and universities who commit resources and expertise to the mission. A voting policy committee of dues-paying members sets priorities for SMC. Technical advisory committees composed of leading scientists in silviculture, nutrition, wood quality and modeling develop plans for research projects. The longevity of SMC makes it one of the best long-term field research suites of its kind. SMC is headquartered at SFR, which provides administration and staffing.

Types of Outreach

1. K-12 Education

None.

2. Informal Education

None.

3. Presentations or Talks to Non-Scientific Audiences

Workshop and symposium sponsorships.

4. Technical Assistance and Training

Database on 479 installations in British Columbia, Washington and Oregon and SMC-ORGANON and CONIFERS-PNW Variant models used extensively by the industry and agencies; tutorials on using the database, growth and yield models; ongoing technical assistance to the industry and agencies.

5. Policy-making and Management Support

Occasional legislative and agency activities, mostly through the British Columbia Ministry of Forests, Oregon Department of Forestry, DNR, Bureau of Land Management.

6. Communications

Fact sheets; quarterly newsletter; annual reports.

7. Web-based Resources

Web site with program information.

8. Citizen Science

None.

Outreach Overview

SMC is heavily engaged in outreach through its **cooperative** structure. It includes **members from academia, state and federal agencies and private industry**. The primary outreach products of SMC are the **SMC database** on 479 installations, primarily in Douglas-fir and western hemlock stands in British Columbia, Washington and Oregon, and **growth and yield models**. The installations included in the database contain 5,869 plots with a variety of treatments repeatedly measured on two- or four-year cycles. Altogether, this includes information on more than 277,000 trees and more than 1.5 million measurements. In addition, the database includes soil survey data, vegetation and habitat surveys and stem section information. The updated database is supplied to SMC members each year and is the principal resource for developing and upgrading widely used growth and yield models such as SMC-ORGANON and CONIFERS-PNW Variant. SMC has also been contracted to develop databases for red alder modeling, the national network of long-term site productivity studies and the Intermountain Nutrition Cooperative. The Oregon State University contingent of SMC has developed and maintains the SMC-ORGANON **growth and yield models**, and the USFS Pacific Southwest Research Station developed and maintains the CONIFERS-PNW Variant **young stand growth and yield model**.

SMC runs **tutorials** and leads **workshops** to train agency and industry members on using the database and growth and yield models. SMC faculty, staff and collaborators also provide ongoing **technical assistance** in the use of these resources.

SMC is occasionally involved in **legislative activities**, mostly through DNR. SMC faculty, staff and collaborators provide **scientific and policy expertise** and advice upon request.

SMC has two internal meetings per year for its members (typically 40 to 50 people in attendance), at which progress on its research projects is shared. It also co-sponsors various **workshops and symposia** to share its most recent research. SMC publishes a **quarterly newsletter** and **annual report**. It also produces **fact sheets** on topics such as “juvenile plantations” and the “crossover effect” and evaluating the growth response of a forest stand to fertilization in the absence of replication. The SMC **Web site** includes information on research, links to publications and a list of upcoming events.

The scope of outreach at SMC has been expanded by its recent incorporation into an NSF Industry/University Cooperative Research Program called **CAFS**. CAFS brings the country’s top forestry research programs together under a structured and supportive partnership. The mission of CAFS is to optimize genetic and cultural systems to produce high-quality raw forest materials for new and existing products by conducting collaborative research that transcends traditional species and disciplinary boundaries.

Resources Devoted to Outreach

Twenty land management organizations provide financial support to SMC. Historically, funding from members has varied between \$550,000 and \$600,000 per year. This funding provides support for field and database staff, partial summer salaries for the director and project leaders (faculty members) and a half-time program assistant. However, funding from members in 2010 declined 20 percent because of the current economic climate. It is expected that this will rebound as the economy recovers. Industry also provides SMC with research sites on their lands. SMC has also received seed funding for research and graduate-student involvement through the NSF CAFS grant and pursues additional external grants whenever possible.

Impetus for Outreach

SMC was developed in response to the recognition by the forest sector that the long-term future of the forest industry in the Pacific Northwest depends in part on the productivity of the region's forests and on the choice of silviculturally sound and cost-effective management regimes. Long-term, large-scale monitoring of stands was required to determine the most effective approaches to silviculture and stand management. A research project of this magnitude could only be accomplished through a cooperative effort of landowners, processors, research agencies and universities. SMC was formed to create the needed pool of funding, scientific talent and long-term continuity for achieving this mission.

Trends in Outreach

The structure of the forest industry and forest agencies has changed significantly since SMC's creation. Industries and agencies that were once large, vertically integrated entities with many scientists on staff now have more limited internal technical and scientific expertise. As a result, the agency and industry members of SMC rely more and more on the technical and scientific capacities of universities.

Outreach Priorities

With additional funding for outreach, SMC would increase investments in analyses and technology transfer in response to increasing demands from landowners and others for these services.

UW Botanic Gardens

The UW Botanic Gardens (UWBG) includes the Center for Urban Horticulture (CUH), the Union Bay Natural Area (UBNA) and the Washington Park Arboretum (WPA) plant collections. UWBG was established in 2005 as an administrative umbrella for the parts of these entities managed by the UW. All parts of UWBG are open to the public at no charge.

CUH was founded in 1983 and includes Merrill Hall (with lab, office and meeting space), the Elisabeth C.

Miller Library (Miller Library), the Otis Douglas Hyde Herbarium (Hyde Herbarium), demonstration gardens and greenhouses and nursery space used for UW research and available to the public for rental growing space. Formerly a landfill, UBNA is now a wildlife area and natural restoration laboratory with 74 acres, four miles of shoreline and several public access trails. More than 30 years of restoration have created a diverse system of meadows, woods and wetlands that are currently managed by UWBG to maintain and enhance plants, wildlife and landscape values while serving as an outdoor laboratory for research, teaching and public service. WPA was established in 1934 in an agreement between the UW and City of Seattle and is Washington's official State Arboretum. With its internationally recognized woody plant collections on 230 acres, it serves the public, students at all levels, naturalists, gardeners and nursery and landscape professionals with its collections, educational programs, interpretation and recreational opportunities.

The mission of UWBG is sustaining managed-to-natural ecosystems and the human spirit through plant research, display and education. Its vision is to be an international hub for plant science, information, teaching and stewardship that promotes an educated, inspired and engaged society dedicated to sustainable ecosystems.

The Washington Rare Plant Care and Conservation Program (Rare Care) is a research and outreach program of UWBG that is described in a separate summary in this document.

Types of Outreach

1. K-12 Education

Field trips; "Seedlings" preschool programs and "Saplings" school programs for K-8 students; "Spruce" school programs for high school students in development; a lending curriculum collection with guidelines and resources on plants and gardening for teachers and others working with children.

2. Informal Education

Tours of WPA, UWBG facilities, Hyde Herbarium and Miller Library; family events such as story times, guided weekend walks, an Azalea Way historical walking tour, Park in the Dark family program and Mother's Day at WPA; Youth Explorer Day Camp; K-6 Arboretum Summer Sleuths program; self-guided pack programs; work parties at UBNA; WPA and UBNA open for public recreation with interpretive signs; Miller Library services available to all Washington residents; informal education exhibits, including botanical art, plant photography and student research posters.

3. Presentations or Talks to Non-Scientific Audiences

Lecture series; book releases; Student Speakers Bureau for public presentations upon request; occasional public presentations by faculty and staff.

4. Technical Assistance and Training

Public classes for adults and professionals; symposia; Plant Answer Line, plant identification assistance and library reference services for the public; information, expertise and advice from faculty, staff and volunteers upon request.

5. Policy-making and Management Support

None.

6. Communications

Monthly *E-Flora* electronic newsletter; biannual conservation program newsletter (described in this document's Rare Care program summary); frequent faculty and staff contributions to the *Washington Park Arboretum Bulletin* and other Arboretum Foundation publications; frequent feature stories in local media about programs.

7. Web-based Resources

Web site with information on conservation and restoration research and activities, public and youth education programs, demonstration gardens, CUH, UBNA and WPA, plus trail maps and a calendar of upcoming events; Miller Library Web site with collections information, Plant Answer Line, Gardening Answers Knowledgebase and other self-help research tools; Hyde Herbarium Web site with information on collections and plant identification, and a plant database in development.

8. Citizen Science

Rare Care program is described in a separate summary in this document.

Outreach Overview

In support of its mission, UWBG engages in a number of outreach activities targeting K-12 students, adults, families, professional horticulturists and other groups. Primary outreach activities include:

- **public classes for adults;**
- **events and programs for families;**
- **preschool and K-12 school programs;**
- **tours and public recreation opportunities;**
- **public presentations;**
- **online and in-person assistance with gardening questions and plant identification;**
- **classes for professional horticulturists** and other related professionals; and
- **hosting community events, meetings** of other organizations with similar goals.

UWBG holds **classes for adults at CUH** on topics such as caring for mature gardens, practical and creative landscape designs, ornamental vines, plant propagation, plant identification, botanical illustration and watercolor and the links between horticulture and plant invasions. All classes are open to the public and have small registration fees.

There are events and programs for families at the Miller Library and WPA. **Story Time** presents book readings and activities that celebrate gardens, plants, and nature for children and their families at the Miller Library.

Park in the Dark, guided weekend walks, an Azalea Way historical walking tour and the **Mother's Day celebration** are some of the events at the Arboretum. WPA also offers two **self-guided pack programs**, which include backpacks for rent containing field guides, scavenger hunts, magnifying lenses and activities for children. WPA summer programs for children include **Youth Explorer Day Camp** and the **Summer Sleuths program**. The Youth Explorer Day Camp offers opportunities for discovering the world of plants, wetlands and more through art, science, games and creative writing. Summer Sleuths includes two-hour guided, hands-on programs on forests, wetlands and animals.

The UWBG **preschool and K-12 school programs** at WPA include the **Seedlings** preschool programs and **Saplings** and **Spruces** (under development) school programs. The Seedlings preschool programs include themes on trees and seasons and wetland wildlife. The Sapling school programs introduce pupils in grades K-8 to plant growth and development, wetland ecology and ethnobotany through a series of 90-minute interactive programs. Programs are aligned with Washington State Essential Academic Learning Requirements. Collectively, programs for youth at UWBG reach more than 8,000 students each year.

UBNA and WPA have **trails for walking, bird watching, picnicking and other forms of recreation**. There are **interpretive signs** providing informal education opportunities for visitors. **Tours** are available. CUH, Miller Library, Hyde Herbarium and demonstration gardens are also open to the public with tours available upon request. **Audio tours** of WPA and demonstration gardens at CUH are available online. **Virtual tours** of WPA are available through the VR Seattle Web site.

The **Student Speakers Bureau** was created at CUH in response to public requests for student presenters. Through this program, student researchers are available to present for groups and at events. UWBG also co-sponsors the **annual Elisabeth Carey Miller Memorial lecture** that is open to the public.

The Miller Library is the **largest horticultural library in the Pacific Northwest**, with 15,000 books, 400 periodical titles, clipping files, VHS and DVD programs and seed catalogs available to professionals and the public for research. A **curriculum collection** is designed to help teachers and other adults who work with children. The library hosts **exhibits** of botanical art and plant photography throughout the year and a student research review at the end of the academic year.

Accessible by phone, e-mail and an online form on the Web site, the Miller Library's **Plant Answer Line** is a quick reference service for gardeners. It is tailored to the needs of Pacific Northwest gardeners but also serves gardeners worldwide. The Hyde Herbarium provides free **plant identification** and assistance with plant keying. CUH faculty and staff also provide **scientific expertise** to a variety of audiences upon request.

Through the **ProHort program**, UWBG offers classes for horticulture professionals on topics such as pruning shrubs and the effects of soil amendments and biologicals on plant pathogens. The program also works in partnership with Seattle Public Utilities to offer specialized training to professionals on topics such as stormwater management.

In total, UWBG outreach classes, tours and programs reach more than 10,000 individuals annually, including professionals and members of the public. This does not include the 18,000 who visit the Miller Library each year, nor the very many who visit the gardens and natural areas. In addition to these outreach activities, UWBG publishes **E-Flora** (a monthly electronic newsletter), and the **Web site** includes information on conservation and restoration research and activities, public and youth education programs, demonstration gardens, UBNA, WPA and CUH, as well as a calendar of upcoming events, audio tours and trail maps. The Miller Library Web site includes collections information, the Plant Answer Line input form, the Gardening Answers Knowledgebase, tutorials on finding horticultural sources, a student research guide, recommended books and Web sites by subjects and a Pacific Northwest calendar of plant sales and garden tours. The Hyde Herbarium Web site includes information on collections and plant identification. An online plant database is also in development.

Resources Devoted to Outreach

Exclusive of research budgets, the UWBG annual budget is about \$1.6 million. The City of Seattle owns the WPA property and provides maintenance for the park infrastructure, lawns and the Graham Visitor Center. The Arboretum Foundation, the major support group for the WPA, provides about \$200,000 in funding for the education and arborists programs. It also raises capital funds for the WPA Master Plan project. Total capital money raised over the last three years is about \$2.6 million.

Recent state budget cuts resulted in the elimination of the education and outreach specialist position at UWBG. Other staff and faculty continue to engage in outreach activities. Volunteers in the Miller Library, Hyde Herbarium, Rare Care program and WPA

contribute significantly to UWBG. In 2008, more than 245 volunteers and an additional 11 volunteer groups contributed more than 12,000 hours.

Impetus for Outreach

For more than 25 years, UWBG has developed educational outreach programs and activities for children and adults based on community need. It has invested heavily in programs for children, given the lack of other programs with a similar focus. Investments in adult education opportunities have been less, given that the Northwest Horticultural Society and local nurseries offer many other opportunities for adults. The ProHort program was developed in response to the need for professional horticulture training. UWBG would like to conduct a needs assessment to help direct future outreach activities.

Trends in Outreach

UWBG has placed increased emphasis on social media and increased outreach to Seattle youth programs. Other trends include establishment of the Pacific Connections Gardens in WPA according to the Master Plan project schedule. UWBG intends to partner with other campus outreach programs in species preservation, encouragement of youth programs and education and in providing demonstration projects to the community.

Outreach Priorities

With additional resources, UWBG would like to hire a half-time events coordinator and increase its communications capacities to improve interpretive signage at CUH and WPA, develop printed materials, update and maintain the Web site and increase publicity and marketing.

UWBG would also like to expand partnerships with other programs on and off campus, such as UW Extension, UW College of Education, PoE, WSU Extension's Master Gardener program and the IslandWood educational facility on Bainbridge Island.

Washington Rare Plant Care and Conservation Program

Rare Care is a research and citizen science program of the UWBG. SFR Associate Professor Sarah Reichard founded Rare Care as a research program in 1998. The program expanded to include citizen science monitoring in 2001. Rare Care is dedicated to conserving Washington's native rare plants through off-site conservation, rare plant monitoring, research, reintroduction, education and other efforts.

Types of Outreach

1. K-12 Education

None.

2. Informal Education

Annual Celebrating Wildflowers event for children and their families.

3. Presentations or Talks to Non-Scientific Audiences

Presentations to the Native Plant Society, garden clubs and other groups.

4. Technical Assistance and Training

None.

5. Policy-making and Management Support

Contribution to listed species recovery teams; consultation for managers and decision-makers.

6. Communications

Biannual newsletter; annual monitoring reports; occasional media coverage of Rare Care's participation in listed species recovery programs; program description in local magazines, such as *Northwest Magazine*.

7. Web-based Resources

Web site with program information, volunteer information, a rare plant identification quiz, program newsletters and annual reports and links to additional resources.

8. Citizen Science

Data collection on rare plant populations by more than 100 volunteer monitors; seed gathering and cleaning from rare and sensitive plant species by about 20 volunteer seed collectors.

Outreach Overview

The **Rare Plant Monitoring and Rare Seed Collectors citizen science projects** are the largest outreach components of Rare Care. The Rare Plant Monitoring project started in 2001 in partnership with DNR's Natural Heritage Program. It trains volunteers to look for and identify rare plants around the state and collect data on known populations of them. Data include: estimates of population size; slope, aspect and soil type at each site; documentation of invasive species; and description of threats from human activities, such as off-road vehicle traffic and livestock grazing. Entered into the Natural Heritage Program's database and ultimately shared with NatureServe, these data provide valuable information for conservationists, researchers and other professional botanists and resource managers about rare plant populations in Washington. The Rare Seed Collectors project began in 2003 as a way to expand seed collecting for the Miller Seed Vault. In this project, volunteers are trained to collect and clean seeds for long-term storage. With a goal of collecting seeds of 300 to 350 plants identified as rare or sensitive by the Heritage Program of DNR, Rare Care's Seed Collectors have amassed seeds from 70 species thus far.

Rare Care conducts two or three volunteer training sessions each year. Volunteers must have taken at least one or more college-level science courses and have had some experience with, or coursework in, plant identification. More than 100 volunteers contribute approximately 5,000 hours to Rare Care projects each year.

Rare Care also organizes **Celebrating Wildflowers**, an **annual event with activities for kids and families**. Targeted at children three to 13 years old, this event was passed on to Rare Care from the U.S. Forest Service. Rare Care has partnered with the Woodland Park Zoo and, more recently, with the Seattle Art Museum to host this summer event to increase general interest in plants in the community. Celebrating Wildflowers includes games, wildflower viewing through microscopes, painting and drawing activities, flower pressing, guided botany walks and a storytelling performance.

In addition to these projects, Rare Care engages in other outreach activities and produces outreach products, including:

- **public presentations** about Rare Care projects to the Native Plant Society, local Garden Clubs and other groups;
- **scientific expertise** provided for recovery teams for listed species and to state and federal managers and decision-makers upon request;
- **biannual newsletter**;
- **annual reports**; and
- **Web site** with project information, volunteer information, a rare plant identification quiz, program newsletters and annual reports and links to additional resources.

Rare Care has been featured in the **media** with general program information and specific information relevant to work on recovery programs for listed species along U.S. Highway 2. The Rare Care program received the **2003 Conservation Project of the Year** award from the U.S. Forest Service and U.S. Bureau of Land Management for its leadership in conservation in Washington state.

Rare Care also participates in the U.S. Bureau of Land Management Seeds of Success program to preserve seeds of common species important for restoration. It also contributes to the Millennium Seed Vault at the Royal Botanic Gardens in London. On behalf of UWBG, Rare Care staff also participates in the Center for Plant Conservation, a network of botanical gardens working toward conservation of native plants.

Resources Devoted to Outreach

Rare Care is funded by grants and private donations, with some matching funds from SFR. The entire program budget in 2008-2009 was about \$120,000, of which 30-40 percent was spent on the citizen science components of the program. The Rare Care staff includes a program manager, volunteer coordinator and seasonal part-time Seeds of Success project manager. All Rare Care staff participates in additional outreach activities.

Impetus for Outreach

Although Rare Care began as a research program, founder Sarah Reichard identified the opportunity to



expand the program in 2001 to include outreach and citizen science based on knowledge of a similar program developed at the New England Wild Flower Society in the 1990s. The Rare Plant Monitoring and Rare Plant Seed Collectors components of the program enable more data and seed collection than would be possible in a traditional research program. This expanded data and seed collection capacity is essential, given current budget cuts to state programs focusing on these issues (such as the Heritage and Natural Area Preserves programs of DNR).

Trends in Outreach

Interest in the program and participation in Rare Care citizen science projects have increased each year. More than 250 volunteers have been trained since 2001. Other outreach activities, such as public talks, have also increased.

Outreach Priorities

With additional resources, Rare Care would focus on technological improvements and Web site support. One priority is to develop a Web-based interface for volunteers with online data entry capabilities. In addition, the program would benefit from increased capacity for Web site maintenance and updating.

The Water Center

The Water Center was created in 2001 as a joint program of the College of Forest Resources (now SFR), the College of Engineering, the College of Ocean and Fishery Sciences and the Evans School of Public Affairs. It combined two long-standing centers focusing on water-related issues: the Center for Streamside Studies (established in 1987) and the Center for Urban Water Resources Management (established in 1991). The Water Center is composed of an advisory board of outside professionals, a director and a program manager, with more than 35 affiliated faculty and numerous graduate students from many UW departments. The mission of the Water Center is to produce scientific, peer-reviewed research that will address key issues, advance understanding, inform decisions and shape policies concerning water resources in the region and beyond.

Community outreach is a major component of Water Center activities. The Water Center strives to communicate scientific information to decision-makers and the public to improve understanding of water resources.

Types of Outreach

1. K-12 Education

None.

2. Informal Education

None.

3. Presentations or Talks to Non-Scientific Audiences

Weekly seminars open to the public.

4. Technical Assistance and Training

Half-day training courses on data management, stream restoration and other topics; additional training and technical assistance based on requests from Water Center Consortium members.

5. Policy-making and Management Support

None.

6. Communications

The Water Center brochure; fact sheets; weekly e-mail of water-related events sent to a large listserv; job announcements sent to listserv.

7. Web-based Resources

Web site with information on Water Center research, education and outreach, as well as publications and fact sheets.

8. Citizen Science

None.

Outreach Overview

The Water Center sponsors two primary outreach events: a **weekly Water Seminar Series** (also offered as a one-credit UW course) and an **Annual Review of Research conference**, held each February. Both events are free of charge and open to the public. Weekly seminars regularly attract off-campus visitors, including consultants and agency and nonprofit staff. Slide presentations and audio recordings of the seminar presentations are posted on the Water Center Web site. The daylong Water Center Annual Review of Research features 20-minute presentations by UW professors and students describing their new water-related research, with emphasis on the Puget Sound region. Slide presentations and audio-recorded presentations from the annual review are also made available on the Water Center Web site. Attendance at the annual conference is typically 300 to 400 people from agency, industry, consultant and nonprofit constituencies, as well as faculty and students from UW and other universities and community colleges.

In addition to these two major outreach activities, the Water Center provides other forms of outreach, including:

- half-day **training courses** on issues such as data management and stream restoration open to students, faculty, staff, consortium members and other interested persons;
- participation in the **Denman Forestry Issues Series**, presented by SFR twice a year and televised via UWTV;
- **two-page fact sheets** on more than 20 water-related topics, including stormwater management, urban stream crossings, large woody debris and constructed wetlands;
- **weekly emails** to listserv of more than 1,300 people with a **list of water-related events**;
- regular postings to listserv with **job announcements** in water-related fields; and

- a **Web site** with information about current research projects of affiliated faculty, availability of water-related curricula from the UW, outreach events, publications and audio recordings and PowerPoint presentations from weekly seminars and annual reviews, plus links to additional resources.

In addition, the Water Center **responds to informational requests** from members of the general public on a wide variety of water issues. It publishes an annual electronic **newsletter** highlighting student and faculty research projects and has created an archive of previous issues on its Web site.

Resources Devoted to Outreach

The Water Center expends more than \$5,000 annually on the weekly seminars and annual research review, in addition to staff time required for these outreach events. Industry sponsors typically contribute half of the costs of the annual review. The program manager's salaried position (the Water Center's only funded position) is primarily used to support outreach activities. Sources to cover the program manager's salary include SFR and the Water Center Consortium (composed primarily of members from city and county water resource departments). The Water Center director's position is currently unfunded and is essentially a volunteer position.

Impetus for Outreach

Outreach is fundamental to the goals of the Water Center, which is involved in bringing together experts from multiple disciplines (Water Center faculty and scientists from interested organizations) to conduct research to solve complex water problems in a cost-effective manner. Through its outreach activities, the Water Center seeks to communicate scientific information to decision-makers and the public in a collaborative effort to understand and resolve water problems in the region and beyond.

Trends in Outreach

When it was the Center for Streamside Studies, the Water Center initially focused largely on salmon recovery and riparian issues. After merging with the Center for Urban Water Resources Management, the effects of urbanization, low-impact development and stormwater became additional areas of research and outreach activities. Despite name changes and the addition of new constituencies, outreach has always been a significant focus of the Water Center. Topics of focus have continuously reflected critical water issues that affect nearly every sector of society. Without funding after June 2010, the continuation of outreach activities at the Water Center is in jeopardy.

Outreach Priorities

Water Center priorities include the weekly water seminars, annual research conference, Web site and job and events listservs. With adequate resources, the Water Center would be able to continue funding the director's and program manager's positions to maintain

these priority outreach activities. Based on results from a February 2009 survey, Water Center constituents highly value the weekly seminars, annual review of research conference and the jobs and events listserv notifications.

Wind River Canopy Crane Research Facility

The Wind River Canopy Crane Research Facility (WRCCRF) was established in 1994 as a cooperative research venture among the UW College of Forest Resources (now SFR), the U.S. Forest Service's Pacific Northwest Research Station and Gifford Pinchot National Forest. Located in the Wind River Experimental Forest, WRCCRF is an active research site of the Biogeosphere-Atmosphere Stable Isotope Network and AmeriFlux network. A full-sized construction crane provides a platform from which to study the entire old growth forest ecosystem, facilitating world-class forest ecosystem research and providing an educational experience for students and professionals in forest science and natural resource management.

WRCCRF has three staff: a site director, assistant site director and crane operator. Although the primary focus of the facility is research, program activities also include outreach.

Types of Outreach

- 1. K-12 Education**
None.
- 2. Informal Education**
Visits to the crane and experimental forest site.
- 3. Presentations or Talks to Non-Scientific Audiences**
Occasional presentations on site — for example, for summer courses offered by park associations.
- 4. Technical Assistance and Training**
Technical assistance and training under special circumstances.
- 5. Policy-making and Management Support**
Scientific expertise and advice to line managers (e.g., forest supervisors and regional foresters), state and federal officials and politicians, as requested.
- 6. Communications**
Regular features in print, radio and TV; also featured in a documentary film.
- 7. Web-based Resources**
Web site with facility information, data, images, Web cams and a list of publications.
- 8. Citizen Science**
None.

Outreach Overview

WRCCRF is primarily a research facility, however the crane and experimental forest are also used for **outreach to professional groups**, including the Ecological Society of America and Natural Areas Association. The location allows researchers, students and visitors to learn about both natural and managed forests and facilitates investigation from the forest floor to the top of the canopy. Due to safety and liability concerns, WRCCRF does not allow K-12 students or the public on the crane. Technology on the crane, including wireless Internet and **Web cams**, allow for remote outreach experiences. In 2005, Ball State University created an **electronic “field trip”** to the crane. Web cam images also are available on the WRCCRF Web site. These sorts of outreach opportunities could be expanded in the future to reach larger and more diverse audiences.

WRCCRF staff provides **scientific expertise** upon request; e.g., expertise on spotted owl habitat provided to the Bureau of Land Management. In addition, the research facility provides information on nutrients and rainfall through the canopy to the USGS. Staff has capitalized on visits to the crane by professional line managers and by professional groups as opportunities to share knowledge that is relevant to development and implementation of forest policies on federal lands. They have also used visits by industrial managers (e.g., the chief executive officer of Weyerhaeuser) and by federal and state legislators and staff as educational opportunities.

The crane has been featured in many media outlets, including KING 5 TV, *Sunset* and *Audubon* magazines, National Public Radio and Discovery Channel. A documentary filmmaker visited the site in summer 2009.

Resources Devoted to Outreach

In recent years, as much as 60 percent of crane operation time has been devoted to visitors, including participants in college and university courses, members of professional organizations and other entities, including the Ecological Society of America and Natural Areas Association.

Impetus for Outreach

The existing demand for crane time is so high that WRCCRF has not actively pursued additional outreach opportunities.

Trends in Outreach

Initial excitement and interest in the facility was sizeable, with considerable interest from the community about the crane and work conducted at WRCCRF. Although the initial excitement has worn off, interest in research results continues today. In addition, there has been increasing emphasis on using WRCCRF for educational purposes. The experimental forest, specifically including WRCCRF, has been selected as the core site for the Pacific Northwest domain of the National Ecological Observatory Network. When this network is completed (sometime after 2012), educational and outreach activities will almost certainly expand dramatically. A broad and significant shift toward education would require a shift in the mission and funding for the facility.

Outreach Priorities

With additional resources, WRCCRF would prioritize:

- Web site development;
- printed materials; and
- development of workshops and short courses.

With the crane tower Web cam, Web site capabilities could be expanded to enable interactive, remote classroom activities for expanded outreach to students and others. WRCCRF would like to produce a printed brochure with information about the facility and research. Although the facility is not currently equipped for multi-day workshops, there is interest in renovating the existing infrastructure to accommodate workshop groups and participants of short courses.

Oceans

Friday Harbor Laboratories

For more than 100 years, the Friday Harbor Laboratories (FHL) have served the scientific community as a highly respected field station for research in marine ecology, zoology, developmental biology, genetics and many other branches of biological science. FHL also provides important training for new scientists through intensive courses for graduate and undergraduate students. FHL is located on a 484-acre tract of land on San Juan Island. The Laboratories also control biological preserves at False Bay and Argyle Lagoon on San Juan Island, at Point George and Cedar Rock on Shaw Island, and some other areas. It provides facilities for visiting investigators from national and international institutions to conduct research while in residence, postdoctoral fellowships and courses, and fellowships and apprenticeship opportunities for graduate and undergraduate students.

The majority of outreach occurs through the Friday Harbor Labs Science Outreach Program (FHLSOP) and courses and fellowships for university students. FHL is a partner in the Ocean and Coastal Interdisciplinary Science Graduate STEM Fellows in K-12 Education (OACIS GK-12) program, with graduate student fellows placed at FHL and in local high schools in San Juan and King counties. Outreach through the OACIS GK-12 program is described in a separate summary in this document.

Types of Outreach

1. K-12 Education

FHLSOP classroom and field-based projects for elementary, middle and high schools.

2. Informal Education

Annual open house with displays and diving for the public; tours of FHL; San Juan Nature Institute (SJNI) adult education classes.

3. Presentations or Talks to Non-Scientific Audiences

Public lecture series (with SJNI); presentations to groups such as Rotary Club and Girls Scouts upon request.

4. Technical Assistance and Training

None.

5. Policy-making and Management Support

Scientific expertise to San Juan County Marine Resources Committee (MRC), WDFW and DNR, in the development of marine protected areas and aquatic reserves; consultation for San Juan County and other agencies; recommendations to the Islands' Oil Spill Association.

6. Communications

Brochure; print and online newsletter; research and activities sometimes covered in local newspapers.

7. Web-based Resources

Outreach program Web site with information about school programs and monitoring projects, plus links to additional resources.

8. Citizen Science

High school student participation in San Juan Islands Watershed Project, Friday Harbor Marina Water Quality Sampling Project and Invasive Mussel Project.

Outreach Overview

Primary outreach activities at FHL include:

- **K-12 outreach** through the FHLSOP;
- **public outreach**, including an open house, tours of the Labs and public presentations;
- **scientific expertise and advice** to a variety of local agencies and organizations.

Since 2001, FHLSOP has worked with the San Juan Island School District, Spring Street International School and San Juan Islands Conservation District to provide hands-on learning opportunities for **elementary, middle and high school pupils** in the field, laboratory and classroom. Elementary school projects include units on marine invertebrates, watersheds and eelgrass beds and water quality sampling. Middle school pupils learn about rocky and soft sediment intertidal habitats, DNA extraction, grey whale skeletons and marine biology field inquiry projects. At the high school level, projects include learning about oceanography and invasive mussels. All K-12 projects are designed to complement and enhance current science curriculum. FHLSOP awards an annual **Young Investigators Prize** to a high school junior or senior showing exceptional promise in the fields of science and math. The winner is awarded a cash prize and the opportunity to spend the summer as a full-time paid research assistant at FHL.

FHL also runs the **OACIS GK-12 program**, pairing graduate students with local (San Juan and King counties) high school teachers to acquire teaching skills and enhance marine and coastal content in the classroom. The GK-12 program is described in more detail in a separate summary in this document.

Public outreach activities at FHL include an **annual open house**, attracting more than 700 people with displays, tours and diving opportunities. **Public presentations** and **tours** of the labs are arranged upon request. The **Marine Science Associates** host a public lecture series at FHL, including approximately 10 lectures per year, with audiences of 50 to 100 people.

Faculty and staff at FHL frequently provide **scientific expertise and advice** to local agencies and organizations. Two FHL faculty members serve on the **San Juan County MRC**. Faculty and staff have provided expertise to the **WDFW** and **DNR** in the development of five marine protected areas and an aquatic reserve in the Islands. They also frequently consult for the county and provide

recommendations to the **Islands' Oil Spill Association**. Permission must be obtained from the director of FHL to collect bull kelp and non-food marine organisms in the waters of San Juan County and off Cypress Island in Skagit County. The director currently serves on the Marine Protected Areas Work Group for the Washington State Legislature. Held at FHL every year, the **Marine Managers Conference** includes participants from WDFW, DNR, the National Park Service, many tribes and other natural resource management agencies.

The FHL **Web site** is an outreach tool providing information about past and ongoing research, courses and fellowship programs, events and outreach activities. FHL publishes a **quarterly online newsletter** and one **print newsletter** each year. FHL research and activities are sometimes covered in local newspapers.

FHL facilities are used by a number of other groups for various activities. **SJNI**, a nonprofit organization affiliated with FHL, holds adult education classes at FHL, covering topics such as mushrooms, birds and other wildlife. The **Helen R. Whitely Center** on the FHL campus provides a retreat for scholars from all disciplines to write, study, create and collaborate.

Resources Devoted to Outreach

There are two staff positions at FHL devoted to the K-12 outreach program. In addition, outreach activities take place in many of the buildings on the FHL campus, and several faculty members participate in outreach activities.

Impetus for Outreach

Outreach has been evolving at FHL since the early 1990s. The first K-12 outreach program coordinator was hired in 1999, and FHLSOP was established in 2001 as a partnership between FHL, San Juan Island School District, the Spring Street International School and the San Juan Islands Conservation District. FHLSOP projects seek to involve students in the processes of science—observing, asking questions, predicting, collecting data, analyzing data and making conclusions. Tours, public talks, open houses and other outreach activities outside of FHLSOP are offered in response to interest from the community.

Trends in Outreach

The K-12 program at FHL has grown significantly since the early 1990s. Other types of outreach have increased as well. Since WDFW established marine protected areas in the San Juan Islands, community interest has expanded greatly. This has resulted in additional outreach efforts by FHL staff and researchers to provide information, expertise and consultation to the community.

Outreach Priorities

With additional resources, FHL would like to invest in building an outreach center, including space to set up educational materials and displays, dedicated space for bringing K-12 classrooms onto campus, a larger lecture hall for public talks and office space.

School of Aquatic and Fishery Sciences

Established in 1919 as the first U.S. College of Fisheries, the UW School of Aquatic and Fishery Sciences (SAFS) encompasses programs for undergraduate and graduate teaching, research and service in basic and applied aquatic sciences, with an emphasis on fisheries management and aquatic resource conservation. The school includes 30 faculty and 16 emeritus faculty, 125 graduate and 100 undergraduate students and about 90 administrative and research staff. SAFS faculty, staff and students have access to myriad aquatic habitats and rich biological resources, and they are involved in interdisciplinary partnerships with other academic programs, public and private organizations and environmental and regulatory agencies.

The Coastal Observation and Seabird Survey Team (COASST), an outreach programs housed in SAFS with a focus on citizen science activities, is described in this document.

Coastal Observation and Seabird Survey Team

COASST, founded in 1999, is a citizen science project of UW in partnership with state, tribal and federal agencies, environmental organizations and community groups. COASST's main office is housed within SAFS. As of 2009, COASST was the largest beached-bird network in the world, with more than 500 volunteers regularly surveying approximately 300 beaches in Washington, Oregon, northern California and Alaska. Volunteers collect data on beached birds, physical beach characteristics and human use of the beach. To date, COASST volunteers have documented more than 18,000 beached birds, representing more than 100 species. With the help of student interns, the small COASST staff coordinates all volunteer activities and conducts additional outreach.

Types of Outreach

- 1. K-12 Education**
Occasional presentations and field trips with K-12 classrooms.
- 2. Informal Education**
Displays at community events.
- 3. Presentations or Talks to Non-Scientific Audiences**
About 20 public presentations annually; COASST socials for volunteers feature guest speakers.
- 4. Technical Assistance and Training**
None.
- 5. Policy-making and Management Support**
Data for natural resource management agencies and other scientists upon request.

6. Communications

Three COASST field guides; *COASSTLine* (quarterly newsletter for volunteers); *COASST Reports* (annual report); print, radio and TV media coverage during mass die-offs and other unusual events.

7. Web-based Resources

Interactive Web site, including online data entry, data reports, events calendar, etc.

8. Citizen Science

More than 500 volunteers surveying about 300 beaches in Washington, Oregon, northern California and Alaska.

Outreach Overview

COASST is a citizen science project in which volunteers commit to surveying their assigned beaches at least once a month. During surveys, COASST volunteers use a COASST-produced field guide to identify beached birds to species; measure, mark and photograph each bird; and collect additional data about weather and beach conditions. As of 2009, more than 500 volunteers in four states participated in the project. Over the past 10 years, more than 1,000 people have participated.

In addition to fostering active participation of volunteers in data collection, COASST engages in a number of other outreach activities, including:

- **public presentations** at COASST events, community events, community group meetings, etc.;
- **displays** at community events, such as the Ocean Shores Beachcombers Fun Fair and Pribilof Island Days;
- **training for volunteers** in beached bird identification and standardized data collection techniques;
- **social events** for volunteers;
- **translation of data and results** into formats digestible by the general public; and
- **providing data and information** to natural resource managers and scientists.

COASST occasionally engages K-12 students in the program through classroom presentations and field trips. COASST publications include three **field guides** to West Coast, Atlantic Coast and Alaska dead birds to help volunteers, NOAA fisheries observers and others identify specimens. It also produces a **quarterly newsletter** for volunteers and an **annual report**. The newsletter and annual report include seabird natural history and marine conservation information and a summary of results from COASST data collection. The COASST **Web site** provides an interactive portal for volunteer data entry and up-to-date access to data in graphic and tabular forms. The Web site also includes volunteer training and events calendars and seabird natural history and conservation information.

COASST has been featured more than 50 times in **print and electronic media**.

The COASST program combines outreach with relevant, rigorous data collection. As stated in the COASST vision, COASST “sees a future in which all coastal communities contribute directly to monitoring local marine resources and ecosystem health through the establishment of a network of citizen scientists, each collecting rigorous and vital data. Through their collective efforts, and the translation of their individual data into baselines against which any impact—from human or natural origins—can be assessed, nearshore ecosystems worldwide will be actively known, managed, and protected.”

Resources Devoted to Outreach

With citizen science and outreach at the core of the program, COASST devotes almost all resources to supporting outreach activities. COASST is funded through a combination of grants, contracts and in-kind support. Limited program funding supports two staff members at the UW and covers the costs of volunteer supplies, publications, Web site maintenance and other program expenses. COASST receives in-kind support in the form of a part-time volunteer coordinator from the Olympic Coast National Marine Sanctuary and staff time from the Alaska Maritime National Wildlife Refuge. In addition, COASST depends on its network of partnerships with agencies and organizations to provide on-the-ground organizational support.

Impetus for Outreach

The entire COASST program is about outreach and community involvement in scientific research. The program mission states “COASST believes citizens of coastal communities are essential scientific partners in monitoring marine ecosystem health. By collaborating with citizens, natural resource management agencies and environmental organizations, COASST works to translate long-term monitoring into effective marine conservation solutions.”

COASST was originally founded to complement long-term research on coastal seabirds of the Pacific Northwest and the recognition of the need for a seabird-monitoring program that would generate baseline data to help assess patterns of seabird mortality due to natural and human-induced events across space and time. Driven by a scientific need and firmly based in the collection of relevant, rigorous scientific data, COASST has always been about engaging and empowering the public through data collection.

Trends in Outreach

In 10 years, COASST has grown from 12 volunteers and five beaches on the outer coast of Washington to more than 500 volunteers and about 300 beaches in the Pacific Northwest and Alaska. As the program has grown, so has the demand for presentations, data and other information.

Outreach Priorities

Two specific funding priorities for COASST are:

1. to establish an endowment for the program, helping to ensure future security for program funding; and
2. to expand the program geographically and/or topically. Geographic expansion into the Pacific Rim, including international collaborations with Japan, Taiwan and Russia, would follow an ecosystem approach and supplement current program coverage in the North Pacific. COASST currently focuses on beached birds but would like to expand the program to include other data streams, such as marine mammals, beach debris and invasive species.

School of Marine Affairs

The School of Marine Affairs (SMA) offers an internationally recognized master's degree program for launching careers in marine policy and management. SMA began as the Institute for Marine Studies in 1972, became a part of the new College of Ocean and Fishery Sciences in 1981, was renamed in 1990 and joined the new CoEnv in 2009. SMA fosters comprehensive, long-term and proactive approaches to marine policy and ocean and coastal management. It also promotes interdisciplinary education, scientific research and public service. SMA provides guidance to industry and all levels of government in the U.S. and abroad, as well as to nongovernmental organizations that promote resolution of ocean and coastal issues by training well-qualified professionals.

SMA currently includes eight faculty members, 14 affiliated and adjunct faculty members and more than 50 graduate students. Although it does not have a formally organized outreach program, faculty and students engage in outreach opportunistically.

Types of Outreach

1. **K-12 Education**
None.
2. **Informal Education**
None.
3. **Presentations or Talks to Non-Scientific Audiences**
Presentations and talks by faculty and students to communities and stakeholder groups.
4. **Technical Assistance and Training**
Technical assistance and training by students and faculty through a sustained engagement with the Coastal Conservation Education Foundation in the Philippines; and by students to marine resource stakeholders through internships and thesis research.

5. **Policy-making and Management Support**
Faculty expertise, advice and participation in managing or making decisions at local, regional, national and international levels.
6. **Communications**
Regular contact with faculty by local media and, occasionally, national and international media.
7. **Web-based Resources**
Web site with program information and related news and events.
8. **Citizen Science**
None.

Outreach Overview

SMA faculty regularly engages in **outreach with policy-makers, managers, industries and constituent groups**, locally, regionally, nationally and internationally. Faculty members are routinely appointed to lead **commissions and panels** and serve as **advisors to government and industry**.

Internationally, SMA faculty have consulted for and advised organizations such as the U.S. Agency for International Development, the Intergovernmental Oceanic Commission of UNESCO, the United Nation's Development Program, Center for Transnational Corporations, Food and Agriculture Organization, Conference on Trade and Development and the Intergovernmental Panel on Climate Change. Faculty members also engage in international conservation efforts, particularly in the Philippines, via a sustained partnership with the Coastal Conservation and Education Foundation.

At the national level, faculty members have served on the U.S. Commission on Ocean Policy, National Research Council and NOAA advisory panels and on advisory panels, boards and committees of organization such as the Council for Ocean Law, American Association of Port Authorities, Union of Concerned Scientists and The Coastal Society. Regionally and locally, SMA faculty have served on and advised the North Pacific Fishery Management Council, Consortium for Risk Evaluation with Stakeholder Participation, Olympic Coast National Marine Sanctuary Advisory Council, Puget Sound Nearshore Ecosystem Restoration Project, Northwest Straits Commission and San Juan County Marine Resources Committee. In addition, faculty routinely provides **testimony to legislative bodies** at state and federal levels and is regularly approached by decision-makers to **provide policy and scientific expertise**.

Through internships and thesis projects, SMA students often provide **technical training and assistance** to marine stakeholder groups. Faculty and students are regularly invited to give **presentations** at public meetings and to civic organizations and industry groups. Faculty members are contacted regularly by local **media** and occasionally by national and international media.

Resources Devoted to Outreach

There are no resources allocated specifically for outreach at SMA. The faculty occasionally receives grants for specific projects that include outreach components. However, faculty members most often volunteer their time while participating in outreach activities.

Impetus for Outreach

Currently, outreach activities at SMA are opportunistic, primarily in response to requests from outside parties.

Trends in Outreach

The breadth and scope of outreach at SMA has increased over the years. As faculty interest has broadened, there have been increased opportunities for engaging various communities.

Outreach Priorities

If additional resources for outreach were available, SMA would focus future outreach activities to advance the school's mission and reputation. Expanded outreach efforts would likely focus on areas that SMA has considerable expertise in, such as designing and building marine protected areas or engaging in marine spatial planning. SMA is also interested in increasing engagement in civic science — research that is guided directly by identified societal needs.

In addition to these priorities, SMA would welcome a concerted effort to formalize outreach through the new CoEnv. In particular, there is interest in exploring mechanisms to incentivize and reward faculty for outreach activities.

School of Oceanography

Oceanography is a national leader in oceanographic research and education of graduate and undergraduate students. Started as the UW's Oceanographic Laboratories in 1930 and formally organized as a UW school in 1951, Oceanography currently includes 66 faculty, 41 adjunct and affiliate faculty (primarily from the Applied Physics Laboratory and NOAA's PMEL), more than 75 graduate students and nearly 100 undergraduate students.

Summaries of two outreach programs in Oceanography are included here. Oceanography faculty, staff and students also engage in additional outreach activities not centrally organized or contribute to broader UW outreach programs, such as UW in the High School. Although these contributions are important, the scope of this survey was limited to outreach programs within or aligned with CoEnv.

School of Oceanography Graduate Student Outreach Program

A graduate student outreach coordinator coordinates general outreach in Oceanography. Many of Oceanography's faculty, staff and students participate in outreach activities independently as well. For example, individuals and groups often contact faculty directly to request presentations on topics of interest or scientific expertise and advice. Because these interactions are difficult to track, they are not included in this outreach summary.

Types of Outreach

1. K-12 Education

Class field trips to Oceanography; classroom visits; job shadowing; demonstrations at family science nights.

2. Informal Education

Demonstrations at informal education events, such as the Pacific Science Center Polar Science Weekend and Seattle Aquarium Family Science Weekend.

3. Presentations or Talks to Non-Scientific Audiences

Presentations for community groups and the public at venues such as the Seattle Aquarium.

4. Technical Assistance and Training

None.

5. Policy-making and Management Support

None.

6. Communications

None.

7. Web-based Resources

None.

8. Citizen Science

None.

Outreach Overview

Since 2005, outreach efforts in Oceanography have been coordinated by a part-time (five hours per week) graduate student outreach coordinator and primarily conducted by graduate and some undergraduate student volunteers, staff and, occasionally, faculty. The most common outreach activities include:

- K-12 **field trips** to Oceanography;
- K-12 **classroom visits**;
- family **science nights** at elementary schools;
- demonstrations at **events**; and
- high school student **job shadowing**.

In addition, outreach volunteers occasionally serve as **science fair mentors and judges** and give **public presentations** at venues such as the Seattle Aquarium.

The general outreach program in Oceanography is currently reactive. When outreach requests from the community are received, they are communicated through biweekly e-mails from the graduate student outreach coordinator to the outreach volunteer listserv. Students, faculty and staff have opportunities to subscribe to the outreach volunteer listserv each year.

In addition to coordinating general outreach activities, the graduate student outreach coordinator will often assist Centers for Ocean Sciences Education Excellence — Ocean Learning Communities (COSEE-OLC) and other education and outreach programs in the area to spread the word about their outreach opportunities to the volunteer listserv.

Resources Devoted to Outreach

Oceanography provides funding for one quarter of graduate student support per year for the outreach coordinator position (spread out over one year to include five hours per week). Additional funding has been devoted to the development of outreach kits that include hands-on activities, demonstrations and exhibits in a ready-to-go format, with all required supplies and instructions. Example kit themes include phytoplankton diversity, bioluminescence in the ocean and what makes a boat float. Food is provided at outreach meetings that offer training on the various kits for outreach volunteers. Funding has been supplemented by money raised by the outreach program from selling pint glasses at monthly Oceanography social events.

Although Oceanography pays for the coordination of outreach activities and some outreach supplies, unpaid outreach volunteers undertake all outreach activities.

Impetus for Outreach

Graduate students started the organized outreach program in Oceanography. It began in 2005 when, at the urging of graduate students, the school began supporting the outreach coordinator position.

Trends in Outreach

Since 2005, when the outreach coordinator position started, the outreach program has become more organized, and Oceanography has become more well-known within the K-12 community as a good source for field trips, classroom visits and other ocean-related activities. For example, the Seattle School District has added Oceanography to its list of recommended field trip destinations. As such, community requests for outreach have increased over the past five years.

Outreach Priorities

With additional resources, Oceanography would focus on advertising the availability of outreach activities to promote opportunities for the community, rather than only reacting to community requests. If successful,

advertising would likely lead to increased demands for outreach, thus requiring additional funding for increased capacity for outreach coordination. A Web site focused on oceanography outreach would assist with publicizing (e.g., providing information about outreach availability and ways to request outreach activities) and could serve, for instance, as a mechanism for the ocean outreach group to fill and track activities and provide readily available presentation instructions for the outreach kits.

Another priority for Oceanography graduate student outreach would be the development of new kits, demonstrations and exhibits.

SoundCitizen

A citizen science program based in Oceanography's Aquatic Organic Geochemistry (AOG) lab, SoundCitizen is focused on volunteer water sampling in the Puget Sound region. The mission of SoundCitizen is to enable the general public to participate in question-driven environmental research and to enhance regional understanding of the relationships between watersheds and receiving waters. SoundCitizen research currently focuses on the detection of everyday cooking spices and flavoring agents in streams, lakes, storm drains and marine waters as they travel from homes to Puget Sound.

SoundCitizen is centered on outreach and engaging citizens in scientific research. Outreach activities are led by the few part-time staff of SoundCitizen and expanded through partnership with the COSEE-OLC.

Types of Outreach

1. K-12 Education

K-12 classroom presentations; high school curriculum.

2. Informal Education

Demonstrations and presentations at COSEE-OLC events (a separate summary for COSEE-OLC is provided in this document).

3. Presentations or Talks to Non-Scientific Audiences

Monthly or more frequent public presentations.

4. Technical Assistance and Training

None.

5. Policy-making and Management Support

None.

6. Communications

Newsletter; coverage in local and national print, radio and TV.

7. Web-based Resources

Web site with program information and data.

8. Citizen Science

Collection of water samples with SoundCitizen kits and submission of data and water samples to the lab for processing.

Outreach Overview

SoundCitizen is a **citizen science** program that recruits the public to sample water from local streams, lakes, storm drains and Puget Sound. Once the volunteers have performed water quality tests on their collected sample, they mail the sample to the lab at the UW for further analyses. The samples are tested for cooking spices and flavoring agents. Results demonstrate the direct connection between activities at home and the waters flowing into Puget Sound. SoundCitizen engages in outreach activities to recruit volunteers and educate the public about program findings. In addition to active participation of volunteers in data collection, the primary outreach activities of SoundCitizen include:

- **presentations** at public events and in schools;
- **curriculum development** and the incorporation of SoundCitizen sampling in local high school classes;
- local, regional and national **media coverage**; and
- the SoundCitizen **Web site**, where data and results are available.

SoundCitizen was launched at a COSEE-OLC event in fall 2008. COSEE-OLC events continue to be a central venue for SoundCitizen outreach. In addition to targeting participation by the general public and local environmental groups, SoundCitizen is currently in the process of developing and enhancing K-12 curriculum for the program. As of fall 2009, four schools are using the SoundCitizen curriculum—*My Place in Puget Sound: Making Connections between People, Places, and Marine Environments*—and collecting samples.

The SoundCitizen Web site provides a central location for outreach information and includes pages specifically for volunteers: “Where to Sample”; “How to Sample”; “Request a Kit”; and “Submit a Kit”. It also includes pages with program results, information for school groups and an “In the News” section with links to media coverage of the program. The first SoundCitizen newsletter was released in fall 2009.

Resources Devoted to Outreach

SoundCitizen is supported by the Richard Fleming Endowment in Oceanography, a small grant from Seattle Public Utilities and in-kind support from COSEE-OLC and WSG. Funding primarily provides for sample collection kits, sample processing and staff time. SoundCitizen depends on undergraduate students to process water samples.

Impetus for Outreach

SoundCitizen was created in response to undergraduate students’ interest in showing the direct connection between household activities and the health of Puget Sound. The underlying concept of SoundCitizen is to use everyday spices to engage and educate the public about these connections; therefore, outreach has been a critical part of SoundCitizen from the beginning.

Trends in Outreach

SoundCitizen officially launched in fall 2008 and immediately received positive media attention and interest from the public. In its first year, SoundCitizen distributed more than 700 water sample kits, and about 60 percent have been returned for lab processing. Knowledge and interest in the program has spread primarily through word of mouth. SoundCitizen is receiving increased requests for kits from volunteers and interest from schools and other groups for outreach and to incorporate SoundCitizen sampling into their programs.

Outreach Priorities

With additional resources, SoundCitizen would increase its staff to facilitate faster sample processing.

Washington Sea Grant

WSG is a catalyst for innovative marine research, education and outreach. The program’s specialists translate research findings into practical information and decision-making tools to meet the needs of ocean users in Washington state, across the nation and throughout the world. Established in 1968, it began as a federal experiment in local investment, building on the UW’s academic strengths in marine science, engineering and policy. In 1971, WSG became one of the first four programs designated nationally as a Sea Grant College. Today, it is part of a national network of 32 Sea Grant Colleges administered by NOAA, U.S. Department of Commerce.

WSG is dedicated to improving the translation of research and scientific information for use in the marine environment. The program serves communities, industries and the people of Washington state, the Pacific Northwest and the nation by identifying and addressing important marine issues, providing better tools for management of the marine environment and use of its resources and initiating and supporting strategic partnerships within the marine community. Through outreach, communication, education, research and special initiatives, WSG helps sustain economic development while encouraging ecosystem-based approaches to management of Washington’s oceans and coasts. Over the past five years, the Sea Grant staff has worked with 22 cities, 15 port districts, 15 coastal counties, almost all Washington tribes, 45 federal and 13 state agencies and scores of school districts, businesses and nonprofit organizations. WSG staff serves on the Puget Sound State and Washington State Ocean Caucuses, West Coast Governors’ Agreement on Ocean Health Action Coordination Teams, NOAA West Regional team, Puget Sound Partnership Ecosystem Coordination Board, Salmon Recovery Funding Board and other marine and coastal groups.

Outreach activities of the Communications, Education and Marine Advisory Services (MAS) programs are described in the following sections. In addition to these core program components, outreach activities are supported through WSG research and program development funding; however, these activities are not included in this document.

Washington Sea Grant Communications

Unbiased brokers of information, WSG Communications helps agencies, organizations, businesses, schools and individuals better understand and manage marine resources and the environment. WSG Communications is a core WSG component, serving both as communications support for the entire organization and as an independent entity for marine and coastal outreach. In the latter capacity, WSG Communications initiates and develops its own projects and products, often working in partnership with outside organizations with compatible goals. The WSG Communications office is involved in the full range of WSG activities, from producing basic informational material for marine user groups, to writing, editing and designing sophisticated publications, to developing strategic communications plans.

Types of Outreach

1. K-12 Education

None; communications support for WSG K-12 education activities.

2. Informal Education

Public education and media campaigns such as the statewide clean vessel awareness campaign; communications support for additional WSG informal education activities.

3. Presentations or Talks to Non-Scientific Audiences

Occasional presentations about communicating science; communications support for additional WSG presentations.

4. Technical Assistance and Training

None; communications support for WSG technical assistance and training activities.

5. Policy-making and Management Support

None; communications support for WSG information and products to inform policy-making and management.

6. Communications

Quarterly program newsletter; annual reports; programmatic documents (strategic plan, program brochures, etc.); media placements (56 in 2008); special projects such as *Heaven on the Half Shell*; communications support for more than 150 technical reports, brochures, fact sheets, manuals, videos,

posters, and other topical documents produced in 2008; communications support for other UW and non-UW partners such as production of the annual report for the JISAO and design of the Web site for CoEnv.

7. Web-based Resources

Extensive Web resources with information on research, outreach and education programs and opportunities, online publications and specialized databases.

8. Citizen Science

None; communications support for WSG citizen science activities.

Outreach Overview

WSG Communications provides materials that support the outreach efforts of all WSG programs, including MAS and Education. Communications continuously works to **translate science** so users can learn and apply new technology. This has included working with WSG marine fisheries scientists to document and explain the use of streamer lines on fishing vessels to avoid seabird bycatch. Another example is production of documents that provide information about safe shellfish harvesting, including symptoms and treatment of shellfish-associated illnesses and their relationship to so-called “red tides.” WSG Communications also develops independent products, such as *Heaven on the Half Shell: The Story of the Northwest's Love Affair with the Oyster*, to raise general interest in and enthusiasm for the marine environment.

WSG Communications also engages in direct outreach activities, including **public education and media campaigns** and occasional **presentations on communicating science**. The WSG Communications team is currently developing a public information campaign designed to raise boaters' awareness of boat sewage pump-out facilities; this project involves direct communications outreach to boaters through surveys and public events.

The WSG Communications team produces WSG program publications, including a **quarterly newsletter** (*Sea Star*) distributed to more than 2,500 stakeholders, **annual reports, program brochures** and other program documents such as the strategic plan and program directory. Communications also develops content for the WSG **Web site**, which contains the most current information about WSG programs and projects. Through the Web and the news media, Communications publicizes WSG events, workshops, seminars and classes.

In addition to its work for WSG, Communications **works with partners** to help them communicate their activities and research to the public. Staff has produced the annual report for the JISAO, a series of technical reports for the Puget Sound Nearshore Ecosystem Restoration Project and Web sites for CoEnv and JISAO.

Resources Devoted to Outreach

WSG Communications has an annual budget of more than \$400,000 that supports two full-time and two part-time staff positions and all WSG communications production. All WSG Communications resources are targeted toward outreach, including Web site development and maintenance, writing and graphic design of communications materials and delivery of technical and creative expertise and strategic communications planning to staff, researchers and others within the university and to external partners.

Impetus for Outreach

Effective communications is key to all outreach activities at WSG. The WSG Communications team supports all WSG outreach efforts and provides communications services to other UW and outside partners. In Washington, economic recession produced a state budget deficit of about \$9 billion for the 2010-2011 biennium and slowed momentum on many environmental initiatives. Research programs, state environmental and resource-management agencies and higher education are all dealing with significant budget reductions. In the meantime, stresses caused by the state's population growth are not diminishing. The impact of growth and development on Washington's coast and estuaries, combined with reduced funding to address this impact, underscores the need for continued marine outreach, communication and education. Now, more than ever, WSG Communications is working to provide constituents with information about individual and collective actions they can take to help protect and preserve marine resources.

Trends in Outreach

The demand for WSG Communications expertise and services has increased. As program funding remains level, WSG programs require increasingly creative and effective communications to maximize outreach efforts, and partner organizations have requested assistance on more projects to meet their communications needs. WSG Communications products have also shifted and will continue to adapt to the rapidly changing news media and online communications scenes, including blogs, social networks and other "new media" outlets to reach targeted audiences.

Outreach Priorities

With additional resources, WSG Communications would like to improve online resources in response to WSG technical needs and make the WSG Web site a more dynamic tool for dialog and engagement with constituents. WSG Communications would also increase support for WSG research projects in translating science into usable information for stakeholders. In addition, WSG Communications would like to expand relationships with outside organizations to use the skill and experience of its staff to deliver important messages consistent with those of WSG.

Washington Sea Grant Education

WSG expertise in bringing together diverse stakeholders provides the foundation for a productive marine education program. Throughout its 41-year history, WSG has conducted formal and informal marine education activities. These activities have been conducted through MAS, Communications, competitively selected research and education projects, program development grants and, since 2007, WSG Education. Existing partnerships with educators, both inside and outside the university, have allowed WSG to expand and formalize the focus and breadth of its marine education mission. Key programs engage students of all ages in activities to improve ocean literacy.

Types of Outreach

1. K-12 Education

Orca Bowl; Washington on Water database of K-12 marine education resources; professional development for middle- and high-school teachers; graduate students and upper-division undergraduates in the Communicating Ocean Sciences (COS) course teach in K-6 classrooms.

2. Informal Education

NOAA Science Camp.

3. Presentations or Talks to Non-Scientific Audiences

None.

4. Technical Assistance and Training

Professional development for informal/free-choice educators; outreach capacity building through delivery of the COS course for graduate students and upper-division undergraduates.

5. Policy-making and Management Support

Service on the West Coast Governors' Agreement on Ocean Health Ocean Awareness and Literacy Action Coordination Team.

6. Communications

Described in this document's summary of WSG Communications.

7. Web-based Resources

Extensive Web resources, with information on K-12 events and opportunities; Washington on Water database, with nearly 200 marine education resources as of 2009.

8. Citizen Science

None.

Outreach Overview

WSG Education programs are geared toward educating students of all ages to further an understanding of the complex nature of Washington watersheds and improve ocean literacy. By partnering with educators and marine-related organizations, WSG reaches a greater number of people, expanding awareness of the environment, enhancing enjoyment of marine and coastal resources, encouraging marine-related careers and empowering environmental action and information sharing.

WSG Education primary outreach activities target the **K-12 community**, including students and teachers. In 2010, WSG enters its second year as coordinator for **Orca Bowl**, expanding its original financial, logistical and graphic design support for this popular event. Held at the UW Seattle campus, this regional ocean science competition of the National Ocean Sciences Bowl attracts teams from across the state and provides an opportunity for high-school youth to learn about ocean sciences and careers and interact with UW scientists. It also offers educational trips, scholarships and college funding.

Washington on Water, an **online clearinghouse of regional marine education programs** available to Washington state educators is currently in development and scheduled to be launched in 2010. In addition, WSG Education offers **professional development opportunities** for middle-school and high-school teachers and informal educators.

WSG Education outreach activities also include informal education opportunities. WSG has provided financial and programmatic support for **NOAA Science Camp (NSC)** for the past seven years and has been a coordinating partner since 2005. NSC is a well-developed program that gives 7th and 8th grade students and educators exposure to science careers and marine-related topics and engages NOAA scientists and staff directly in education activities and in program development.

In addition to these primary outreach activities, WSG Education, in collaboration with Oceanography and COSEE-OLC, cosponsors the **COS course** for graduate and advanced undergraduate students. This course teaches inquiry-based instructional strategies and COS students are placed in local schools to provide ocean science content to K-6 students and teachers. In 2010, COS will be expanded to incorporate the Communicating Ocean Sciences to Informal Audiences curriculum and include student delivery of ocean science in informal settings.

WSG Education staff **support management and decision-making** through serving on the West Coast Governors' Agreement on Ocean Health Ocean Awareness and Literacy Action Coordination Team. WSG Education staff also maintains active memberships in marine and environmental organizations such as the National Marine Educators' Association, the Northwest Aquatic and Marine Educators, the Environmental Education Association of Washington and the Sea Grant Education Network.

Resources Devoted to Outreach

The WSG Education program comprises three part-time education staff. An annual budget of approximately \$400,000 supports all education activities and an extensive fellowship program, which is beyond the scope of outreach as defined in this document.

Impetus for Outreach

Outreach is a core component of the WSG Education program. With its enormous diversity of marine resources, Washington continually must deal with conservation and management issues that provide opportunities for both collaboration and conflict. Ocean-related education is essential to strengthen local, regional and national appreciation for the importance of the oceans and coasts and to improve scientific literacy. In 2006, a major public opinion poll concluded that most people in the Puget Sound region knew very little about this central environmental feature in their lives—its resources, industries and the career potential it offers. By working with educators and marine-related organizations, WSG Education and other programs seek to spark individuals' interest in all things marine—an enjoyment of ocean and Puget Sound resources, a desire among students to enter into marine-related careers and an ability to articulate to others why taking care of the environment matters. WSG expertise in bringing together diverse stakeholders provides the foundation for a productive marine education program.

Trends in Outreach

Prior to 2007, education activities at WSG were conducted primarily through MAS outreach. While MAS continues with these efforts, the WSG Education program was established to bring a central focus to education activities. WSG Education has responded to needs in the Washington education community. For example, educators identified a need for centralized access to marine science education resources, streamlining the process for locating age-appropriate, place-based learning experiences. Capitalizing on its expertise in getting information to stakeholders, WSG Education developed the soon-to-be-launched *Washington on Water* online clearinghouse for K-12 teachers.

Outreach Priorities

With additional resources, WSG Education would focus on increasing collaborations with key marine education entities, including: regional NOAA offices; university departments; state and tribal organizations; the Seattle Aquarium; COSEE-OLC; Pacific Education Institute; the Puget Sound Partnership's Education, Communication and Outreach Network; and the Environmental Education Association of Washington. Such collaboration would advance a common ocean literacy approach in the state. WSG Education would also continue to enhance the information available through the *Washington on Water* online clearinghouse.

Marine Advisory Services

WSG MAS is a statewide marine outreach and technology transfer program, providing university resources and technical expertise for decisions about local, regional and national issues. MAS provides informal marine education, develops public awareness of resource management and conservation, transfers new technology to stakeholders, conducts applied research projects that benefit marine users and serves as a link between university research and marine resource users. MAS agents have specialized expertise relevant to a variety of marine resource issues and are based all around western Washington.

Types of Outreach

1. K-12 Education

None; see WSG Education summary.

2. Informal Education

Numerous outreach programs and activities (e.g., community festivals, beach walks, etc.; 25 different events with more than 1,800 attendees in 2008); volunteer opportunities through various programs (more than 2,000 hours in 2008).

3. Presentations or Talks to Non-Scientific Audiences

Public presentations in various formats to non-scientific audiences (196 presentations serving more than 5,000 attendees in 2008).

4. Technical Assistance and Training

Technical meetings, workshops and conferences in response to constituent and partner needs (105 events serving more than 3,300 attendees in 2008); continuous availability of staff to individual requests for information, advice, technical assistance and resources.

5. Decision-making and Management Support

Programs designed to deliver staff and university expertise to stakeholders, including managers and decision-makers; e.g., staff authorship of state-of-the-science technical reports and best-practices documents that directly assist managers; programs such as the Shoreline and Coastal Planner Group, designed specifically to provide professional development for local governments; active memberships on the Puget Sound State and Washington State Ocean Caucuses, West Coast Governors' Agreement on Ocean Health Action Coordination Teams, NOAA's Western Region team, etc.

6. Communications

More than 150 technical reports, brochures, fact sheets, manuals, videos, posters and other documents produced in 2008 to support MAS activities; 260 radio programs in 2008.

7. Web-based Resources

Extensive Web resources with information on MAS programs.

8. Citizen Science

State of the Oyster Study, Canal Watchers, Allyn Bird Monitoring Project and collaborative programs, including the Port Townsend Marine Science Center Plastics Monitoring Project and Puget Sound Marine Invasive Species Monitoring Program; citizen science specialist working to build regional citizen science capacity and available for assistance to volunteer programs, managers and scientists.

Outreach Overview

Outreach is a central component of WSG and the core function of MAS. MAS programs are designed to deliver staff and university expertise to stakeholders, which include any individuals or organizations that interact with the marine environment, from shoreline property owners to resource managers to fishing fleets. The MAS network of campus- and community-based specialists routinely **assists constituents** in aquaculture, fisheries, coastal economic development, coastal tourism, ports and marine transportation, safety at sea, marine technology training, water quality, shoreline protection and restoration, small oil spill prevention, aquatic invasive species control and citizen science.

MAS convenes **technical meetings, workshops and conferences** on contemporary marine resource issues to promote discussion and transfer of knowledge and technical information. More than a dozen MAS agents are available to respond to **requests for information** and to provide **advice, technical assistance and resources** to marine industries, community and trade groups and individuals. Some MAS outreach programs are designed to deliver **technical expertise directly to managers and decision-makers**, through, for example, authorship of technical reports and best-practices documents. One MAS staff, under a contract with the state, has authored a marine riparian guidance document for local jurisdictions that are updating their shoreline master plans. Another member heads the Shoreline and Coastal Planners Group, which provides professional development for local governments.

MAS agents also engage communities and people of all ages in a variety of ways. Twenty-five **events**, such as **community festivals, beach walks** and other activities, drew more than 1,800 attendees in 2008. MAS volunteer opportunities relating to the marine environment totaled more than 2,000 participant hours, and **public presentations to non-scientific audiences** reached more than 5,000 people in 2008.

MAS programs include three **citizen science projects**: State of the Oyster Study, Canal Watchers and the Allyn Bird Monitoring project. MAS staff also collaborates on other citizen science projects, including the Port Townsend Marine Science Center Plastics Monitoring Project and Puget Sound Marine Invasive Species Monitoring Program. In addition to specific citizen science project offerings, one MAS staff member is

available to assist volunteer programs, managers and scientists in citizen science project development and implementation.

MAS, in partnership with WSG Communications, develops many communications products for outreach, including **technical reports, brochures, fact sheets, manuals, videos, posters and weekly radio programs**. The **WSG Web site** includes information on MAS programs.

Resources Devoted to Outreach

The MAS annual budget of \$1.27 million supports MAS programs and 10 professional staff, two subcontracted field staff (WSU Extension faculty members) and two part-time contract field assistants. The UW Seattle campus houses the largest number of MAS staff, and off-campus offices are located in Seattle, Elma, South Bend, Shelton, Bremerton, Mount Vernon, Bellingham, Langley and Port Hadlock. The Seattle field office is located at Fishermen's Terminal, in cooperation with the Port of Seattle.

Current national Sea Grant program funds for MAS staff activities are augmented by a variety of state and federal agencies, including NOAA Fisheries support for seabird bycatch research and observer training, Department of Agriculture funding for seafood trade assistance, state and foundation support for citizen science and state funding for water quality and oil spill prevention education.

Impetus for Outreach

WSG works to encourage the understanding, use and conservation of marine resources and the marine environment through research, education and public service. The organization communicates, interacts and partners with educational institutions, industry, government and the public throughout Washington. Outreach is the core function of the MAS program. MAS continually adapts to provide the most relevant and current university resources and technical expertise that address local, regional and national problems and produce economic and social benefits. Through periodic needs assessments, MAS works to ensure that its program reflects priorities within primary sectors of the state coastal economy and complements regional and national capabilities.

Trends in Outreach

The MAS program reflects its position in a state that is rich in marine resources—and one in which the economy, culture and lifestyle of its citizens are intimately tied to those resources. As MAS continuously adapts to meet stakeholder needs, the program reflects trends in marine resource issues in Washington. Top sectors in Washington's ocean economy are tourism and recreation, marine transportation, living marine resources and shipbuilding. In large part, these four sectors rely on and affect the environmental health of the state's ocean and coastal resources. Coupled with increasing population pressures, they create diverse demands on these rich resources, creating user conflicts. These demands and conflicts are likely to increase as the population and economy continue to grow. For example, fisheries revenues have increased by 50 percent over the past six years, and the importance of aquaculture has increased 10-fold since 1993, with Washington growers contributing almost 84 percent of the West Coast cultured shellfish production in 2006. MAS programs respond to these types of changes by providing best-available science, tools and technologies, as well as training and general information, to managers, decision-makers, industries and the public to support responsible use and management of marine resources.

Outreach Priorities

With additional resources, MAS would prioritize the Sound Future initiative and increase program capacity in coastal resiliency issues. Sound Future is a joint initiative of the UW and WSU Extension to provide comprehensive and complementary science, education and outreach programs to support ongoing efforts to protect and restore Puget Sound. Sound Future partners are working to secure funding to engage the public and implement pragmatic solutions to high-priority concerns, such as managing stormwater, reducing pollution, protecting and restoring habitat, preserving freshwater, protecting fish and wildlife and promoting sustainable development. MAS will be the primary delivery mechanism for WSG education and outreach efforts tied to this initiative and will add field and specialist positions as new funding is available.

WSG is working with the Coastal Services Center within NOAA's National Ocean Service to assess joint funding of a coastal resiliency specialist, who would provide long-needed support for outreach activities on the Olympic Peninsula, potentially in partnership with Peninsula College and the UW's ONRC.

Other Partnerships and Programs

The Burke Museum of Natural History and Culture

The Burke Museum serves Washington's citizenry by preserving the state's natural and cultural heritage and interpreting that heritage through an expanding array of programs targeted toward all age groups, interests and educational backgrounds. Founded in 1885, it is Washington's oldest museum. In 1899, the State Legislature designated the museum as a Washington State Museum. It welcomes a broad and diverse audience and provides a community gathering place that nurtures lifelong learning and encourages respect, responsibility and reflection.

Types of Outreach

1. K-12 Education

Museum tours; Magnuson Outdoor Learning Lab; educator workshops; curriculum development and classroom resources including Burke Boxes and the Burkemobile; homeschool programs; interactive educational games and lessons on the museum's Web site.

2. Informal Education

Onsite and travelling exhibits; museum tours; summer camps; cultural events; artist demonstrations; Family Days; workshops; museum interpretation through the Burke 101 program; volunteer programs.

3. Presentations or Talks to Non-Scientific Audiences

Lectures, readings, and films.

4. Technical Assistance and Training

Training of regional museum professionals to collect and process objects.

5. Policy-making and Management Support

None.

6. Communications

Various education and outreach publications; annual reports; more than 10,000 e-mails, phone calls, and personal inquiries annually; extensive local media coverage; national and international media coverage.

7. Web-based Resources

Web site with information about all exhibits, events, research and collections, education activities, interactive educational games for kids, interactive lessons for teachers and students and links to other online resources of interest.

8. Citizen Science

Collection and processing of objects for museum collections by volunteers and the public.

Outreach Overview

Although its primary focus is to maintain its collection for the purposes of research, the Burke Museum is also very focused on educational outreach. It targets four audiences in its education efforts:

- Washington residents and visitors;
- researchers, scholars and enthusiasts;
- indigenous peoples; and
- K-12 students and educators.

The Burke Museum reaches out to these audiences in several different ways. **Exhibits** provide informal education opportunities for the general public. Changing exhibits focus on subjects ranging from current research and recent discoveries in natural history to the finest traditional and contemporary cultural arts. Burke Museum travelling exhibits, including a suite of three critical environmental issue-themed exhibits, are launched at the museum, where they are seen by campus and public audiences, and then each tours for at least three years to statewide and national sites. As of 2009, there were eight travelling exhibits in circulation. The Burke Museum electronically archives all past exhibits and presents subject-specific features online.

The Burke Museum also engages the broader community by hosting regular **Family Days, camps, cultural and community events, lectures and workshops**. Family Days focus on one division's collection, display many objects that are not typically available for public viewing and involve experts in interpretation for the public. The Burke Museum provides a suite of **summer camps** for elementary, middle and high school students. In 2009, the **Burke Circus** brought scientific specimens and educators to 11 Seattle Public Libraries for informal, interactive family programs as part of the libraries' Summer Reading Program. Programs for Girl Scout and Boy Scout badges in geology and birding are also available each year. **Lectures** are given by the most prestigious scientists in their fields, as well as established interpreters and chroniclers of the natural world and leading Northwest Native spokespersons and UW researchers. **Cultural events** include performances by leading Northwest Native artists and artist demonstrations of carving, weaving and other native crafts. **Workshops** include hands-on activities with visiting artists and an annual Environmental Writers Workshop, which, in 2009, featured award-winning authors Lyanda Haupt, Jourdan Keith and Coll Thrush.

The Burke Museum fosters connections between UW students and the broader community through its **Burke 101** program. This program enables UW students to share what they are learning in class through interactions with museum visitors in the galleries as part of their coursework.

The Burke Museum has developed a suite of K-12 student programs aligned with the Washington State Learning standards, in direct response to school district needs. It provides several types of facilitated **tours** for K-12 students. Led by museum educators, onsite programs highlight discovery-based learning with museum specimens and content-rich lessons for pre- and post-visit classroom enrichment. The museum has 62 **Burke Boxes**, which are portable collections of scientific specimens and cultural artifacts for all ages, along with comprehensive curricula designed to supplement the study of various topics in cultural and natural history. The **Burkemobile** brings interactive, object-based lessons into classrooms throughout Washington. Special programs, such as 2009's "People and the Environment," are also available for **homeschool** students and their families.

The Burke Museum provides professional development for K-12 teachers via frequent hands-on **educator workshops** geared towards elementary and middle-school teachers, as well as upper middle-school and high-school social studies classes. Workshops connect Washington K-12 educators with the Burke Museum, UW and community experts. Some educator workshops are open to the public.

The Burke Museum's **volunteer program** includes an element of **citizen science**, as volunteers are trained to collect, catalogue and maintain objects in the Museum's collection. The Burke Museum is an active partner with many organizations with similar missions, providing services ranging from curatorial advice for exhibits at the Pacific Science Center to meeting rooms for Seattle Audubon.

Resources Devoted to Research

Approximately half of Burke Museum resources are devoted to education and outreach. The Burke Museum currently has an education staff of 10 and two public outreach coordinators. Curators, collection managers and an extensive network of volunteers also support education and outreach efforts. Washington state provides about 45 percent of Burke Museum funding, although this funding was cut by 9.7 percent in 2009. Funding is also provided by endowments, gifts and revenue sources, including admission fees, facilities rentals and memberships. Grants fund exhibits and education programs.

Impetus for Outreach

Education and outreach are a core part of the mission of the Burke Museum. As a Washington State Museum, the museum is responsible for the state's collections of natural history and cultural heritage, and for sharing the knowledge that makes them meaningful. The Burke Museum plays a vital role as a translator between UW and the public.

Trends in Outreach

The Burke Museum has continued to develop and expand its education and outreach program in recent years, through initiatives such as the Traveling Exhibits Service, Burkemobile and Burke Boxes and events such as the Environmental Writers Workshop. Increasing the variety and frequency of educator workshops has helped to meet the need for more professional development for area teachers. The Burke Museum Web site has also become a useful education tool, making resources available for teachers and, through its Burke Kids Web experience and Burke Box interactive sites, providing an interactive educational experience for children. National museum trends in educational outreach show the need for expanding programs for families and adult learners, and the Burke Museum hopes to respond by increasing activities in these areas.

In recent years the Burke Museum has increased programming for general audiences, hosted more lectures and special events, added Family Days, which focus on mycology and mammalogy, and strengthened connections with producing partners across the region.

Outreach Priorities

With additional resources, the Burke Museum would focus on three areas: expanding field science day trips, multi-part classes, hands-on workshops and other programs for adults; developing specialized science, technology, engineering and mathematics programs, such as the UW/Burke Climate Quest summer program, that connect museum staff and UW faculty and students with high school and middle school students; and producing additional annual family programs and traveling exhibits that help the Burke Museum and the UW communicate science and cultural knowledge to the general public.

Centers for Ocean Sciences Education Excellence — Ocean Learning Communities

COSEE-OLC was established as a partnership among the UW College of Ocean and Fishery Sciences, UW College of Education and the Seattle Aquarium. It began in 2005 and is funded by NSF. The Ocean Inquiry Project (OIP) joined COSEE-OLC in 2008 after receiving a partnership grant from NSF. COSEE-OLC is actively building an ocean learning community made up of marine scientists, marine volunteer organizations, formal and informal educators and interested citizens. The COSEE-OLC team includes three primary investigators, an operations manager, two postdoctoral positions, one graduate student, one evaluator and other contracted part-time staff. Primary activities include cultivation and study of ocean learning communities, "inreach" to researchers, outreach to citizens and research and communications on learning science in diverse communities.

Ocean sciences education and outreach are at the core of COSEE-OLC's mission. This summary describes the primary outreach activities of COSEE-OLC. A separate summary in this document describes outreach activities of the OIP, a COSEE-OLC partner.

Types of Outreach

1. K-12 Education

Graduate students and upper-division undergraduates in the COS course teach in K-6 classrooms.

2. Informal Education

Events and workshops for the ocean learning community of scientists, marine volunteers, resource managers and educators, with networking opportunities and presentations on current ocean and marine research, strategies for communicating science, the latest research on how people learn science and other themes.

3. Presentations or Talks to Non-Scientific Audiences

Events and workshops include presentations and talks to non-scientific audiences.

4. Technical Assistance and Training

Outreach capacity building through training for scientists on communicating ocean sciences, consulting on the writing and implementation of broader impacts components of research proposals and delivery of the COS course for graduate and upper-division undergraduate students.

5. Policy-making and Management Support

None.

6. Communications

Quarterly newsletter.

7. Web-based Resources

Web site with social network of scientists, volunteers and educators.

8. Citizen Science

None directly; engaged in efforts with other organizations and institutions to catalyze citizen science discussions and networking; support scientists in developing proposals that include citizen science as outreach activities (additional information is contained in summaries for OIP and SoundCitizen).

Outreach Overview

Outreach is a core component of the COSEE-OLC mission. Outreach activities target three primary audiences: marine volunteers, scientists and educators. Primary outreach activities include:

- **public events** bringing together scientists, marine volunteers, educators and interested citizens to foster discussion and networking on communicating science, learning science, citizen science and marine science;
- **training** on communicating ocean sciences, how people learn science and effective science instruction;

- **consulting** on writing and implementing broader impacts components of research proposals;
- the COSEE-OLC **Web site**, where members of the ocean learning community can communicate and network and find relevant content on marine science, volunteering, teaching and learning; and
- a quarterly **newsletter**.

COSEE-OLC typically partners with other local organizations to hold a minimum of four events per year, attended by 150 to 170 people per event. The COSEE-OLC online community currently includes more than 100 scientists, volunteers and educators.

In addition to these primary outreach activities, graduate and advanced undergraduate students in the COSEE-OLC-cosponsored COS course learn about teaching and learning research and theory and gain hands-on teaching experience delivering **oceanography lessons in local elementary schools**.

Although COSEE-OLC does not directly offer citizen science opportunities (other than promoting participation in SoundCitizen), the program has been instrumental in providing venues for citizen science discussions and networking. For example, COSEE-OLC and its partners—Washington Sea Grant, Port Townsend Marine Science Center and the Puget Sound Partnership—organized a two-day workshop on *Exploring the Spectrum of Citizen Science* in April 2009. In addition, COSEE-OLC partners with OIP, which offers citizen science opportunities (described in the OIP summary in this document).

Resources Devoted to Outreach

All COSEE-OLC activities, research and evaluations support the outreach-focused mission of the program. The COSEE-OLC budget includes funding for outreach activities, learning-science research and program evaluation. The budget supports three project investigators (who devote 10-20 percent of their time to direct outreach activities), one full-time staff position, two half-time postdoctoral positions, one graduate student and other part-time staff.

Impetus for Outreach

COSEE-OLC is one of 12 national COSEE centers across the country with the goal of enhancing ocean sciences education. Its five-year competitive funding award from NSF is based on outreach and research activities designed to expand social networks by linking ocean science researchers with formal and informal educators, marine organizations, learning scientists, businesses and local government agencies. It builds on this social network by cultivating and studying interdisciplinary collaborations.

Trends in Outreach

COSEE-OLC is currently in the fourth year of the initial five-year NSF grant. As the awareness about COSEE-OLC has increased in communities of scientists, educators and volunteers, COSEE-OLC events and other outreach activities have become more popular, and events are often filled to capacity.

Outreach Priorities

With additional resources, COSEE-OLC would like to increase Web site maintenance capabilities and enhance the site to provide additional resources and opportunities for community networking capabilities.

COSEE-OLC is currently in the planning phase for the next five-year grant cycle. Future COSEE-OLC outreach activities will depend on continued funding from NSF.

Northwest Association of Networked Ocean Observing Systems

The Northwest Association of Networked Ocean Observing Systems (NANOOS) was created in 2003 as the Regional Association of the U.S. Integrated Ocean Observing System (IOOS) in the Pacific Northwest (primarily Washington and Oregon). Since then, NANOOS has integrated and built its Regional Coastal Ocean Observing System, composed of observing assets, data management and communications, modeling and products and education and outreach. As of 2009, NANOOS is a partnership of more than 40 entities including industry, state agencies, local governments, tribes, nongovernmental organizations and education institutions. Sponsored by NOAA, NANOOS provides coastal and ocean observational and model data and forecasts, decision-making tools and new applications for a variety of users, including mariners, fishermen, oil spill responders, port authorities, state resource managers, tribal authorities, fish and wildlife resource managers, coastal managers, local government planners, teachers, students and the general public. Development of products and services to address maritime operations, ecosystem impacts, regional fisheries and coastal hazards were prioritized based on extensive stakeholder and member input.

The NANOOS Governing Council is composed of one representative from each of the member organizations, currently providing roughly equal representation of four constituencies: academic, industry, nongovernmental organizations and local, state, federal and tribal agencies. Although NANOOS is not specifically a UW program, many UW faculty and staff are active in the association, and the executive director is a principal oceanographer in the UW's Applied Physics Laboratory.

Outreach activities are primarily organized by the education and outreach coordinator (a UW staff position) and the multi-institutional Education and Outreach

Committee. The User Products Committee is also heavily engaged in outreach.

Types of Outreach

1. **K-12 Education**

Classroom visits; curriculum, lesson plan, and learning tool development; teacher training.

2. **Informal Education**

Displays at aquaria and marine science centers.

3. **Presentations or Talks to Non-Scientific Audiences**

Public presentations on request to yacht clubs and other groups on request.

4. **Technical Assistance and Training**

Training for data user communities.

5. **Policy-making and Management Support**

Researcher briefings, demonstrations and consultation on areas of expertise (e.g., tsunami evacuations and hypoxia monitoring) upon request.

6. **Communications**

Brochure; biannual *NANOOS Observer* newsletter; researcher contact with media on topic-specific issues (e.g., ocean acidification and hypoxia).

7. **Web-based Resources**

Web site with data products, services and educational tools; "myNANOOS" feature allows users to customize settings according to interests.

8. **Citizen Science**

None directly; online data portal through Web site for citizen science data; citizen science opportunities through some NANOOS member organizations.

Outreach Overview

NANOOS provides coastal and ocean observational and model data, forecasts, decision-making tools, educational materials and new applications for a variety of users. NANOOS engages in outreach activities both to solicit information from potential users on priorities for data and product development and subsequently to inform users about available data and products. After extensive outreach to the user community via **workshops and meetings**, NANOOS has identified the following priority areas: maritime operations, ecosystem impacts, regional fisheries and coastal hazards. Within each of these priority areas, NANOOS identifies existing efforts, integrates these into the NANOOS **Web site** and works strategically to develop new efforts to meet user needs.

As of 2009, the Web site provides access to more than 50 coastal and ocean data products, including the Puget Sound Boater Information System, Columbia River Plume Forecasts, Tsunami Evacuation Route maps, NOAA Tide and Currents information and West Coast Wave Forecasts. These products provide information to a variety of users, ranging from captains of cargo ships to surfers and coastal managers. The NANOOS Visualization System provides a map-based interface that

allows access to regional ocean observing data, including: real-time and near-real-time observations from buoys, shore stations and coastal land-based stations; model forecast and satellite data; and shipboard cruise data. NANOOS outreach activities seek to inform potential users of products available through the NANOOS portal and continually seek input from users about future product needs. NANOOS also would like to provide a place for citizen science projects to share their data with user communities.

In addition to products and services available from the NANOOS Web site, NANOOS primarily engages in the following outreach activities:

- K-12 classroom presentations;
- delivery of curricula, lesson plans, learning tools and links to other education resources through the NANOOS Web site;
- data user community trainings;
- displays at informal education venues such as aquaria and marine science centers;
- public presentations;
- interacting with members of user communities at events such as the Salty Dogs Convention (predominantly recreational fishermen), COSEE-OLC citizen science workshop, annual meeting for shellfish growers, National Science Teachers Association regional meeting and Storming the Sound conferences; and
- a biannual newsletter and fact sheets.

NANOOS researchers are often called upon to provide **expertise**, briefings and demonstrations on coastal and ocean issues such as tsunami evacuations and hypoxia monitoring. They occasionally provide information to the **media** on coastal and ocean issues.

NANOOS also partners with the Northwest Aquatic and Marine Educators Network, Seattle Aquarium, Hatfield Marine Science Center, Pacific Science Center and other education and outreach-focused organizations.

Resources Devoted to Outreach

NANOOS is funded by multiple grants from NOAA. Grant funding is devoted to program administration, outreach and education activities and research and data/product services by 24 NANOOS researchers. The education and outreach specialist is an 80 percent position.

Although all NANOOS resources ultimately go toward outreach, in that products and information integrated and developed by NANOOS are used by the broader community, education and outreach activities are specifically supported by relatively modest components of the Regional Association and Regional Coastal Ocean Observing System grants from NOAA.

Impetus for Outreach

NANOOS is the Pacific Northwest regional component of IOOS, which evolved out of a recognized need for a user-driven system that would provide access to coastal and ocean data and products. At the national level, Congress and the National Ocean Research Leadership Council promoted this need in the late 1990s. In 2009, President Obama signed into law the U.S. IOOS authorization. On a regional scale, NANOOS has embodied this strong and vibrant inclusivity of stakeholders as designers, operators, developers and beneficiaries of the NANOOS system.

As a program focused on meeting user needs for data and information, outreach has always been integral to NANOOS and has helped gain information about the needs of the various user communities. In addition, outreach is critical in informing user communities about products and services available through the program.

Trends in Outreach

NANOOS membership has grown from 25 organizations in 2003 to more than 40 in 2009. The number of available data products, services and educational materials has increased substantially since NANOOS's inception and is anticipated to continue to grow.

Outreach Priorities

With additional resources at the UW, NANOOS would like to offer fellowships for natural and social science students to work on a range of projects—for example, developing products in important areas (such as ocean acidification), conducting assessments of product and service applicability with user communities, completing cost-benefit analyses and evaluating the effectiveness of the NANOOS Web site.

Ocean and Coastal Interdisciplinary Science GK-12 Program

OACIS GK-12 is based in FHL, the Biology Department, SAFS and Oceanography. OACIS GK-12 is funded by NSF and is part of the national NSF Graduate STEM Fellows in K-12 Education program that supports fellowships and training for graduate students in these disciplines.

Through the OACIS GK-12 program, graduate student fellows are paired with high school teachers and their classes in the Seattle (urban) and San Juan County (rural) public schools. Graduate fellows gain teaching experience and provide marine science content expertise for K-12 teachers and their classes. To date, the OACIS GK-12 program has included graduate students from the UW's Biology, SAFS, Oceanography and ESS programs.

Types of Outreach

1. K-12 Education

Instruction in best practices in high school science teaching curriculum development for OACIS GK-12 fellows, including hands-on activities, demonstrations and presentations in K-12 classrooms; workshops for OACIS GK-12 fellows and teachers.

2. Informal Education

None.

3. Presentations or Talks to Non-Scientific Audiences

Presentation of research by OACIS GK-12 graduate student fellows to participating teachers during summer workshops; occasional presentations about the program to other audiences by graduate students, teachers and students.

4. Technical Assistance and Training

Outreach capacity building through workshops, seminars and courses for OACIS GK-12 fellows focused on best practices for high school science teaching.

5. Policy-making and Management Support

None.

6. Communications

UW *University Week* article about program.

7. Web-based Resources

Web site with program information, biographies of fellows and teachers and links to additional resources.

8. Citizen Science

None directly; partners with the OIP to offer boat-based experiences for OACIS GK-12 program classrooms; SoundCitizen curriculum piloted in OACIS GK-12 classes; majority of OACIS GK-12 classes participate in SoundCitizen sample collection.

Outreach Overview

The primary objective of the OACIS GK-12 program is to facilitate and support partnerships between graduate students and K-12 teachers, to provide professional development for teachers and graduate students and to increase and improve marine and coastal curriculum in K-12 classrooms. The program pairs eight **graduate student fellows** with eight Seattle and San Juan County **public school teachers** each year. Fellows develop **curricula, hands-on activities and demonstrations** and work 10 hours per week in the **K-12 classroom**. The graduate student fellows are expected to support the K-12 teacher with marine and coastal expertise, and the K-12 teachers are expected to assist the fellows with teaching skills and pedagogy.

OACIS GK-12 fellows and teachers attend two one-week summer **workshops** to set the stage for collaboration during the school year, introduce themes for use in the classroom and have shared marine research experiences. The graduate student fellows participate in a **biweekly seminar** to work on teaching and learning and share experiences. Fellows also take a course on **best practices in high school science teaching**, offered by Oceanography.

While K-12 outreach is the predominant focus of the OACIS GK-12 program, participants are also encouraged to give **presentations** about their work in various venues. In addition, the **Web site** includes program information, biographies of fellows and teachers and links to additional resources. The OACIS GK-12 program does not directly offer citizen science opportunities, but it does partner with the OIP to offer boat-based **citizen science** data collection opportunities for OACIS GK-12 classroom use. A majority of OACIS GK-12 classes participate in sampling for the SoundCitizen citizen science program, and the high school-level SoundCitizen curriculum is being piloted in OACIS GK-12 classrooms. The program has received limited media attention with an article in *University Week*.

Resources Devoted to Outreach

The OACIS GK-12 program provides funding for eight graduate student fellows and eight teachers each year. Fellows work directly in the classroom 10 hours per week throughout the academic year. The OACIS GK-12 staff (three faculty, one part-time program manager and two coordinators) coordinates and runs the workshop for fellows and teachers. Some funding is available for classroom activities.

Impetus for Outreach

The three faculty (from FHL, SAFS and Oceanography) applied for OACIS GK-12 funding to provide support for graduate students to gain teaching experience in the K-12 environment and strengthen ocean and coastal curriculum in local schools.

Trends in Outreach

The OACIS GK-12 program is only in the second year of the five-year grant. Therefore, no trends are apparent yet.

Outreach Priorities

With additional resources, the OACIS GK-12 program would like to increase compensation to teachers who participate in the program, improve the program Web site and provide additional support for graduate students to engage in other outreach and education activities.

Ocean Inquiry Project

OIP is an independent nonprofit organization connecting researchers, teachers and students through scientific inquiry on Puget Sound. OIP offers oceanographic education and data-collection cruises for K-16 classes and community groups, including marine volunteers and after-school programs. While not officially a UW program, OIP was founded in 1999 by Oceanography graduate students who recognized the power of boat-based learning opportunities for students using an inquiry style of instruction and the need to increase oceanographic sampling in Puget Sound. Fritz Stahr, manager of the Seaglider Fabrication Center in Oceanography, is a co-founder and current president of OIP. OIP clients include the UW (Seattle and Tacoma campuses), the University of Puget Sound, the Evergreen State College, many community colleges and high schools, a middle school and COSEE-OLC-related groups. Science partners include the UW, the Washington State Department of Ecology (Ecology), the King County Department of Natural Resources, the Puget Sound Naval Shipyard and COSEE-OLC.

Types of Outreach

1. K-12 Education

One-day oceanographic cruises with training in oceanographic data collection for all levels of students.

2. Informal Education

One-day oceanographic cruises for the public, including beach naturalists and other groups; displays at events.

3. Presentations or Talks to Non-Scientific Audiences

Presentations provided occasionally upon request.

4. Technical Assistance and Training

None.

5. Policy-making and Management Support

None.

6. Communications

Program brochure; some print media coverage; documentary on Franklin High School students' experience on an OIP cruise.

7. Web-based Resources

Web site with cruise information, poster and classroom presentations, photos and links to Puget Sound data/models and other Puget Sound oceanography and education resources.

8. Citizen Science

One-day oceanographic cruises on Puget Sound, including hydrographic sampling, plankton tows and water quality sampling.

Outreach Overview

OIP provides groups the opportunity to participate in real-world, boat-based oceanographic data collection in Puget Sound. OIP staff work with scientists (from UW, Ecology, etc.) to select observation stations and data collection priorities. OIP participants learn about the marine environment and become scientific partners by contributing data to research projects and long-term databases, including the Puget Sound Regional Synthesis Model (PRISM) and Puget Sound Marine Environmental Monitoring (PSMEM).

OIP's primary outreach activity is **citizen science** conducted aboard its cruises. Cruise participants include **K-16 students, community groups** such as beach naturalist programs and **conference and workshop participants** (e.g., COSEE-OLC, Port Townsend Marine Science Center, Washington Sea Grant, Puget Sound Partnership Citizen Science Workshop). Through the cruise opportunities, participants receive training in oceanographic data collection methods, including hydrographic sampling, plankton tows and water quality sampling. Most cruises also include a live-feed video from SCUBA divers at the end of the cruise, enabling participants to see habitat and wildlife below the surface.

Additional outreach activities include efforts to raise awareness about the program through **posters** at conferences, a **brochure, annual reports**, the program's **Web site** and occasional **media coverage**. In addition, a **documentary movie** was created on Franklin High School students' experiences on an OIP cruise and with other water-based activities.

Resources Devoted to Outreach

OIP is funded by grants and private donations. Funders include the National Ocean Partnership Program, The Russell Family Foundation, NSF and individuals. The annual operating budget of OIP is \$40,000-\$50,000, supporting limited staff salary (part-time program director and president), oceanographic sampling equipment and maintenance and cruise expenses. Volunteer cruise instructors include UW graduate and undergraduate students, UW staff, NOAA scientists and others. A grant from The Russell Family Foundation in 2003 funded a workshop for parties interested in marine science education on Puget Sound. Starting in 2008, OIP became a partner with COSEE-OLC with funding from NSF to increase outreach opportunities in the ocean learning communities around Puget Sound. Ultimately, all OIP resources are devoted to offering oceanographic cruise opportunities and increasing awareness about the marine environment through observation.

Impetus for Outreach

OIP was founded with the understanding that experience is a powerful instructional medium, as well as one that can galvanize opinion. The founders recognized the lack of experiential, on-the-water education opportunities and the need for additional oceanographic sampling in Puget Sound. OIP fills both of these gaps and has made outreach to all those interested in the ocean central to its mission. OIP provides the opportunity for students, teachers and the public to experience first-hand oceanography research in Puget Sound. Additional outreach activities, such as presentations and the Web site, are intended to increase awareness about OIP cruise opportunities.

Trends in Outreach

OIP has offered more than 125 cruises since the program started in 1999. Most years typically include about 10 cruises, but the COSEE-OLC partnership will increase that for 2009-2011. Over the years, OIP has noticed an increased interest in teaching about the effects of land use changes in coastal communities on Puget Sound. Partly in response, OIP has recently incorporated SoundCitizen sample collection into cruise activities.

Outreach Priorities

With additional resources, OIP could focus on two specific priorities: increasing access to OIP data and improving the program Web site.

OIP data are currently archived on an OIP disk and can be requested by anyone. However, they should be made available to all through submission to the following: PRISM DataStream, PSMEM database and NANOOS. OIP would like to enhance data access and visualizations on its own Web site for current and former OIP students, cruise participants and potential data users such as the Modeling the Salish Sea project at the UW.

The OIP Web site is currently maintained by the program director. However, this part-time staffer does not have enough time for upgrades to allow data serving and other Web site enhancements (e.g., on-line donations). With additional resources, OIP would invest in additional staff capacity for these tasks.

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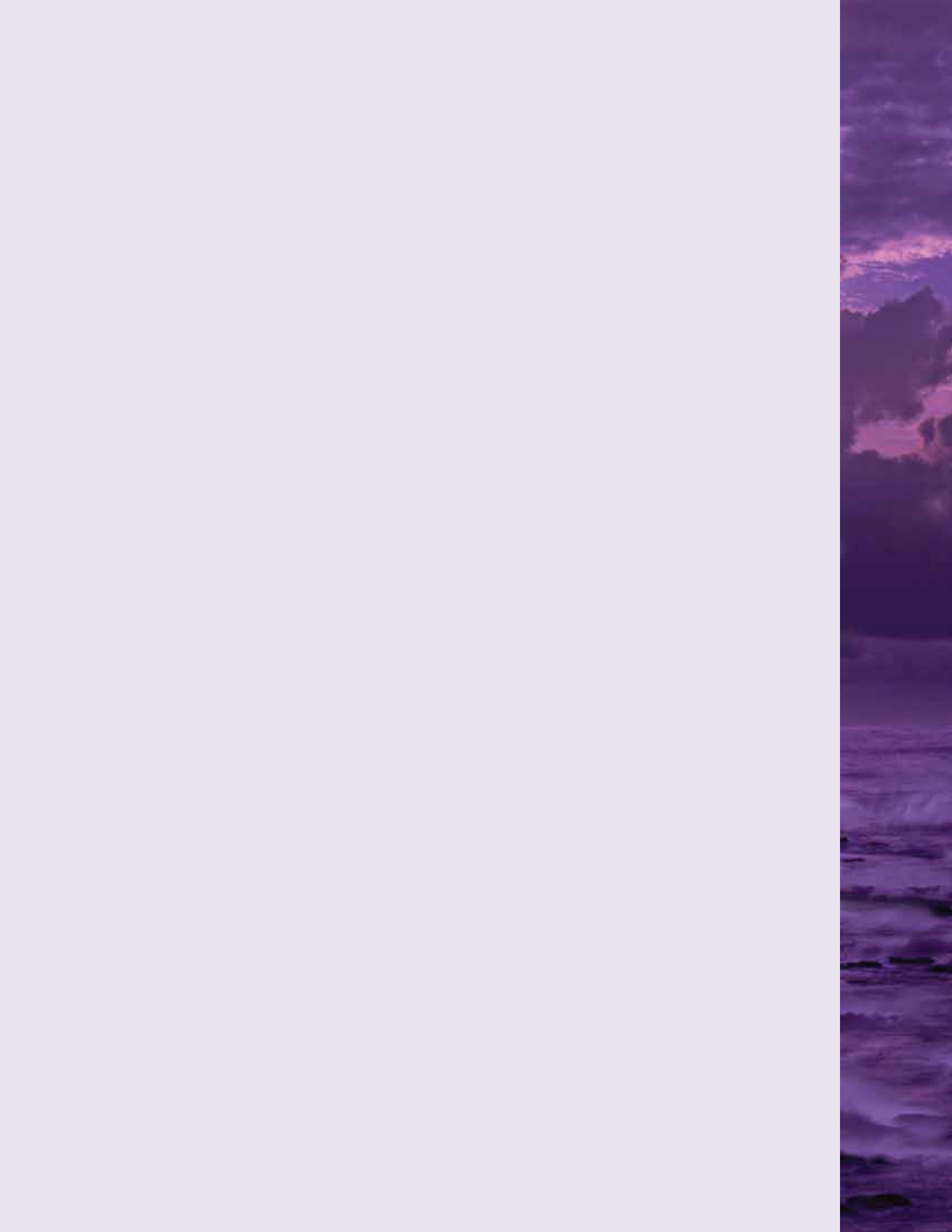
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