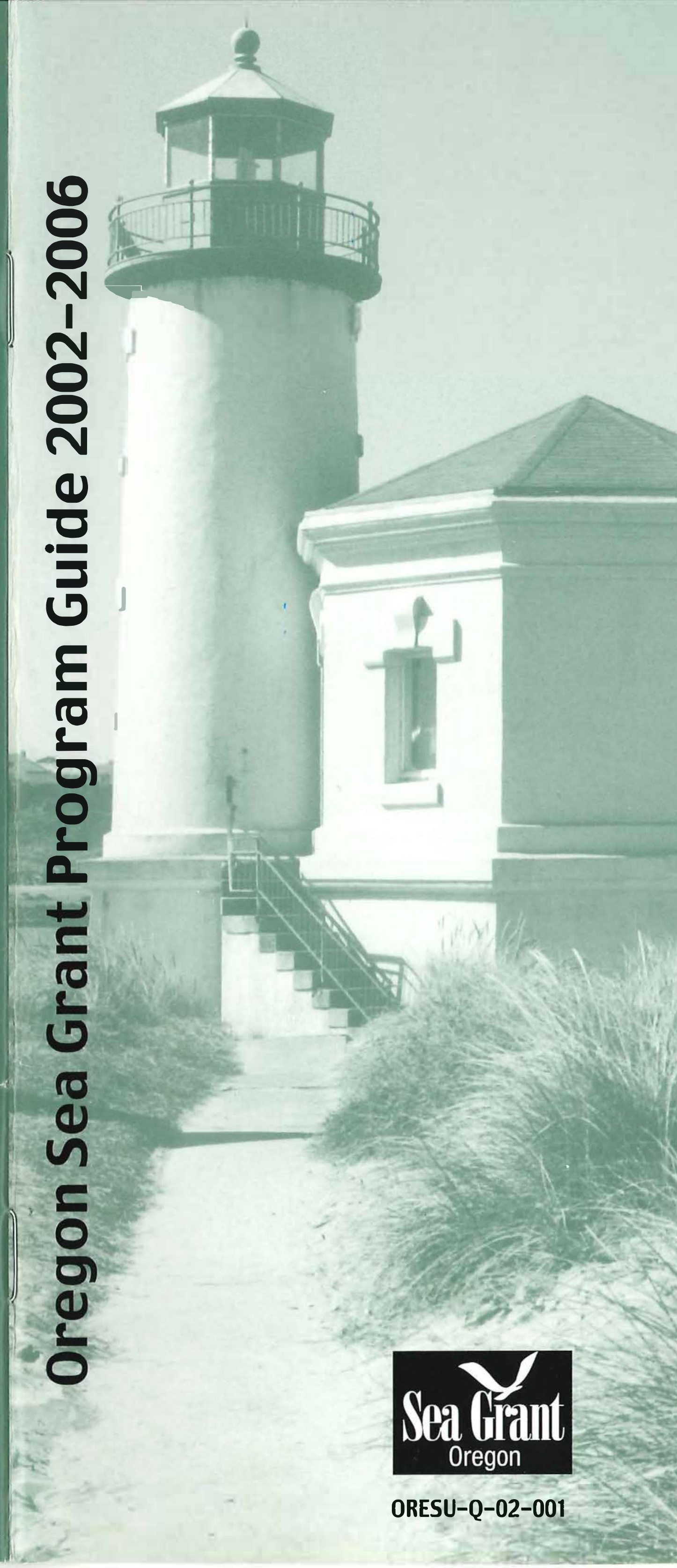
Oregon Sea Grant Program Guide 2002–2006



Sea Grant
Oregon

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Oregon Sea Grant Program Guide 2002-2006

Oregon Sea Grant
Corvallis, Oregon

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Sea Grant is a unique partnership with public and private sectors, combining research, education, and technology transfer for public service. This national network of universities meets the changing environmental and economic needs of people in our coastal, ocean, and Great Lakes regions.

OREGON STATE UNIVERSITY

Contents

For more than three decades, Oregon Sea Grant has made significant contributions to the rational management, use, and conservation of coastal and marine resources. Sea Grant research, outreach, and communications products bring the best available science to bear on matters important to coastal communities, people, and the environment. Despite the program's modest size, it has identified needs, found ways to leverage other resources, and partnered with others to improve the coastal well-being of Oregon, the Pacific Northwest, and the nation.

For more information, see our Web page at http://seagrant.orst.edu.

Administration

Besides overseeing the entire Oregon Sea Grant program, Sea Grant Administration also conducts two alternating-year fellowship programs (M/A-16), which provide graduate students with opportunities to develop working knowledge of coastal and marine issues, management, and policy processes through assignment to either the Oregon legislature or one of the state's natural resource agencies.

Through its program development funds (M/A-2), Sea Grant also provides rapid response to unforeseen problems and opportunities. Modest program development grants are available to support research projects that arise outside the program's normal funding cycle or special requests for research-related conference and travel fees.

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Research

Sea Grant provides competitive, peer-reviewed grants that allow top ocean and coastal researchers to apply their skills to issues of critical importance to the state, the region, and the nation. Over the years, the program's funding emphasis has changed to meet and anticipate the region's changing needs. Urgent issues - the decline of once-abundant fisheries, the challenges posed by coastal population growth, the heightened awareness of invasive species - help propel Sea Grant's research priorities as the program strives to put limited resources where they can do the most good.

Economic Leadership

Coastal Economic Development

Locating Possible Late Pleistocene and Early Holocene Prehistoric Sites on Oregon's Southern Coast (R/CC-04)

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Roberta Hall and her associates are using a combination of the latest technology and local lore to try to answer some long-standing questions: How did the first humans get to the Oregon coast, and when? The long-dominant model of the history of human life in North America-that a single over-land migration led to the earliest colonization of the continent-is being reconsidered by scientists like 'Hall, who suggest it is possible that small groups of wayfarers made their way around the Pacific Rim in small boats, foraging along the western coast of North and South America.

Changing geology and rising sea level have drowned most of the coastal landscapes that would hold evidence of such early settlement. But there are a few places where tectonic uplift has preserved ancient marine terraces, dunes, and estuaries dating as far back as the late Pleistocene. Riverine landforms farther inland could have been used by coastal migrants in search of resources. Hall and her team, which includes earth scientists, archaeologists, and the cultural resource branch of the Coquille Indian Tribe, are trying to locate areas of the southern Oregon coast where such ancient landforms still exist and look there for evidence of early human habitation.

Biotechnology

DNA Vaccines for IHNV-Development of a Suicide Vector (R/BT-36)

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Jo-Ann Leong is known worldwide for developing genetically based vaccines for the treatment of fish diseases, which can be devastating to aquaculture operations. Through years of research, her team has developed an effective, DNA-based vaccine for hematopoietic necrosis virus (IHNV), a particularly troublesome fish killer. The aquaculture industry is eager for the creation of recombinant vaccines for

managing diseases that cannot be controlled with antibiotics or traditional vaccines. However, public acceptance of animals vaccinated with naked DNA is problematic, with consumers worried that persistent DNA in the animals might be harmful.

To meet this concern, Leong and her team are seeking to create a DNA vaccine with a "suicide vector." Once the vaccine triggers the viral gene that produces the protection against IHNV, the suicide vector will trigger a second response, prompting the animal's system to eliminate the DNA vaccine from its body.

Use of Green Protein (GFP) Fusions to Study Colonization and Tissue-Specificity of Virulence Gene Expression During Infection of Salmonids with *Vibrio anguillarum* (R/BT-37)

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Many of the genes that pathogenic bacteria use to cause infection have been identified. However, the stages of infection and specific tissues in which each of these individual genes is expressed remains a pressing question.

Jorge Crosa will use the fish pathogen *Vibrio angutllarum* and its native host, salmonid fish, as a model to identify the timing and pattern of the expression of these genes during infection. In this three-year study, Crosa will use molecular-genetic methods to create *Vibrio anguzllarum* strains that are genetically engineered in a way that allows the activity of specific virulence-gene promoters (the genetic elements that control gene expression) to be directly measured using fluorescence microscopy. These "tagged" bacteria will then be used to infect salmonid fish at Oregon State University's Salmon Disease Laboratory, and gene expression will be monitored throughout the infection process. The study is expected to provide useful information on the tissue specificity and timing of virulence-gene expression during the infection process, which will in turn provide important insights into the roles of each of the genes in the study.

Revitalize Commercial Fisheries

Developing Best Management Practices for Exploited Marine Ecosystems (A/RCF-10)

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How are West Coast fisheries being managed and regulated, and what would be the best practices for improving that management? These questions, of vital importance to maintaining and restoring Pacific fisheries, are the target of Susan Hanna's research.

Hanna, a recognized national and international expert in fishery economics, believes the key to enhancing fisheries management is to develop a "best practices" prototype for ecosystem management for the Pacific groundfishing industry. To do that, she first will look at current management and regulations, how they developed over time, and how effective they are now. From there she will look at institutional incompatibilities and the relationship between groundfish ecosystems and regulations.

Using this information as a benchmark, she will identify best practices as applied in agriculture and natural resources to develop prototype best-management practices for marine ecosystems to improve fishery management. The final step will be to develop publications and other materials to promote those practices within the industry.

Minimizing Bycatch Related Mortality and Predicting Long-Term Survival in Sablefish (R/RCF-11)

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Determining factors that lead to bycatch mortality in sablefish could be an important benefit to the commercial fishing industry. By simulating the capture and handling of sablefish in a range of temperature and time settings, Carl Schreck and his team hope to compare how the physiological indices and behavioral responses affect the survivability of the fish. Their conclusions, which will be compared with those obtained during actual harvest, should have a direct and immediate importance to the fishery industry. In addition to finding out more about the link between physiological measures and fish survival, the work should provide a basis for management of coastal fisheries by allowing prediction of the impact on fisheries where sablefish are part of the incidental catch. Risks from such temperature variables as fishing season or El Niño could be reduced.

Sustainable Aquaculture

Early Assessment of Maturity and Sex in Salmonids by Non-Invasive Short Wavelength Near Infrared Spectroscopy (R/SAQ-05)

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Proper rearing of captive broodstock of spring chinook salmon requires early determination of maturity and sex, but the amount of handling now required to make those determinations can be

stressful to the fish. At Eastern Oregon University, Anna Cavinato is developing a technique to make that determination without having to handle the fish extensively.

Beginning with the spawning cycle in spring 2002, Cavinato and her team will collect the near-infrared spectra of anesthetized spring chinook salmon from the Grande Ronde Basin Captive Broodstock Program. They will do this by placing a fiber optic probe in direct contact with the skin and scales. By learning the optimal point on the fish for placing the probe and gathering data, they will develop a calibration model that will let them easily and quickly distinguish maturing from nonmaturing fish and males from females. This technique will allow early and accurate segregation of fish, reducing the number of times the fish will need to be handled and the amount and expense of feed required, among many other benefits.

Seafood Science and Technology

Water Re-Use and Nutritional Evaluation of Solids Recovered from Surimi Processing by a Coagulation/Ultrafiltration Combination (R/SF-29)

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J. Antonio Torres is continuing his work with chitosan, a versatile substance extracted from the shells of crustaceans with promising uses in waste management, medicine, food processing, and biotechnology. The substance is useful for separating solids from liquids, especially when natural compounds are demanded.

In this project, Torres and his team are studying two alternatives for surimi wastewater treatment. In one, surimi wastewater proteins will be recovered by coagulation with chitosan-alginate to obtain coagulated solids for animal feed, with the remain-ing liquid treated with ultrafiltration to obtain water for surimi processing. In the second, proteins will be recovered for incorporation into the surimi. The remaining proteins will be recovered for animal proteins.

The study will compare both the technical feasibility of the two processes and the potentially rich economic rewards of recovering proteins for incorporation into surimi and animal feed and the recovery of water.

Coastal Ecosystem Health and Public Safety

Coastal Ecosystems

Juvenile Salmon Rearing in Restoring Wetlands of the Salmon River (R/ECO-02 [C])

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On the surface, it would seem obvious that breaching dikes to allow the tides to flow back into historic estuarine marshlands would be an option for restoring large coastal wetlands. Such a strategy could potentially return large tracts of land to their role as productive habitats for juvenile salmon. However, few studies have been conducted to determine the effectiveness of the strategy and what other factors are involved.

This study expands upon previous research documenting the dynamics of fish movement and residence times through the Salmon River estuary and among restored and recovering marsh habitats. This phase of the project will use indicators of salmon life history, growth, and survival to evaluate the benefits of marsh restoration to salmon. Research results should be useful to watershed recovery programs throughout the Pacific Northwest by providing information on the importance of estuary habitat to salmon.

Are Algicidal Bacteria Important in Controlling Phytoplankton Blooms in Oregon Coastal Waters? (R/HAB-01)

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Harmful algal blooms, already a source of much attention in the Eastern U.S., also represent a serious problem on the Pacific coast, where paralytic shellfish poisoning and domoic acid outbreaks have been traced back to the days of early settlers and coastal Indians. Although the ecophysiology of such blooms has received intense scrutiny, little has been done to explore the role that marine bacteria play in natural control of these outbreaks. Yet from a purely theoretical perspective, bacteria seem to have both the means and the opportunity to influence the course of algal blooms. Researchers already know, for instance, that marine bacteria produce chemicals that are toxic to marine algae.

Stephen Giovannoni is continuing to pursue this question at its most basic levels, identifying which

bacteria co-exist with natural phytoplankton blooms along the Oregon coast, and then isolating them and screening for compounds that affect algal metabolism. Finally, he will investigate the chemistry of those compounds. The investigation will provide fundamental insights into the coastal food web and could lead to better methods for predicting and controlling harmful algal blooms.

Sustainable Harvesting Levels for Intertidal Species of Marine Algae (R/ECO-13)

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Before you can decide how to protect a resource, you have to know how much of it there is and how much can be removed before its ability to recover is impaired. Those are the first steps of a study to guide harvesting of marine macroalgal resources.

The Oregon Parks and Recreation Department is responsible for protecting ocean shore resources and regulating their public use. The department, in partnership with the Oregon Institute of Marine Biology, will study the biomass and diversity of intertidal algal resource, determining what level of removal can be sustained and what effect different harvesting times and techniques might have.

The results of the three-year study will establish guidelines for the development of a new maritime industry.

Salmonid Use of Restored Estuarine Wetlands: Regional Application of the Salmon River Estuary Study (R/ECO-14)

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Interest in restoring salmon habitat in coastal watersheds throughout the Pacific Northwest has increased markedly in the face of declining Pacific salmon runs. Because many salmon populations live in estuaries for an extended period before migrating to sea and use estuarine marsh channels as nursery habitats, there is interest in restoring salt marshes to promote salmon recovery.

This research project is designed to answer important questions about landscape and habitat factors in estuaries that affect salmon habitat use and performance. The research will evaluate whether the results from the ongoing Salmon River

project can be applied broadly to the diversity of estuaries and wetland-habitat conditions found along the Oregon coast.

Sustainable Development

Testing Fecal Source Discrimination in Water Using Molecular Markers from Bacteroides (R/SD-07)

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Animal and human feces are a troublesome source of pollution in some coastal estuaries, including Tillamook Bay, an area rich with dairy farms. Fecal pollution poses significant human health risks and also threatens the area's shellfish industry. But it's often difficult to tell whether the pollution is coming from cows or humans, and controversy over that question has blocked many efforts to correct the problem.

Katharine Field has developed a new method of tracking fecal sources, using biotechnology to identify genetic fingerprints of fecal bacteria found in Tillamook Bay. Unlike previous methods, these tests have the advantage of speed. They do not rely on growing indicator organisms but measure the gene patterns directly from water samples. Field is working with the Tillamook Bay National Estuary Project, which routinely samples and monitors the bay, to see if her tests can show exactly where these fecal markers are turning up, and when.

Understanding the Role of Knowledge in Public Support of Salmon Restoration and Sustainable Pacific Fisheries (R/SD-08)

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Restoring native salmon runs in Oregon and building sustainable fisheries in the Pacific North-west are issues that are having a direct impact on the lives of many Oregonians. These issues have been and will continue to be the subject of lively, some-times contentious, public debate. In the belief that the course of that debate should be directed by good scientific information, Steel and Lach are embarking on a study to learn how much the public knows about salmon restoration and how it learned what it knows.

They will study the level of policy-relevant knowledge among different groups of Oregonians, what their primary or most-trusted sources of information are, which sources provide higher levels of relevant knowledge, and how the media shape the public agenda. They also will look at the relationship between a high level of relevant knowledge and the attitudes supporting public policies aimed at restoring salmon and sustaining Pacific fisheries.

The researchers believe their study can have a direct impact on the debate, identifying the most trusted sources of information among different groups in the state. The data from the study would allow relevant information to be targeted to specific groups, raising the level of discourse.

Paleosol Aquitards, Geotechnical Properties and Groundwater Redox-Geochemistry of Stratified Dunal Deposits: Applied Research for the Sustain-able Development of Dunal Landscapes in Coastal Plains (R/SD-09)

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In work that could have a profound impact on development all along the Oregon coast, geologist Curt Peterson and his team are mapping and analyzing prehistoric dunes that mantle much of the coastal plain and abutting foothills within the Pacific coastal zone.

For the last half century, geologists have assumed that west coast sand was pushed ashore by rising sea levels during the late Pleistocene (80,000-120,000 years ago) and the mid- to late-Holocene (back to 7,500 years ago). These assumptions have helped shape much of what was thought about coastal sand deposits, their origins, and their predicted stability. But recent research is casting doubt on those assumptions.

It turns out that as much as 50 percent of the Pacific coastal plain is mantled by paleodune sheets, sand formations with unique geological and hydrologic properties derived from alternating layers of unconsolidated sand and ancient, clay-rich soil horizons (paleosols). The dunes climbed inland one to three miles and up to elevations of several hundred feet. Roads, pipelines, residences, and other infrastructures are built on these prehistoric dunes, which are rarely recognized as such because of forest cover, but which have a significant effect on their stability.

Peterson and his team have mapped and dated most of the prehistoric dune sheets. Future work will involve subsurface imaging by ground-penetrating radar, slope stability analysis, and ground-water monitoring from shallow wells. The result of this work will help demonstrate the role the dunes play in forming dunal lakes and wetlands, drinking water aquifers, buildable sites, active dune environments, beach erosion, and archaeological sites, among others. Their goal is to build a framework of understanding about the fundamental nature of the paloedunal landscape as it relates to sustainable development of the coastal plain.

Extension

Extension is Oregon Sea Grant's outreach arm, bringing the vast resources of research and higher education to bear on real-world issues facing coastal residents, businesses, and communities. Extension Sea Grant marine agents, based at coastal offices of the OSU Extension Service, deliver advice, assistance, and informal education as local issues and needs arise, in areas ranging from watershed restoration to invasive species. Specialists and educators, based on campus or off, focus on subjects of broader concern: watershed and ecosystem health, marine fisheries, community development, and seafood, for example. Together, they form a team that helps coastal residents, communities, and policymakers look at problems and find the right tools to solve them.

For up-to-date information about individual agents, specialists, and educators, and their projects and fields of expertise, see http:// seagrant.orst.edu/ extension.html.

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Extension Agents, Specialists, and Educators

Extension marine agents are stationed in county offices of the Oregon State University Extension Service and affiliated with academic departments on the OSU campus. Each agent is responsible for developing and delivering outreach and informal education programs to meet local needs and issues. Agents also serve statewide clientele with their own areas of expertise, ranging from marine safety to watershed restoration. ESG specialists and educators focus on topical issues of statewide or regionwide importance. They provide support to Extension Sea Grant agents, conduct academic research, and develop practical, specialized information for use by the industry, agencies, and the public.

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Projects and specialties: community development; public policy education, organizational skill build-ing and leadership training (especially for water-shed councils); workshop design and facilitation, consensus decision making, and conflict resolution

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Projects and specialties: marine trades and coastal recreation, coastal visitor information technology, port and harbor executive training, recreational boater safety education, coastal enterprise E-commerce innovations; low power AM radio, World Wide Web applications, virtual e-mail community development, and other innovative information technologies

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Projects and specialties: oyster and shellfish culture, aquaculture, water quality, marine recreation, general public marine education, and Tillamook Bay National Estuary Project

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Projects and specialties: watershed management, stream ecology, salmonid habitat, and fish behavior

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Projects and specialties: fishing families and communities; marine vessel safety

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Projects and specialties: Watershed Stewardship Education Project

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Projects and specialties: coastal zone management; estuarine restoration; coastal hazards management; GIS in ocean and coastal management; director, Marine Resource Management graduate program. Projects include Reducing Earthquake-Tsunami Hazards in Pacific Northwest Ports and Harbors, Netarts Littoral Cell Management Plan Pilot Project, and Watershed Stewardship Education Project.

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Projects and specialties: marine economics, change in fishing communities and regions, the economic history of U.S. fisheries, and the impact of access limitations

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Projects and specialties: educational research, marine science educational programs, and exhibits and interpretive material at OSU's Hatfield Marine Science Center

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Projects and specialties: coastal watershed restoration, and commercial fisheries limited entry and management. Member, Coquille Watershed Association, Pacific States Marine Fisheries Commission, and Pacific Fisheries Management Council Habitat Steering Committee

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Projects and specialties: aquatic ecosystem health, Oregon Watershed Weeks, aquatic invasive species, and oil spill prevention and management

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Projects and specialties: control of histamine production in Albacore tuna; federal seafood guidelines, e.g., Hazard Analysis and Critical Control Point (HACCP) technology and value-added seafood products (smoked fish, etc.). Member: National Sea Grant HACCP Seafood Alliance

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Projects and specialties: riparian plant communities, passive restoration (discontinuing damaging practices as a way to restore watersheds), and watershed awareness

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Projects and specialties: Kolbe serves Sea Grant programs and constituents in Oregon, Washington, and Alaska. His specialties: seafood thermal process engineering (chilling, freezing, cold storage, cooking and pasteurizing); onboard refrigeration and storage; energy conservation in seafood processing; electrical heating of foods

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Projects and specialties: water-quality monitoring, riparian restoration, and watershed awareness

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Projects and specialties: marine mammal conservation and management policy and practice, including public education programs and research to identify the critical habitats of endangered whales (areas of breeding, feeding, calving, and migration); strandings and marine mammal-fishery interactions

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Projects and specialties: program coordinator, Watershed Stewardship Education; coordinating watershed council trainings; chair of outreach and education for Marys River Watershed Council

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Projects and specialties: marine education offerings for teachers and students, watershed education and water quality monitoring, Global Environmental Issues (GLOBE Program Franchise), marine science day camps, and aquatic programs for youth groups

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Projects and specialties: fisheries management and salmon issues, fisheries enhancement, and marine safety

Communications

Getting research-based information to people who can use it: that's the purpose of Sea Grant Communications. This team of professionals uses every tool at its disposal - from print to audio and video to the World Wide Web - to inform the public, near and far, about important issues, fascinating facts, and scientific discoveries that affect the oceans, the coast, and the creatures and people who depend on them.

The Communications staff also supports researchers, Extension faculty, the HMSC Visitor Center, and the rest of the program in meeting Sea Grant's mission and collaborates with state and federal partners on projects to benefit the public.

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HMSC Visitor Center

The Visitor Center at OSU's Hatfield Marine Science Center in Newport offers visitors young and old a chance to learn more about the ocean and coastal environment, often through the work of marine researchers based in the HMSC' s own labs. From hands-on exhibits to classes for children - and for those who teach children - along with whale-watch programs, nature walks, lectures and seminars, and summer programs for entire families, the Visitor Center provides a window on Oregon's ocean for visitors of all ages.

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Advisory Council

Oregon Sea Grant's Advisory Council helps ensure that research and outreach programs address the real needs and priorities of Oregon and its coastal communities, businesses, and policymakers. Council members, appointed to three-year terms, meet periodically to help set program priorities, offer advice on specific plans and research proposals, and give counsel to the program's administrative staff.

Don Barth
Lincoln Security Bank Board of Directors; Oregon's Salmon Restoration and Production Task Force

Kirk Beiningen
Retired, Oregon Department of Fish and Wildlife

Anne Berblinger
Economic Development Administration, U.S. Department of Commerce

Ralph Brown
Commercial fisher; member, Pacific Fisheries Management Council

Ellie Dumdi
Retired, Lane County Board of County Commissioners

Nancy Leonard
Former member, Lincoln County Board of Commissioners; Oregon Water Resources Commission

Fran Matthews
Owner and operator, Marine Discovery Tours

Bob Montgomery
Former member, Oregon House of Representatives; former manager, Port of Cascade Locks

Willa Nehlsen
U.S. Fish and Wildlife Service

Merritt Tuttle
Retired, National Marine Fisheries Service

Allan Rumbaugh
General manager, International Port of Coos Bay

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