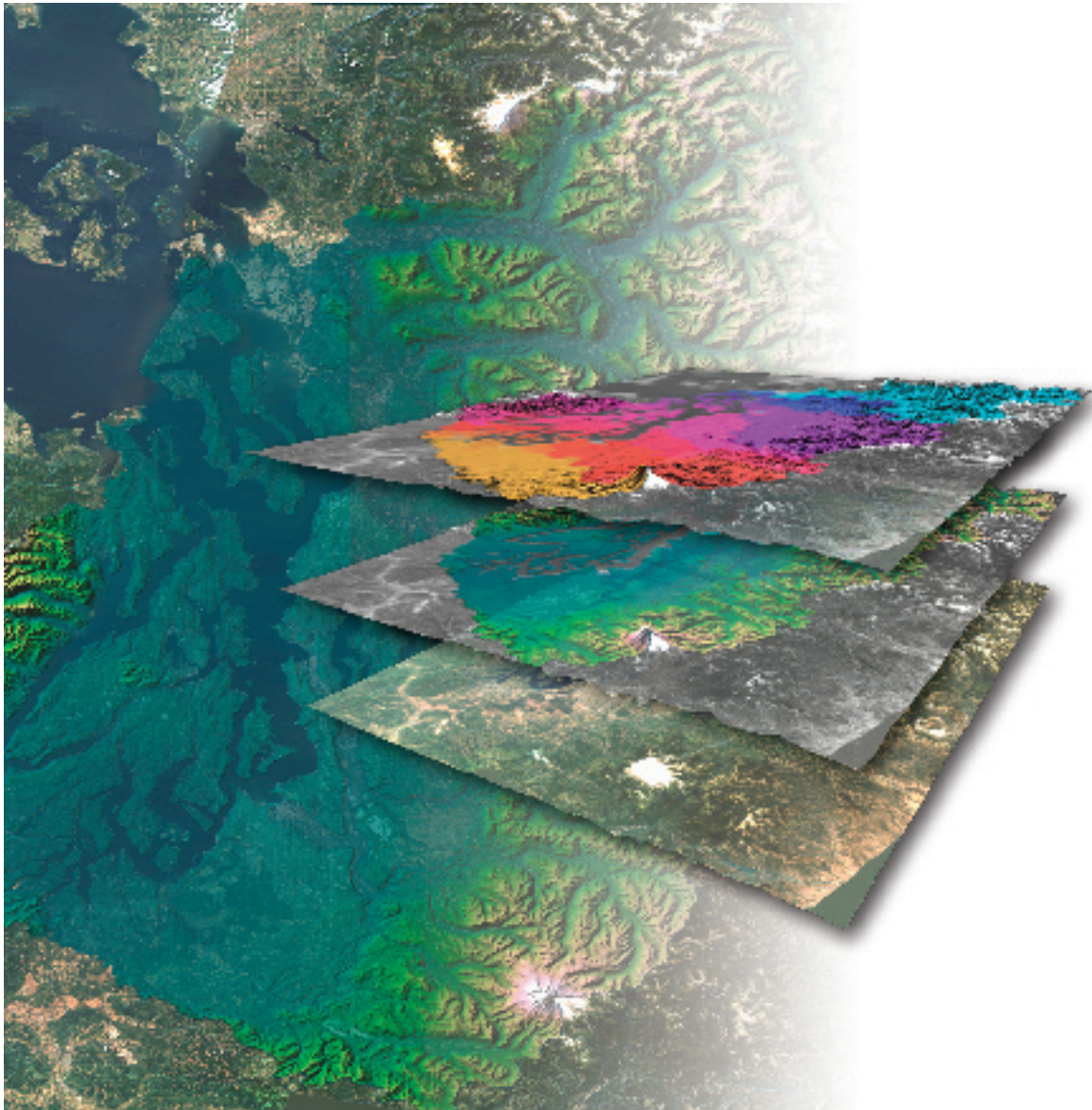


University of Washington
Expertise and Resources
for the Puget Sound Watershed

Inventory of Activities 2001~2005



University of Washington

Expertise and Resources for the Puget Sound Watershed

Inventory of Activities

July 1, 2001 to June 30, 2005

Prepared by

University of Washington Earth Initiative

University of Washington Water Center

with support from the College of Ocean and Fishery Sciences

November 28, 2005

The University of Washington

An Essential Contributor to the Protection and Recovery of Puget Sound



A Message from UW President Mark Emmert

As human population and development in our region have increased, the overall health of Puget Sound has steadily decreased. Challenges such as over-enrichment of nutrients, pathogen contamination, toxic chemicals, alteration of freshwater inflow, loss of habitat, declines in fish and wildlife, and introduction of invasive species confront our natural resource managers as they strive to maintain the delicate balance between resource conservation and economic growth.

Puget Sound is a diverse and dynamic environment and one of this region's most valuable assets. It is a complex web of natural resources—soil, water, air, plants and animals—that are influenced by events and changes throughout the entire watershed, from the heights of the Cascades and the Olympics to the Straits of Juan de Fuca. Key to the sustainable management of Puget Sound is a clear understanding of the myriad connections, including the human-environment interactions, which influence the environmental conditions within our region.

Because of our breadth of expertise, the University of Washington (UW) is uniquely positioned to bring substantial intellectual abilities to address many of the challenges facing the Sound. As a major research university in the region, it is our responsibility to deliver relevant research, policy and technical assistance to regional resource managers and decision makers. Beyond our fundamental role to help develop a basic understanding of how Puget Sound works, an ideal role for UW is one of partnerships—where UW scientists, engineers, and scholars work with government agencies, nonprofit organizations, industries, and citizens to produce the solutions that we now need, far faster than if they were each working on their own.

A successful, coordinated effort to restore and maintain the health of Puget Sound will help not only our environment, but also our economic and societal well-being. We can protect human lives from hazards, provide for the sustainable use of the Sound's resources, and learn about the role and importance of the Sound in our daily lives. This inventory describes our contributions to the search for solutions to the Sound's most pressing problems. It was created as a tool to (1) enable decision-makers and the public to better utilize UW resources; (2) identify possible opportunities for leveraging, enhancing, or expanding already existing initiatives and identify needs that are not currently being met; and (3) help us to better answer questions about our role in the efforts to protect and restore Puget Sound.

Contents

Climate	1
Weather, Climate Variability, and Climate Change.....	2
Climate Impacts.....	5
Ecosystems, Habitats, and Wildlife	9
Birds and Terrestrial Wildlife	10
Estuarine and Coastal Ecosystems	14
Fish and Shellfish.....	20
Freshwater Ecosystems	26
Marine Mammals	29
Restoration and Remediation.....	32
Terrestrial Ecosystems.....	37
Hazards	41
Air Quality	42
Geologic Hazards.....	45
Invasive Species	49
Toxins	52
Regional Communities and Economies	55
Culture	56
Fisheries Management.....	60
Forest Management.....	64
Public Health	69
Transportation	72
Urban Infrastructure and Planning.....	76
Water	82
Water Quality.....	83
Water Resources.....	87
Resources	90
Berman Environmental Law Clinic.....	90
Climate Impacts Group.....	91
Northwest Environmental Forum	92
Puget Sound Regional Synthesis Model (PRISM)	93
Washington Sea Grant Program.....	94
The Water Center	96
Interagency Partnerships	97
Facilities	99
Puget Sound Field Stations.....	99
Research Vessels	107
Sources	108



Climate

Weather, climate variability, and climate change can profoundly influence social and natural environments throughout the world, with consequent impacts on natural resources and industry that can be large and far-reaching. For example, seasonal to interannual climate fluctuations strongly affect agriculture, the abundance of water resources, and the demand for energy, while long-term climate change may alter agricultural productivity, land and marine ecosystems, and the goods and services that these ecosystems supply.

The University of Washington (UW) is working to further our understanding of the patterns and predictability of regional weather and climate variability, the influence of climate variation and change on the Pacific Northwest environment and its institutions, and strategies for increasing societal resilience to climate change.

The information in this section is organized in the following categories:

- Weather, Climate Variability, and Climate Change
- Climate Impacts

Weather, Climate Variability, and Climate Change

Understanding how climate affects our natural resources and human systems rests squarely on an understanding of climate itself. UW scientists have made great gains in understanding (1) how climate typically varies within the Pacific Northwest, (2) how our climate is affected by larger-scale climate variations, such as El Niño/La Niña and the Pacific Decadal Oscillation, and (3) how climate is likely to change in the future because of the global increase in greenhouse gases in the atmosphere.

Pacific Northwest climate and ecology are largely shaped by the interactions that occur between seasonally varying weather patterns and the region's mountain ranges. Approximately two-thirds of the region's precipitation occurs in just half the year (October–March) when the Pacific Northwest is on the receiving end of the Pacific storm track. Much of this precipitation is captured in the region's mountains, influencing both natural and human systems throughout the Pacific Northwest. From late spring to early fall, high pressure to the west generally keeps the Northwest fairly dry.

Some fluctuations in regional climate are related to the El Niño/Southern Oscillation and Pacific Decadal Oscillation phenomena. The relationships between these phenomena and normal winter/spring climate allow us to monitor for and predict variations in these patterns to provide information about future Pacific Northwest climate a few seasons to years in advance.

Both Pacific Northwest temperature and precipitation have increased over the 20th century. On average, the region warmed about 1.5°F (0.83°C); warming was largest west of the Cascades during winter and spring. There is good reason to expect warming to continue as a result of climate change, with a likely warming rate of about 0.5°F (0.27°C)/decade. While future changes in precipitation are less certain, overall, precipitation is projected to increase in the region.

Examples of how the UW works to better understand weather, climate variability, and climate change in the Puget Sound region:

- High-resolution forecasts of Pacific Northwest weather are produced twice per day at the UW. These forecasts are incorporated into a regional environmental forecast system that is used in a wide range of real-time transportation, air quality, fire weather, and hydrologic applications. This effort is supported by a consortium of local, state, and federal agencies.
- The Climate Impacts Group (CIG) is working to further our understanding of the patterns and predictability of regional climate variability and the influence of climate variation on the Pacific Northwest environment. CIG's natural science research approach is retrospective, interdisciplinary, integrated, and contextual, beginning with an analysis of the patterns and predictability of regional climate variability.

Faculty

Expertise

Atmospheric Sciences

Mass, Clifford
cliff@atmos.washington.edu

Synoptic and mesoscale meteorology.

Earth and Space Sciences

Waddington, Edwin
edw@ess.washington.edu

Glaciological problems related to derivation and interpretation of paleoclimate records from ice cores.

Joint Institute for the Study of the Ocean and Atmosphere

Mantua, Nathan
mantua@atmos.washington.edu

Large-scale climate variability and predictability; human and ecosystem dimensions of climate variability; El Niño/Southern Oscillation and other modes of climate variability.

Mote, Philip
philip@atmos.washington.edu

Climate variability and change, description and impacts; public outreach, interdisciplinary research.

Salathé, Eric
salathe@atmos.washington.edu

Regional climate simulations.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Mass, Clifford F: A Cooperative Program for the Improvement of Forecasting for the Pacific Northwest (National Weather Service/UCAR)	\$38,541	\$39,950	\$40,075	
Mass, Clifford F: Improvement and Maintenance of Real-Time Regional Weather Prediction over the Pacific Northwest (Washington State Department of Ecology)	\$10,000			
Mass, Clifford F: Real-Time Prediction of Mesoscale Weather, Fire Danger and Smoke Dispersal for the Pacific Northwest (U.S. Forest Service)		\$100,000	\$100,000	\$100,000
Mass, Clifford F: Regional Weather Analysis and Prediction (National Oceanic and Atmospheric Administration)			\$124,942	
Mass, Clifford F: A Weather Information System for Washington State Transportation Needs (Washington State Department of Transportation)	\$444,000		\$248,350	\$226,200
Mote, Philip: Office of Washington State Climatologist (Washington State Department of Ecology Research)				\$18,000
Waddington, Edwin D: Assessing the Current State of Blue Glacier, Olympic Mountains, Washington: Comparison to the Longer-Term Record (Evolving Earth Foundation)			\$3,000	
Total for Weather, Climate Variability, and Climate Change	\$492,541	\$139,950	\$516,367	\$344,200

Climate Impacts

Profound changes have occurred in the Puget Sound environment over the past century and the next several decades will see even more change. Glaciers in the Cascade and Olympic Mountains have been retreating for 50-150 years. Pacific Northwest temperatures are rising faster than the global average. Puget Sound waters are warming, and river and stream flows are changing.¹

Puget Sound supports a stunning diversity of life within and around its waters. Fluctuations in climate play a role in determining the suitability of these habitats through their influence on circulation and water properties. Even subtle changes in Pacific Northwest precipitation and temperature due to seasonal variability have noticeable impacts on the region's mountain snowpack, river flows and flooding, the likelihood of summer droughts, forest productivity and forest fire risk, salmon abundance, and quality of coastal and near-shore habitat. In the long-term, air and water temperature increases will force plants and animals into different distributions. All species have certain preferences for where they like to live based on conditions like temperature, salinity, availability of food, etc. When those conditions change, plants and animals will shift in response.

The ultimate impact of climate change in Puget Sound depends not only on future levels of greenhouse gases in our atmosphere, but also on choices we make in the region about dealing with climate change. By starting now to plan for climate change, the region can build the capacity required to prepare for and cope with climate impacts in the Puget Sound region.

Example of how the UW addresses climate impacts in the Puget Sound region:

- The Climate Impacts Group (CIG) engages in climate science in the public interest, working to understand the consequences of climate variability and climate change for the U.S. Pacific Northwest. CIG's unique focus is on the intersection of climate science and public policy — performing basic research aimed at understanding the consequences of climate fluctuations for the Pacific Northwest, and promoting application of this information in regional decisions. CIG's assessment examines climate impacts on four diverse, yet connected, natural systems — water, forests, salmon and coasts — and the human socioeconomic and/or political systems associated with each. CIG works to provide regional planners, decision makers, and natural resource managers with valuable knowledge about the ways in which crucial regional resources are vulnerable to changes in climate, and how this vulnerability could best be reduced.

¹Uncertain Future: Climate Change and Its Effects on Puget Sound. UW Climate Impacts Group. 2005.

Faculty

Expertise

Applied Physics Laboratory

Newton, Jan
newton@u.washington.edu

Biological oceanography; coastal and estuarine dynamics; climate and human impacts on water quality.

Aquatic and Fishery Sciences

Francis, Robert
bfrancis@u.washington.edu

Fisheries management; marine ecosystem dynamics; fisheries oceanography; climate change.

Schindler, Daniel
deschind@u.washington.edu

Understanding species interactions; energy transfers; ecosystem dynamics through biogeochemistry and environmental chemistry.

Architecture

Loveland, Joel
loveland@u.washington.edu

Energy use in buildings; lighting and energy use; ecological design; global warming trends and long-term changes in energy use in buildings.

Atmospheric Sciences

Mass, Clifford
cliff@atmos.washington.edu

Synoptic and mesoscale meteorology.

Civil and Environmental Engineering

Lettenmaier, Dennis
dennisl@u.washington.edu

Hydroclimatology; surface water hydrology; GIS and remote sensing.

Palmer, Richard
palmer@u.washington.edu

Water resource management; optimization and simulation techniques; risk analysis; systems analysis; expert systems.

Steinemann, Anne
acstein@u.washington.edu

Drought; water management; environmental impacts; health effects of pollutants; sustainability.

Forest Resources

Brubaker, Linda
lbru@u.washington.edu

Dendrochronology and palynology; responses of vegetation to climate change and disturbance at different temporal and spatial scales.

Franklin, Jerry
jff@u.washington.edu

Natural forest ecosystems, especially old-growth forests; effects of changing environmental conditions, such as global change, on forest processes; management and landscape ecology.

Peterson, David
wild@u.washington.edu

The effects of environmental stress on forest ecosystems, including flooding, fire, air pollution and climatic change.

Faculty

Expertise

Joint Institute for the Study of the Ocean and Atmosphere

Mantua, Nathan

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Large-scale climate variability and predictability; human and ecosystem dimensions of climate variability; El Niño/Southern Oscillation and other modes of climate variability.

Mote, Philip

philip@atmos.washington.edu

Climate variability and change, description and impacts; public outreach.

Snover, Amy

snover@atmos.washington.edu

Integrated assessment of climate impacts on the Pacific Northwest.

Marine Affairs

Fluharty, David

fluharty@u.washington.edu

Natural resource policy; climate variability and fishery management; international management of fisheries and marine mammals; nonrenewable natural resource management.

Huppert, Daniel

huppert@u.washington.edu

Marine resources economics; salmon conservation; water and hydropower economics; marine fisheries management.

Miles, Edward

edmiles@u.washington.edu

Climate impacts; international law and organization; science technology and international relations; marine policy and ocean management.

Public Affairs

Cullen, Alison

alison@u.washington.edu

Environmental exposure and risk analysis; particulate air pollution and public health risk; climate impacts on hydropower; decision making under uncertainty.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Lettenmaier, Dennis P: Implications of Seasonal to Interannual Covariability of Pacific Northwest-California Climate (University of California, San Diego)			\$150,000	
Mantua, Nathan: Impacts of Anthropogenic Climate Change on Rockfish Populations (National Oceanic and Atmospheric Administration)			\$9,141	
Mantua, Nathan: Climate Impacts on Paralytic Shellfish Toxins, NWFSC/NOAA Center of Excellence in Oceans and Human Health (National Oceanic and Atmospheric Administration)				\$99,000
Mass, Clifford F: Climate Information Products for Hydro-Electric Utility (Seattle City Light)		\$30,000	\$40,000	\$40,000
Miles, Edward: An Integrated Assessment of the Impacts of Climate Variability and Climate Change on the Pacific Northwest (National Oceanic and Atmospheric Administration)	\$940,000			
Mote, Philip: Puget Sound Action Team Agreement (Puget Sound Action Team Research)				\$18,925
Palmer, Richard N: Climate Change Impacts on Pacific Northwest Streams (National Oceanic and Atmospheric Administration)				\$23,000
Palmer, Richard N: Evaluating the Potential Impacts of Climate Change on Regional Water Demands and Supplies (King County Water and Land Resources Division)				\$70,394
Peterson, David L: Climatic Variability, Ecosystem Dynamics and Disturbance in Mountain Protected Areas (U.S. Geological Survey)		\$189,063	\$150,000	\$210,000
Schindler, Daniel E: Forecasting Amphibian Distributions in Response to Climate Change in Olympic National Park (National Park Service)	\$75,000			
Total for Climate Impacts	\$1,115,000	\$219,063	\$349,141	\$461,319



Ecosystems, Habitats, and Wildlife

The ecosystems that together make up the Puget Sound region form a rich tapestry of unique landscapes, relationships, and organisms. Understanding and sustaining such biodiversity is in our self-interest as our biological resources are the pillars upon which we have built our economy and well-being. Nature's products support such diverse industries as agriculture, fisheries, pulp and paper, horticulture, construction and waste treatment. The loss of biodiversity threatens our public health, food supplies, opportunities for recreation and tourism, and sources of wood, medicines, and energy. It also interferes with essential ecological functions.

Since the UW was founded almost 150 years ago, our faculty have made crucial contributions in biology, forest and aquatic and fishery sciences—helping us understand how ecosystems evolve and change, and how humans affect these processes. Just as important, UW scientists are using this knowledge to develop tools for conserving and restoring ecosystems and biodiversity, both in the Northwest and around the world.

The information in this section covers the basic biological systems of the Puget Sound region and is organized in the following categories:

- Birds and Terrestrial Wildlife
- Estuarine and Coastal Ecosystems
- Fish and Shellfish
- Freshwater Ecosystems
- Marine Mammals
- Restoration and Remediation
- Terrestrial Ecosystems

Birds and Terrestrial Wildlife

Each species has its own unique niche, or place that it occupies in an ecosystem. For example, birds help pollinate plants, disperse seeds, scavenge carrion, and control insects. As the top herbivores in an ecosystem, terrestrial mammals can shape the vegetation communities that are present. Birds and wildlife can be very sensitive to ecological change. Small perturbations in weather, availability of food, and habitat can dramatically affect animal populations. Birds and wildlife can also be severely affected by oil spills and other forms of pollution. Some species, such as the Common Murre, are so sensitive to natural and human-induced events that they are considered the “canary-in-the-coalmine” for their ecosystems.

Birds and wildlife are an integral part of the Puget Sound ecosystem and they are indicators of the health of our region. Unfortunately, many of our native species are now listed as threatened or endangered by Washington state or the U.S. federal government because of their declining populations. There is a pressing need to unravel the potentially complex causes of these declines if we are to be able to help these populations effectively recover.

Examples of how the UW addresses issues facing birds and terrestrial wildlife in the Puget Sound region:

- The Washington Cooperative Fish and Wildlife Research Unit at the UW is one of 40 comparable units within the United States established to facilitate cooperation between the federal government, colleges and universities, the states, and private organizations in improving the management of the nation’s fish and wildlife resources. Units accomplish this by conducting natural resource management research, educating people to intelligently manage natural resources, and providing research findings to individuals or to agencies that put this information to practical use. Our unit’s wildlife research focuses on habitat requirements of individual species, aquatic wildlife within crop and forest lands, and wildlife within near-coastal communities.
- One of the most daunting challenges in understanding environmental change is knowing what “normal” is. Because seabirds are vulnerable to change, many factors can affect their distribution, abundance, and mortality. If we are to recognize changes, particularly important population trends, we need to gather long-term background, or baseline data. Our Coastal Observatory and Seabird Survey Team (COASST) is a citizen science project in partnership with the Olympic Coast National Marine Sanctuary that fulfills part of this data gap by gathering data on seabird mortality. COASST volunteers collect monthly data on beach-cast carcasses of marine birds to establish the baseline pattern of beached bird mortality in Washington and Oregon.

Faculty

Expertise

Aquatic and Fishery Sciences

Grue, Christian
cgrue@u.washington.edu

Wildlife toxicology; wildlife science.

Parrish, Julia
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Animal aggregation; seabirds; marine conservation.

VanBlaricom, Glenn
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Marine wildlife; community ecology; conservation biology; marine mammals.

Biology

Kenagy, George J
kenagy@u.washington.edu

Ecophysiology and behavior; reproduction and life history; population biology; evolution; mammalogy.

Rohwer, Sievert
rohwer@u.washington.edu

Ecology and evolution of social behavior; deception and evolution of status-signaling systems; avian biology.

Wasser, Samuel
wassers@u.washington.edu

Conservation biology; genetics; endocrinology.

Wingfield, John
jwingfie@u.washington.edu

Environmental and hormonal control of life cycles in vertebrates; how life history stages are integrated; how animals deal with environmental stress.

Forest Resources

Ford, E David
edford@u.washington.edu

Formation, persistence and decline of foliage canopies.

Manuwal, David
auklet@u.washington.edu

Avian ecology and conservation.

Marzluff, John
corvid@u.washington.edu

Forest fragmentation and the nest predators of the endangered Marbled Murrelet and a variety of songbirds in coastal Washington; how birds respond to urbanization.

West, Stephen
sdwest@u.washington.edu

Vertebrate population dynamics and natural history; evolution and ecology of mammals, vertebrate habitat use within forest ecosystems; wildlife management.

Psychology

Ha, James
jcha@u.washington.edu

Social behavior of highly cognitive animals.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Ford, E David: Analysis of Modeling of Flying Squirrel Tracking Data (U.S. Forest Service)			\$30,664	
Ford, E David: Spatial Analysis of Squirrel Distributions (U.S. Forest Service)			\$38,291	
Grue, Christian E: Distribution, Demography and Nesting Habitat of the Marbled Murrelet in Washington State (Washington State Department of Natural Resources)			\$30,753	
Grue, Christian E: Seabird Research (Washington State Department of Fish and Wildlife)			\$13,000	\$68,255
Grue, Christian E: Understanding the Risk of Nest Predation to Marbled Murrelets in Managed Landscapes (Washington State Department of Natural Resources)	\$120,000			
Kenagy, George J: Curation of Mammal Specimens from Olympic National Park (National Park Service)	\$4,600			
Manuwal, David A: Bird Community Responses to Thinning in Coniferous Forests at Ft. Lewis, Washington (U.S. Forest Service)		\$13,118		
Marzluff, John M: Evaluation of the Effects of Barred Owls (National Park Service)	\$12,691			
Marzluff, John M: Population Ecology of the Marbled Murrelet on the Olympic Peninsula (U.S. Forest Service)				\$19,800
Marzluff, John M: The Influence of Timber Management, Proximity to Human Activity, and Forest Fragmentation on Corvid Abundance, Distribution, and Predation on Nests of Marbled Murrelets in the Pacific Northwest (U.S. Department of Agriculture)	\$49,924			
Marzluff, John M: Understanding the Influence of Landscape Characteristics on Murrelet Use of DNR-Managed Forests in the Olympic Experimental State Forest (U.S. Forest Service)		\$35,000		
Parrish, Julia K: A COASST Field Guide (Washington State Department of Fish and Wildlife)	\$10,500			
Parrish, Julia K: Coastal Observation and Seabird Survey Team (Russell Family Foundation/Washington State Department of Fish and Wildlife)		\$57,688		
Parrish, Julia K: Spatial Patterns of Migratory Shorebirds: Implications for Conservation and Management (U.S. Forest Service)	\$33,454	\$45,008		
Wasser, Samuel K: Assessment of Scat Detection Dog Methods for Long-Term Monitoring of Cougar Populations in the Cascade Mountains (Woodland Park Zoo)		\$4,000		
Wasser, Samuel K: Human-Bear Management Plan for North Cascades National Park Service Complex (National Park Service)	\$25,800			

Grants and Contracts (cont'd)

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Wasser, Samuel K: Scat Dog Matching: Noninvasive Methods for Monitoring Wildlife (Gordon and Betty Moore Foundation)			\$126,000	
West, Stephen D: Bat Inventory in the Olympic National Park (National Park Service)		\$15,000		
West, Stephen D: Developing Assays for Identifying Western Washington <i>Peromyscus maniculatus</i> and <i>P. keeni</i> Using Salivary Amylase Electrophoresis and Cytochrome-b Restriction Fragment Length Polymorphisms (U.S. Forest Service)			\$11,735	
West, Stephen D: Habitat Selection by Lynx in the North Cascades (U.S. Department of Agriculture)	\$19,219	\$15,220	\$1,755	
West, Stephen D: Monitoring Lynx with Domestic Dogs in the Northcentral Cascades (Washington State Department of Natural Resources)	\$19,898			
West, Stephen D: Movement Patterns of Stream Amphibians in Managed Forests (U.S. Forest Service)		\$35,000		
Total for Birds and Terrestrial Wildlife	\$296,086	\$220,034	\$252,198	\$88,055

Estuarine and Coastal Ecosystems

Puget Sound is a transition zone between the Puget Sound watershed and the Pacific Ocean. It is a place where freshwater rivers and streams meet and mix with salt water, forming a rich soup of organic and mineral nutrients. These nutrient-rich waters feed the critical nursery grounds for a tremendous diversity of living marine resources, including oysters, crabs, clams, and many finfish, and are vital to the area's wildfowl and marine mammal populations.

A variety of shoreline types—coastal bluffs, wetlands, rocky beaches—rings the Sound and serve as the interface between the water and the land. In addition to their beauty and their value as a food source, these coastal ecosystems maintain marine water quality by filtering pollutants from inland freshwater systems. Wetlands and seagrass beds filter or degrade toxic pollutants, absorb nutrient inputs, and help control pathogen populations. Coastal ecosystems also store and cycle nutrients and help protect shorelines from erosion and storms. Conversion or destruction of these ecosystems disrupts their natural functions, often resulting in hazards such as eutrophication, harmful algal blooms, and coastal erosion.

Examples of how the UW works to better understand estuarine and coastal ecosystems in the Puget Sound region:

- Puget Sound's nearshore provides important food and refuge for young salmon as they migrate from rivers to the sea and includes shallow saltwater, wetlands, estuaries, beaches, and bluffs. The UW's interagency Nearshore PRISM (Puget Sound Regional Synthesis Model) Working Group seeks to better understand and predict the consequences of human activity and long-term change on our critical estuarine-nearshore ecosystems. This information is being incorporated into the UW's emerging PRISM synthesis of the Puget Sound basin.
- Hood Canal's dissolved oxygen concentrations are at historically low levels, resulting in several significant fish kills in recent years. Many factors contribute to the low dissolved oxygen problem in Hood Canal. These include the circulation and flushing of the canal, the productivity of algae, the total carbon and nutrient load, and the degree of seawater stratification. Through the collaborative Hood Canal Dissolved Oxygen Program, the UW is leading a three-year study that uses marine, freshwater, and biological monitoring data and computer models to quantify the roles of the various processes acting in the canal.

Faculty

Expertise

Applied Physics Laboratory

Alford, Matthew
malford@apl.washington.edu

Describing and understanding small-scale ocean/estuarine processes; how small-scale processes affect both biological processes and the larger-scale circulation.

D'Asaro, Eric
dasaro@apl.washington.edu

Physical oceanography; internal waves; air-sea interaction; upper ocean dynamics; oceanic internal waves; oceanic turbulence and mixing processes; Arctic oceanography; ocean instrumentation.

Gregg, Michael
gregg@apl.washington.edu

Small-scale ocean mixing.

Martin, David
dmartin@apl.washington.edu

Program management; remote sensing; bio-optical oceanography.

Newton, Jan
newton@u.washington.edu

Biological oceanography; coastal and estuarine dynamics; climate and human impacts on water quality.

Aquatic and Fishery Sciences

Beauchamp, David
davebea@u.washington.edu

Fish behavior; acoustics; ecosystem modeling; and bioenergetics.

Essington, Timothy
essing@u.washington.edu

Marine fish ecology and biology; food web interactions; and marine fisheries—estuarine/coastal.

Francis, Robert
bfrancis@u.washington.edu

Fisheries management; marine ecosystem dynamics; fisheries oceanography; climate change.

Karr, James
jkarr@u.washington.edu

Ecology and public policy; watershed management; tropical forest ecology; conservation biology.

Parrish, Julia
jparrish@u.washington.edu

Animal aggregation; seabirds; marine conservation.

Quinn, Thomas
tquinn@u.washington.edu

Behavior, ecology and evolution of fishes, with emphasis on migrations, life history patterns, reproduction, and habitat requirements and diversification of Pacific salmon.

Schindler, Daniel
deschind@u.washington.edu

Relationships between species interactions; ecosystem dynamics.

Simenstad, Charles
simenstd@u.washington.edu

Estuarine/coastal ecology, food web structure, and juvenile salmon ecology.

VanBlaricom, Glenn
glennvb@u.washington.edu

Marine wildlife; community ecology; conservation biology; marine mammals.

Faculty

Expertise

Biology

Dethier, Megan
mdethier@u.washington.edu

Ecology of marine and estuarine shorelines.

Ruesink, Jennifer
ruesink@u.washington.edu

Thresholds in species interactions; introduced species; energy sources supporting estuarine productivity.

Waaland, J Robert
jrw@u.washington.edu

Biology of marine algae.

Earth and Space Sciences

Montgomery, David
dave@ess.washington.edu

Evolution of topography and the influence of geomorphological processes on ecological systems and human societies.

Forest Resources

Wyllie-Echeverria, Sandy
zmseed@u.washington.edu

Seagrass conservation.

Interdisciplinary Arts & Sciences (UW Tacoma)

Secord, David
dave@u.washington.edu

Experimental marine ecology; invertebrate zoology; evolution; symbiotic interactions; conservation biology; biological control; biology of cnidarians and other clonal organisms.

Marine Affairs

Hershman, Marc
hershmj@u.washington.edu

Legislative, administrative, and socioeconomic aspects of the uses of the coastal zone and its resources; coastal planning and management; port development; and exclusive economic zone use and governance.

Klinger, Teresa
tklinger@u.washington.edu

Application of genetic, population, and ecosystem studies to marine environmental decision making.

Oceanography

Armbrust, E Virginia
armbrust@ocean.washington.edu

Hytoplankton ecology; molecular ecology of diatoms; molecular analysis of the diatom sexual cycle; analysis of genetic diversity within phytoplankton populations.

Delaney, John
jdelaney@u.washington.edu

Deep-sea volcanic activity; regional cabled ocean observatories.

Frost, Bruce
frost@ocean.washington.edu

Zooplankton ecology; phytoplankton-grazer interactions; zooplankton-fish interactions.

Grunbaum, Daniel
grunbaum@ocean.washington.edu

Combining lab and field experiments with mathematical theory to answer fundamental questions about how marine ecosystems function.

Faculty

Expertise

Oceanography (cont'd)

Kawase, Mitsuhiro
kawase@u.washington.edu

Simulation of circulation in Puget Sound; coupling of sea ice and ocean circulation in Japan/East Sea; deep circulation in the south Atlantic Ocean.

Keil, Richard
rickkeil@u.washington.edu

Preservation and degradation of organic compounds in aquatic environments; microbial processes that lead to organic matter burial or preservation; sorptive processes between organics and mineral

Lessard, Evelyn
elessard@u.washington.edu

Microzooplankton ecology; ecology and physiology of heterotrophic dinoflagellates; oceanic and coastal microbial food web dynamics; role of protists in bioremediation in sediments.

MacCready, Parker
elessard@u.washington.edu

Physical oceanography in coastal and estuarine regions; flow over rough topography; estuarine circulation theory; river plumes; bio-physical interactions.

Parsons, Jeffrey
parsons@ocean.washington.edu

Puget Sound beach processes; water column suspension properties; Eel Canyon morphology; near-bed, high-density suspensions; rockfalls and slides; bedrock streams.

Urban Design and Planning

Alberti, Marina
malberti@u.washington.edu

The impacts of alternative urban development patterns on ecosystem dynamics.

Urban Studies (UW Tacoma)

Carlson, Tom
carlsont@u.washington.edu

GIS and remote sensing for change detection in Puget Sound salt marshes and surrounding lowlands; modeling urban space and creating population density surfaces for cities.

Washington Sea Grant Program

Copping, Andrea
acopping@u.washington.edu

Marine environment; water quality; marine science; marine policy.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Alberti, Marina: Assessing the Effects of Urbanization on Shellfish Growing Areas in Puget Sound (Puget Sound Water Quality Authority)		\$49,998	\$3,902	
Alberti, Marina: Effects of Landscape Patterns on Aquatic Ecosystems and Near Shore Environment (Puget Sound Water Quality Authority)			\$59,400	\$15,000
Alberti, Marina: How Patterns of Development Impact Aquatic Ecosystems (WA Dept. of Ecology)			\$29,818	
Alberti, Marina: A Tiered-Scale GIS Analysis of Land Use Change and Shoreline Habitat Alteration (Washington State Department of Ecology)				\$75,000
Delaney, John R: Critical Elements of Neptune Phase 2: Development of a Cabled Earth/Ocean Observatory at the Scale of a Tectonic Plate (U.S. Department of the Navy)	\$382,438	\$1,380,401		
Dethier, Megan N: Spatial Patterns and Temporal Trends in Shoreline Biota in Puget Sound: 2001-2003 Data Analysis and 2003-2005 Data Collection (Washington State Department of Natural Resources)	\$77,531		\$59,852	
Essington, Timothy: Spatial and Temporal Variation in Food Web Structure of Puget Sound (UW)			\$34,175	
Grue, Christian E: Hood Canal Dissolved Oxygen Program (Washington State Department of Ecology)				\$119,274
Grue, Christian E: JEMS Plankton Samples (Washington State Department of Ecology)		\$12,329		
Hershman, Marc J: Protocol for Citizen-Based Epibenthic Sampling (Friends of the San Juans)		\$37,469		
Kawase, Mitsuhiro: A Partnership Modeling the Marine Environment of Puget Sound, Washington (U.S. Department of the Navy)	\$390,924	\$609,780	\$748,536	\$834,558
Klinger, Terrie: Larval Rockfish Dispersal Trajectories in the Georgia Basin/Puget Sound Region (University of California)	\$54,864	\$39,976		
Martin, David L: Build Regional Association Partnerships Leading to the Implementation of a PNW Regional Integrated and Sustained Ocean Observing System (National Oceanic and Atmospheric Administration)			\$200,000	
Montgomery, David R: Historical Estuary of the Dungeness River (Jamestown S'Klallam Tribe)			\$50,000	
Newton, Jan A: Hood Canal Low Dissolved Oxygen Program-Integrated Assessment and Modeling (HCDOP-IAM) Study (U.S. Department of the Navy)				\$1,353,000
Parsons, Jeffrey D: Bathymetric-Topographic Digital Elevation Model of Puget Sound (Army Corps of Engineers, Seattle District)				\$10,666

Grants and Contracts (cont'd)

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Simenstad, Charles A: Development of the Puget Sound Nearshore Conceptual Model (U.S. Army Corps of Engineers)		\$23,500		
Simenstad, Charles A: Hood Canal and Eastern Strait of Juan de Fuca Summer Chum Estuarine Invest: Extended Hyperspectral Analysis of Intertidal Landscape Structure (Point No Point Treaty Council)	\$30,000			
Simenstad, Charles A: Salmon Bay Natural Area Aquatic Monitoring (City of Seattle)			\$35,975	\$1,000
Stewart, Marc S: Seaglider in the Hood Canal for AUVFEST (U.S. Department of the Navy)				\$20,000
VanBlaricom, Glenn R: Effects of Commercial Geoduck (Panopea Abrupta) Harvest on the Benthic Infaunal Communities of Puget Sound (University of California, Davis)	\$29,935			
Wyllie-Echeverria, Sandy: Assessment of Eelgrass (Zostera marina) in Westcott Bay, San Juan County (Friends of the San Juans)				\$23,575
Total for Estuarine and Coastal Ecosystems	\$965,692	\$2,153,453	\$1,221,658	\$2,452,073

Fish and Shellfish

The Northwest Straits and Puget Sound are inhabited by a rich diversity of more than 250 species of fish and shellfish. Groundfish, such as Pacific cod, Pacific whiting, and rockfish, are species that inhabit the bottom or mid-water. Baitfish, including herring, sandlance, and smelt, are small, schooling fish living close to the surface that are important prey for larger fish as well as for birds and mammals. The trout, salmon, and char that make up the salmonids are anadromous; they begin life in freshwater rivers and streams, spend most of their lives in marine water, and return to freshwater to mate and die. Finally, key shellfish species within the Puget Sound food web include Manila clams, butter clams, littlenecks, geoducks, horse clams, abalone, mussels, scallops and oysters.

Many of these fish and shellfish have complex physiologies, organs, and behaviors for dealing with their environment in a sophisticated manner. Understanding their basic life history and behavior — and the complex physical, biological, and human factors that affect them — is required to construct scientifically sound conservation, protection, and recovery actions for fish and shellfish and their habitats in Puget Sound.

Examples of how the UW works to better understand the status and health of fish and shellfish in the Puget Sound region:

- An understanding of the relationship between genetic diversity and fitness in a species is important in setting priorities in conservation and aquaculture, because a species' continuing viability is related to its adaptability in a changing environment. Researchers from the UW Marine Molecular Biotechnology Laboratory are using a number of approaches, incorporating both molecular and quantitative genetics, to study the evolution, diversity and adaptation of aquatic organisms, such as salmon and abalone, to their environments—and how environmental changes and human activities can impact and promote the long-term fitness of these animals.
- The salmon populations of the North Pacific Ocean show significant interannual variation and decadal trends in fish numbers, body size, and age at maturity. It is not clear to what extent these fluctuations are caused by external changes in climate or ocean productivity. To sort out the contributing factors, UW researchers are conducting studies of the endocrine and physiological systems controlling growth to better understand factors affecting the salmon life cycle and body size.
- The spiny dogfish is a small, long-lived shark that is particularly vulnerable to overfishing because of its late maturity, low reproductive capacity and longevity. Spiny dogfish in Puget Sound were heavily fished during WWII for their vitamin rich livers. In the mid-1970s, entrepreneurs developed European and Asian markets for dogfish and an intense fishery was reinstated. Catches of dogfish in Puget Sound have since declined from a peak of 8.6 million pounds in 1979 to less than 140,000 pounds in 2000. UW researchers are working to better understand the life history, population structure, and fishing vulnerability of spiny dogfish along the west coast of the United States and Canada, including Puget Sound, to inform the management of the commercial fishery.

Faculty

Expertise

Aquatic and Fishery Sciences

Armstrong, David
davearm@u.washington.edu

Crustacean ecology; fisheries population dynamics.

Beauchamp, David
davebea@u.washington.edu

Fish behavior; acoustics; ecosystem modeling; bioenergetics.

Dickhoff, Walton
dickhoff@u.washington.edu

Endocrinology; aquaculture/fisheries enhancement.

Essington, Timothy
essing@u.washington.edu

Marine fish ecology and biology; food web interactions; estuarine/coastal fisheries.

Francis, Robert
bfrancis@u.washington.edu

Fisheries management; marine ecosystem dynamics; fisheries oceanography; climate change.

Friedman, Carolyn
carolynf@u.washington.edu

Health management, conservation, and culture of marine invertebrates.

Gallucci, Vincent
vgallucc@u.washington.edu

Stock assessment; sharks; artisanal fisheries; fisheries management.

Grue, Christian
cgrue@u.washington.edu

Wildlife toxicology; wildlife science.

Gunderson, Donald
dgun@u.washington.edu

Marine fisheries; stock assessment; recruitment processes.

Hilborn, Ray
rayh@u.washington.edu

Fisheries population dynamics and management; natural resource conservation; fishery resources of the west coast of the United States, Canada, New Zealand and Australia.

Naish, Kerry-Ann
knaish@u.washington.edu

Conservation genetics; quantitative genetics; evolution; molecular genetics; genome mapping; aquaculture; salmonids; shellfish.

Pietsch, Theodore
twp@u.washington.edu

Ichthyology.

Quinn, Thomas
tquinn@u.washington.edu

Behavior, ecology and evolution of fishes, with emphasis on migrations, life history patterns, reproduction, and habitat requirements and diversification of Pacific salmon.

Simenstad, Charles
simenstd@u.washington.edu

Estuarine/coastal ecology, food web structure, and juvenile salmon ecology.

Young, Graham
grahamy@u.washington.edu

Reproduction; fish physiology and endocrinology; aquaculture.

Faculty

Expertise

Earth and Space Sciences

Montgomery, David
dave@ess.washington.edu

Evolution of topography and the influence of geomorphological processes on ecological systems and human societies.

Pathobiology

Kurath, Gael
gael_kurath@usgs.gov

Molecular biology, genetic diversity, and evolution of RNA viruses; viral pathogens of fish.

Statistics

Guttorp, Peter
peter@stat.washington.edu

Uses of stochastic models in scientific applications in hydrology, atmospheric science, geophysics, environmental science, and hematology.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Armstrong, David A: Salmon in the School (Seattle Public Utilities)		\$20,939		
Beauchamp, David A: Estimating the Density of Pelagic Fishes in Lake Washington (City of Bellevue)			\$3,200	
Beauchamp, David A: Feasibility of Estimating Abundance for Key Fishes in Lake Washington (Seattle Public Utilities)				\$13,287
Beauchamp, David A: Investigation of Factors Influencing Sockeye Growth and Survival in Lake Washington (City of Seattle)		\$46,307	\$28,696	\$15,913
Beauchamp, David A: Investigations of Lake Washington Juvenile Chinook Salmon Habitat Preferences in Experimental Arenas (City of Seattle)		\$60,067	\$42,633	
Beauchamp, David A: Pelagic Fish Assessment Survey (Seattle Public Utilities)				\$18,180
Beauchamp, David A: Predation on Juvenile Chinook, Coho, and Steelhead in Lake Washington (Seattle Public Utilities)				\$178,080
Beauchamp, David A: Review of Existing Data and Development of a Study Plan to Examine Factors Limiting Production of Juvenile Sockeye Salmon, Juvenile Coho Salmon and Bull Trout in Baker-Shannon Reservoirs (Puget Sound Energy, Inc.)	\$15,000			
Beauchamp, David A: Salmon Marine Trophic Demand and Distribution in Puget Sound (Washington Office of the Interagency Committee)	\$69,445		\$109,571	
Boersma, P Dee: Analysis of Salmonid Datasets (National Oceanic and Atmospheric Administration)	\$24,444			
Boersma, P Dee: Salmonid Population Research: Recovery or Extinction (National Oceanic and Atmospheric Administration)	\$69,999	\$1,500		
Dickhoff, Walton W: Growth and Development of Salmon (Northwest Fisheries Science Center Research)	\$198,561	\$241,026	\$792,000	
Dickhoff, Walton W: Identifying Salmon IGF Binding Proteins (U.S. Department of Agriculture)			\$187,714	
Dickhoff, Walton W: Salmon Insulin-Like Growth Factor Binding Practice (U.S. Department of Agriculture)	\$100,000			
Friedman, Carolyn: Improvement of Disease Resistance and Understanding of Mortality in Pacific Oysters (Pacific Shellfish Institute)			\$39,672	\$49,294
Friedman, Carolyn: Oyster Summer Mortality (Pacific Shellfish Institute)	\$39,609	\$34,065		
Gallucci, Vincent F: Abundance, Life History, and Population Demographics of Spiny Dogfish, Squalus Acanthias (North Pacific Research Board)				\$260,500

Grants and Contracts (cont'd)

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Gallucci, Vincent F: Sixgill Shark Population Dynamics in Puget Sound (National Oceanic and Atmospheric Administration)			\$15,000	
Grue, Christian E: Greater Shilshole Bay Juvenile Salmon Passage and Habitat Phase I: Juvenile Salmon Habitat Use and Prey Resources (Washington State Department of Fish and Wildlife)	\$89,999			
Grue, Christian E: Hamm Creek Juvenile Salmon Diet Studies (U.S. Geological Survey)		\$7,583		
Grue, Christian E: Health and Ecology of Western Fishes (U.S. Geological Survey)	\$146,990		\$321,503	\$41,200
Grue, Christian E: Life Histories of Juvenile Salmon (Casner Family Foundation)				\$6,700
Grue, Christian E: Reproductive Status of Dogfish Sharks (Washington State Department of Fish and Wildlife)			\$6,572	
Grue, Christian E: Response of Juvenile Chinook Smolts to SONAR: Seawater Adaptation and Avoidance (State of Washington)				\$25,708
Grue, Christian E: Stomach Content Analysis of Juvenile Chinook and Competitors/Predators in Sinclair Inlet (Washington State Department of Fish and Wildlife)		\$41,684	\$30,764	
Guttorp, Peter: Salmon Sampling and Analysis (National Oceanic and Atmospheric Administration)		\$62,024	\$13,999	
Kurath, Gael: Novel In Vivo Virus Competition and Fitness Assay System in Rainbow Trout (U.S. Department of Agriculture)		\$137,329		
Montgomery, David R: Salmonid Research (National Oceanic and Atmospheric Administration)	\$74,626			
Naish, Kerry-Ann: Captive Broodstocks of Pacific Salmon (National Marine Fisheries Service/Northwest Fisheries Science Center)	\$230,692	\$185,100	\$211,893	
Naish, Kerry-Ann: Cause(s) of Developmental Abnormalities among Larvae from Puget Sound's Once-Largest Herring Population (University of California, Davis)	\$40,028			
Naish, Kerry-Ann: Measuring the Consequences of Inbreeding Depression on Fitness Traits in Chinook Salmon (National Oceanic and Atmospheric Administration)		\$23,907	\$42,699	
Naish, Kerry-Ann: Molecular Genetics of Pacific Salmonids (Northwest Fisheries Science Center Research)	\$233,365	\$84,142	\$269,211	
Naish, Kerry-Ann: Salmon Imprinting and Reproduction Study (National Oceanic and Atmospheric Administration)			\$112,166	\$365,062

Grants and Contracts (cont'd)

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Naish, Kerry-Ann: Sampling of Geoducks in Deep Inland Waters of Washington (University of Alaska, Fairbanks)		\$9,933		
Naish, Kerry-Ann: Temporal Stability of Genetic Diversity and Population Structure of Coho Salmon in Puget Sound (Murdock Charitable Trust)				\$14,000
Quinn, Thomas P: The Migratory Behavior of Adult Sockeye Salmon in Lake Washington (Seattle Public Utilities)		\$39,115		
Quinn, Thomas P: Trends in Puget Sound Coho and Chinook Salmon Life History Traits (King County)		\$81,393		
Simenstad, Charles A: Analysis of Methods for Estimating Juvenile Salmon Presence and Behavior on City of Seattle Shorelines (Seattle Public Utilities)	\$40,000			
Simenstad, Charles A: Benthic Macroinvertebrate Survey in Seahurst Park Burien (Parks and Recreation, City Of Burien)			\$15,000	
Simenstad, Charles A: Diet Analysis of Juvenile Salmon from Skagit River (Skagit System Cooperative)	\$20,000	\$30,000	\$15,000	
Simenstad, Charles A: Dietary Analysis of Juvenile Salmonids Collected from Nearshore Waters of Central Puget Sound (King County Department of Natural Resources)		\$45,155	\$14,662	
Simenstad, Charles A: Juvenile Salmon Behavior under Ferry Terminals Study (Battelle Pacific Northwest Laboratories)			\$25,000	
Simenstad, Charles A: Juvenile Salmon Diet Analysis for Dyes Inlet Estuary Study (Suquamish Tribe Fisheries Environment Program)		\$15,000		
Simenstad, Charles A: Juvenile Salmon Presence and Behavior on City of Seattle Shorelines (Seattle Public Utilities)		\$100,000		
Total for Fish and Shellfish	\$1,392,758	\$1,266,269	\$2,296,955	\$987,924

Freshwater Ecosystems

Freshwater ecosystems are essential habitat for many species and provide critical physical and biological linkages between terrestrial and marine environments. Because of their association with scarce surface water resources, freshwater ecosystems have long been influenced by human activities. Among the most serious impacts to freshwater ecosystems are water removal and diversion, groundwater pumping from aquifers, livestock grazing, land clearing, heavy recreational demand, fire, and the elimination of native organisms or the introduction of exotics.

Freshwater systems play an important role in the health and well-being of our region. They are habitat, nourishment, and means of transport for countless numbers of organisms; their powerful forces create the landscape in which we live; they leave valuable deposits of sediments, such as sand and gravel; and they form vast floodplains where many of our cities are built. In addition, they are the primary source of our drinking water, serve as transportation corridors, host multiple recreational opportunities, and provide us with much of our region's power.

Examples of how the UW works to better understand freshwater ecosystems in the Puget Sound region:

- The same research that allowed UW professor WT Edmondson to focus the region's attention on the environmental degradation of Lake Washington in the 1960s continues today. We are working with scientists from tribes and state and federal agencies to document how the ecology of the lake is changing over time. As the environment around Lake Washington changes due to natural changes and human activity, we are working to elucidate the complex interplay between the physical dynamics, chemical factors, and food-web interactions of the lake in both short- and long-time scales.
- An understanding of our landscape's evolution since the last glaciers receded approximately 12,000 years ago provides context for understanding historical (mid-1800s) and current environments. Landscape-scale reconstructions of historical environments provide insight into how different parts of the landscape have responded to different land uses and engineering measures, and point to the functions that are critical to restoring particular environments. The UW's Puget Sound River History Project has documented the presettlement conditions of western Washington's rivers, providing a template for how these systems operate that is being used by government agencies to set targets for river- and stream-enhancement efforts.
- Thirty years ago people cleared streams and rivers of logs and rootwads to improve fish passage. However, research findings over the past decade have shown that the presence of woody debris is intricately linked to stream health and higher fish returns. A thorough understanding of riparian ecosystems is required if we are to wisely invest the many hundreds of millions of dollars in federal, state, and local funding now targeted to improve the health of the region's fisheries. UW researchers are at the forefront of efforts to understand the factors that determine watershed health in this region, from the impacts of the large quantities of marine nutrients spawning salmon bring into freshwater ecosystems to the effects of tree harvesting on the chemistry of streams.

Faculty

Aquatic and Fishery Sciences

Beauchamp, David
davebea@u.washington.edu

Expertise

Fish behavior; acoustics; ecosystem modeling; bioenergetics.

Conquest, Loveday
conquest@u.washington.edu

Statistical methods for data analysis; sampling/field design; general methodology for environmental monitoring and natural resource management.

Karr, James
jkarr@u.washington.edu

Ecology and public policy; watershed management; tropical forest ecology; conservation biology.

Naiman, Robert
naiman@u.washington.edu

Structure and dynamics of lotic ecosystems; watershed ecology and management; the role of large animals in influencing ecosystem dynamics.

Schindler, Daniel
deschind@u.washington.edu

Relationships between species interactions and ecosystem dynamics.

Wissmar, Robert
wissmar@u.washington.edu

Riparian interactions; river ecosystem restoration; endangered salmon.

Civil and Environmental Engineering

Booth, Derek
dbooth@u.washington.edu

Consequences of geologic processes and materials on land-use: stream channels, river systems, hillslope stability, erosion, and groundwater; measurement and monitoring.

Brett, Michael
mtbrett@u.washington.edu

Eutrophication and regulation of algal biomass and secondary production in lakes; reservoir operation and limnology; pesticide impacts on aquatic biology; aquatic food web processes.

Forest Resources

Bolton, Susan
sbolton@u.washington.edu

Effects of land use on water quantity and quality; hydrologic effects on stream biota; ecological engineering.

Calhoun, John
jcalhoun@u.washington.edu

Forest management ; habitat conservation.

Schiess, Peter
schiess@u.washington.edu

Interactions between streams and roads; timber harvest planning as a subset of landscape-level analysis; road locations and haul; and GIS methodologies.

Interdisciplinary Arts & Sciences (UW Tacoma)

Gawel, James
jimgawel@u.washington.edu

Environmental and aquatic chemistry.

Oceanography

Logsdon, Miles
mlog@u.washington.edu

Spatial pattern analysis in ecosystem sciences; applications of Geographic Information Science (GIS) and remote sensing in ecosystem models.

Richey, Jeffrey
jrichey@u.washington.edu

Drainage basin and riverine biogeochemistry; hydrological cycles; gas fluxes from field, modeling and remote sensing; land-ocean interaction in the coastal zone.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Beauchamp, David A: Implications of Alternative Energy Pathways and Environmental Conditions on Ecosystem Dynamics and Salmonid Recovery in Lake Washington-Sammamish (King County Department of Water and Land Resources Division)	\$95,928	\$24,085		
Bolton, Susan: Monitor and Characterize Variations in Dissolved Oxygen (DO) Concentrations in Mill Creek Basin (King County)		\$20,000		
Booth, Derek B: Green River Mapping - East Lake Washington Data Acquisition Database Updates and Web Access (Office of King County Executive)			\$100,000	
Calhoun, John M: River Food Web Response to Riparian Zone Management (U.S. Forest Service)	\$34,764			
Freitag, Robert: Kimball Creek Floodplain Course (City of Snoqualmie)		\$9,000		
Gara, Robert I: Effect of Marine-Derived Nutrients on Aquatic Macroinvertebrate Production in a Salmon Spawning Stream (U.S. Department of Agriculture)	\$45,728			
Gara, Robert I: Effect of Salmon Derived Nutrients on Macroinvertebrate Production and Community Composition in Salmon Spawning Streams (U.S. Forest Service)				\$54,877
Grue, Christian E: Influence of Riparian Harvesting on the Chemistry of Headwater Streams (Washington State Department of Natural Resources)				\$43,581
Grue, Christian E: Tributary Influences on Mainstem Particle Size Distribution and Bed Morphology (Washington State Department of Natural Resources)		\$19,579		
Mac Gowan, Patricia M: Watershed Elementary School Curriculum Activities (Russell Family Foundation)		\$30,000	\$22,000	
Montgomery, David R: Geographic Information System Mapping of the Historical Skagit River Landscape (Skagit System Cooperative)	\$15,000			
Montgomery, David R: Historical Conditions and Channel Migration Along the White River (King County Department of Natural Resources)	\$51,155	\$35,200		
Montgomery, David R: Historical Conditions of the Nooksack River (Nooksack Indian Tribe/Whatcom County Council of Governments)		\$105,881		
Schindler, Daniel E: Lake Washington Zooplankton Sampling (Seattle Public Utilities)				\$16,996
Schindler, Daniel E: A Record of the Ecology of Lake Washington (Andrew W. Mellon Foundation)		\$420,000		
Total for Freshwater Ecosystems	\$242,575	\$663,745	\$122,000	\$115,454

Marine Mammals

Together with humans and seabirds, marine mammals are top predators in the food chains of an ecosystem. As such they are important indicators of the health of the environment. The reproductive success of the different species of marine mammals, to a large degree, reflects the availability of their preferred food. The stocks of some of these organisms, especially fishes, are heavily affected by human exploitation and activities. Reduced reproductive success of marine mammals thus may be a warning signal that the prey stocks are being unsustainably depleted. In the same way, marine mammals are important indicators of the levels of toxic contaminants in their environment—levels that may turn out to be harmful also for humans.

Marine mammals in Puget Sound include whales, dolphins, porpoises, seals, sea lions, and sea otters. As an indication of the problems facing these populations, PCB concentrations in killer whales and southern Puget Sound harbor seals are among the highest in the world. While PCBs are the primary chemical contaminant of concern in marine mammals, causing reproductive problems, biological disorders, and death, many other chemical contaminants and heavy metals, including mercury and DDE, frequently bioaccumulate to significantly high concentrations in Puget Sound's marine mammals. Other pressures, such as increased vessel traffic and noise, declining salmon runs, and general ecosystem deterioration, are also facing marine mammals in the Sound.

Examples of how the UW addresses issues facing marine mammals in the Puget Sound region:

- Since 1996, the overall size of Puget Sound's three resident orca pods has declined 20%. Of primary concern, most of the animals being lost are young whales of reproductive age. To better understand the decline of orcas in the Sound, UW researchers are studying a range of factors that influence their behavior and health, from their ability to detect their prey using sound transmission and reflection to the characteristics and impacts of underwater sound caused by human activities, and from critical habitat use and movement to their social behavior.
- Sea otters existed along the Washington coast and Straits of Juan de Fuca for thousands of years before an intensive harvest for their valuable pelts that began in the mid-1700s decimated their population, leaving only a few small and isolated communities. This near-extinction dramatically reduced sea otter genetic diversity. Coupled with a variety of environmental disturbances, their genetic vulnerability has threatened sea otter populations throughout this range. Researchers in the Center for Conservation Biology are collaborating with the Seattle Aquarium to investigate this problem by using noninvasive stress, reproductive and genetic measures in wild, and captive sea otters.

Faculty

Expertise

Applied Physics Laboratory

Dahl, Peter

dahl@anchor.apl.washington.edu

Experimental and theoretical studies in acoustic scattering from entrained bubbles, the sea surface, and marine life using both the field and laboratory setting.

Jones, Christopher

cjones@apl.washington.edu

Ocean acoustics; scattering from and within ocean sediments; acoustic signals to examine biological activity, hydrothermal plume flow, and particle size distributions.

Aquatic and Fishery Sciences

Horne, John

jhorne@u.washington.edu

Scale-dependent processes influencing aquatic organism distributions; predator-prey interactions; the application of acoustics to aquatic ecology and resource management.

VanBlaricom, Glenn

glennvb@u.washington.edu

Marine wildlife; community ecology; conservation biology; marine mammals.

Biology

Wasser, Samuel

wassers@u.washington.edu

Conservation biology; genetics; endocrinology.

Marine Affairs

Fluharty, David

fluharty@u.washington.edu

Natural resource policy; climate variability and fishery management; international management of fisheries and marine mammals; nonrenewable natural resource management.

Psychology

Ha, James

jcha@u.washington.edu

The social behavior of highly cognitive animals.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Ha, James: Social Behavior and Affiliation Patterns in Southern Resident Orca (<i>Orcinus orca</i>) (Northwest Fisheries Science Center)			\$16,890	
Horne, John: Potential Prey of Killer Whales in Puget Sound: A Pilot Study (National Oceanic and Atmospheric Administration)				\$49,993
Jones, Christopher D: The Acoustic Environment of the Haro Straits: Modeling and Measurements of the Acoustic Environment of the Southern Resident Killer Whales (National Oceanic and Atmospheric Administration)				\$69,786
VanBlaricom, Glenn R: Analysis of Sea Otter Fat for Fatty Acid Determination (U.S. Geological Survey)				\$5,660
VanBlaricom, Glenn R: Predation on Depleted Salmonid Populations by Harbor Seals in Hood Canal, Puget Sound, Washington (Washington State Department of Fish and Wildlife)	\$34,000	\$34,400	\$36,000	\$8,682
VanBlaricom, Glenn R: Response of an Isolated Harbor Seal Population to an Extended Foraging Event by Transient Killer Whales (North Pacific Marine Science Foundation/UBC)				\$49,000
Total for Marine Mammals	\$34,000	\$34,400	\$52,890	\$183,121

Restoration and Remediation

As long as humans have been using natural resources, we have left behind a trail of degraded and diminished landscapes. The goal of habitat restoration and remediation is to turn back the clock in these damaged habitats, returning them to a time of greater ecological function through the recreation of natural conditions. But the region's history of resource extraction and the expansion of urban populations have put these resources increasingly at risk, and already damaged many beyond their intrinsic capacity to heal themselves.

Continued decline—and now Endangered Species Act listings—of the region's salmonids have fueled public and government agency interest in this aspect of watershed management, and major expenditures are expected over the next decade in the name of “stream enhancement” and purported salmon restoration. Yet similar expenditures in the past have typically gone toward narrow fixes of single perceived problems, such as urban runoff, or toward treating symptoms, such as absence of woody debris in streams, rather than root causes, such as alterations in hydrology, riparian vegetation, and human attitudes and behavior. Too often, imperfect analyses combine with conflicting socioeconomic interests and politics to limit rehabilitation success. Yet the region needs integrative and diagnostic approaches to maintain its quality of life for people and stream biota, a lack that University scientists and engineers are beginning to fill.

We are actively engaged in learning about the processes that create habitat and restore ecosystem functions and structure, how those processes influence ecosystems, and how to gauge the response of ecosystems to both land-use changes and restoration efforts. Our ecosystems are still responding to historic changes, and degraded habitat may not be restored successfully if natural conditions are not well understood.

Examples of the UW's restoration and remediation efforts in the Puget Sound region:

- The City of Seattle Public Utilities Watershed Management Division has initiated an experimental restoration project with UW scientists within the Cedar River Municipal Watershed. The primary goals are to accelerate development of ecological structures associated with older forests, to increase complexity of wildlife habitat, and to enhance biological diversity. We are characterizing the structure and composition of the existing forests; quantifying relationships among canopy structure, light availability, and understory development; designing experimental treatments that are likely to accelerate development of forest structure and understory diversity; and assessing short-term responses to restoration efforts.
- The UW Restoration Ecology Network provides technical expertise and guidance to community groups undertaking restoration projects in the Puget Sound region. This partnership involves UW faculty, graduate students, advanced undergraduates, and mentors from other community groups successful in creating long-term stewardship for their projects.
- Phytoremediation research at the UW promises to provide an inexpensive, environmentally benign, and esthetically pleasing procedure for cleaning up the legacy of industrial environmental mismanagement in our region. The use of plants to clean up toxic compounds in contaminated environments is a very economical method for treating soils contaminated with metals, organic contaminants, and industrial chemicals. UW researchers are genetically engineering plants that are able to break down contaminants many times faster than normal plants. We are testing these techniques at sites around Puget Sound.

Faculty

Expertise

Aquatic and Fishery Sciences

Herwig, Russell
herwig@u.washington.edu

Marine ballast water; microbiology of aquatic environments.

Parrish, Julia
jparrish@u.washington.edu

Animal aggregation; seabirds; marine conservation.

Simenstad, Charles
simenstd@u.washington.edu

Estuarine/coastal ecology; food web structure; juvenile salmon ecology.

Wissmar, Robert
wissmar@u.washington.edu

Riparian interactions; river ecosystem restoration; endangered salmon.

Biology

del Moral, Roger
moral@u.washington.edu

Ecology; primary succession gradient analysis; community structure.

Civil and Environmental Engineering

Booth, Derek
booth@u.washington.edu

Consequences of geologic processes and materials on land-use: stream channels, river systems, hillslope stability, erosion, and groundwater; measurement and monitoring.

Environmental Health and Safety

Lundstrom, David
dlund@u.washington.edu

UW environmental health and safety programs.

Forest Resources

Bolton, Susan
sbolton@u.washington.edu

Effects of land use on water quantity and quality; hydrologic effects on stream biota; ecological engineering.

Doty, Sharon
sldoty@u.washington.edu

Phytoremediation; poplar-bacteria interactions.

Edmonds, Robert
bobe@u.washington.edu

Forest soil microbiology (especially decomposition, nutrient cycling processes, and mycorrhizae); forest pathology (especially root and canker diseases); air pollution.

Ewing, Kern
kern@u.washington.edu

Restoration of various ecosystems: freshwater and coastal wetlands, prairie, shrub-steppe, arid lands, oak woodlands, oak savanna, montane and thornscrub vegetation types.

Halpern, Charles
chalpern@u.washington.edu

Community ecology; succession; ecology of montane/subalpine meadows; effects of forest management on plant diversity.

Harrison, Robert
robh@u.washington.edu

Forest soil science.

Faculty

Expertise

Forest Resources (cont'd)

Reichard, Sarah
reichard@u.washington.edu

Traits of invasive plants; prediction of invasive ability; early detection and rapid assessment of new invaders; impacts of plant invaders on native ecosystems and plants; rare plant species.

Strand, Stuart
sstrand@u.washington.edu

Microbial remediation of organic contaminants; the uses of plants for phytoremediation of contaminated environments; biological wastewater treatment processes.

Interdisciplinary Arts & Sciences (UW Bothell)

Gold, Warren
wgold@u.washington.edu

Alpine ecology; plant adaptation to cold environments; ecosystem role of cryptobiotic crusts; restoration of alpine ecosystems; plant response to grazing and UV radiation.

Groom, Martha
groom@u.washington.edu

Application of ecological and evolutionary theories to conservation problems; experimental population biology; tropical ecology and conservation; conservation biology.

Henry, Charles
clh@u.washington.edu

Soil amendments; fate of contaminants in soils; nutrient cycling; recycling; composting; bioremediation; biosolids management; product life cycle analysis.

Marine Affairs

Hershman, Marc
hershmj@u.washington.edu

Legislative, administrative, and socioeconomic aspects of the uses of the coastal zone and its resources; coastal planning and management; port development; and exclusive economic zone use and governance.

Oceanography

Keil, Richard
rickkeil@u.washington.edu

Preservation and degradation of organic compounds in aquatic environments; microbial processes that lead to organic matter burial or preservation; sorptive processes between organics and mineral surfaces.

Lessard, Evelyn
elessard@u.washington.edu

Microzooplankton ecology; ecology and physiology of heterotrophic dinoflagellates; oceanic and coastal microbial food web dynamics; role of protists in bioremediation in sediments.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Bolton, Susan M: Effectiveness Monitoring of Salmon Recovery Funding Board (SRFB) Funded Restoration Projects (Tetra Tech FW, Inc.)			\$13,807	
Echols, Louie S: Development of Salt Marsh Vegetation on Restoration Sites in Puget Sound (National Oceanic and Atmospheric Administration)				\$46,648
Edmonds, Robert L: Soil Manipulations to Favor Phenolic Defense Chemicals in Protection Against <i>Natrassia Magniferae</i> in Pacific Madrone (<i>Arbutus menziesii</i>) (City of Seattle)	\$14,677			
Ewing, Kern: Development of Restoration Strategies for Low-Elevation Riparian Forests in the North Cascades (National Park Foundation)			\$61,527	
Ewing, Kern: Ecology and Restoration of Prairies in San Juan National Historic Park (National Park Service)		\$16,069		\$52,019
Ewing, Kern: Health of Restored Plant Communities in the Sunrise Campground (National Park Service)	\$8,280	\$1,079		
Ewing, Kern: Restoration of a Low-Elevation Riparian Forest system in the North Cascades National Park (National Park Service)	\$33,247	\$15,000		
Ewing, Kern: Sudden and Significant Loss of <i>Z. marina</i> in the Westcott-Garrison Bay Complex (Russell Family Foundation)			\$20,000	
Grue, Christian E: Development of Citizen Involvement Monitoring Programs For Maury Island Aquatic Reserve (Washington State Department of Natural Resources)				\$4,000
Halpern, Charles B: An Ecological Restoration Experiment in the Cedar River Municipal Watershed (City of Seattle, Public Utilities Department)				\$500,000
Harrison, Robert B: Status of Soil and Turf in Lawns Remediated for Asarco Smelter Contamination (Washington State Department of Ecology)		\$9,870		
Henry, Charles L: Biosolids Information and Education Program – Technical and Educational Support for the Northwest Biosolids Management Association (King County Department of Natural Resources/Northwest Biosolids Management Association)	\$144,000	\$103,500		
Henry, Charles L: Mountains to Sound Greenway (King County)	\$55,000	\$55,000		
Hershman, Marc J: Submerged Vegetation Monitoring Project: Ecological Component (Washington State Department of Natural Resources)	\$30,777			
Hershman, Marc J: The Development of Management Guidelines with Respect to Minimum Light Requirements for <i>Zostera marina</i> (eelgrass) in Puget Sound (U.S. Department of the Navy)	\$14,916			

Grants and Contracts (cont'd)

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Lundstrom, David: UW Tacoma Campus Shaub-Ellison Parcel Site: Brownfields Cleanup (Environmental Protection Agency)				\$200,000
Parrish, Julia K: Common Murre Restoration (Washington State Department of Fish and Wildlife)	\$221,019			
Parrish, Julia K: Spatial Patterns of Migratory Shorebirds: Implications for Conservation and Management (U.S. Forest Service)	\$33,454	\$45,008		
Reichard, Sarah E: Native Seed Conservation (Center for Plant Conservation)				\$69,000
Reichard, Sarah E: Rare Plant Population Monitoring (National Fish and Wildlife Foundation)		\$25,000		
Reichard, Sarah E: Riparian Vegetation Enhancement and Restoration (King County)	\$24,468	\$25,508		\$35,590
Simenstad, Charles A: Crescent Bay Slat Marsh and Salmon Habitat Restoration (Island County)	\$225,483	\$38,772		
Simenstad, Charles A: Evaluating Habitat Restoration Opportunities for Pacific Salmon in the Duwamish River (National Oceanic and Atmospheric Administration)		\$8,297	\$5,730	\$5,000
Simenstad, Charles A: Research Support for the Puget Sound Nearshore Ecosystem Restoration Program (U.S. Geological Survey)		\$60,000		
Simenstad, Charles A: Transplanting and Epiphytic Monitoring of Eelgrass at the WSDOT Clinton Terminal (Battelle Pacific Northwest Laboratories)	\$42,384		\$25,346	
Total for Restoration and Remediation	\$847,705	\$403,103	\$166,410	\$912,257

Terrestrial Ecosystems

Pacific Northwest forests are a diverse set of ecosystems, ranging from temperate rainforest to subalpine forest to dry savanna. They provide many essential services for the region: clean water, clean air, stable soils, habitat, and biodiversity. In broad terms, a healthy forest is one that sustains desirable ecosystem functions and processes. Indicators of healthy forests include biodiversity, resilience, wildlife habitat, aesthetic appeal, and resource sustainability. Both natural and human influences can impact forest health in positive and negative ways. In fact, natural influences, such as fire, insects, and disease are essential for the regeneration and succession of most of our forests.

Even cities and suburbs are ecosystems. Our cities are more than centers of commerce, industry, education, and culture. They are also living entities—urban ecosystems with green spaces and waterways that bring together nature and human habitat. Urban areas are experiencing unparalleled expansion as most of the state’s population growth is funneled into the Puget Sound region, where more than half of all Washington residents already live. That means rapid change in the physical profile of cities and greater stress on the trees, parks, watersheds, and waterways that provide us everything from shady streets to recreation and wildlife habitat near our neighborhoods.

Examples of how the UW works to better understand terrestrial ecosystems in the Puget Sound region:

- The Forest Ecology Interest Group covers a broad spectrum of topics in forest biology and environmental science. UW faculty and students are involved in basic and applied research in a diversity of fields including: aquatic-terrestrial interactions, conservation biology, ecological modeling, ecophysiology, ecosystem studies, entomology, fire ecology, forest community ecology, genetics, global climate change, landscape ecology, paleoecology, pathology, and soils and nutrient cycling. Much of this work is carried out in the forested lands surrounding Puget Sound as well as at field sites around the world.
- By 2030, nearly 5.1 million people are expected to call the Puget Sound region home. This urbanization can fragment and reduce habitats, introduce exotic organisms, significantly modify energy flow and water and nutrient cycles, appropriate vast amounts of natural resources, and generate and export large quantities of emissions and waste. The UW Urban Ecology Program works to understand and improve the conditions of human-dominated ecosystems using the Puget Sound watershed as its primary laboratory. In our increasingly urbanized world, a clearer understanding of urban ecology—the process of dynamic interaction among human and ecological systems, is crucial to guide urban change toward more sustainable environments. Ecological and social knowledge gained from such research is relevant to planners and urban managers who make strategic choices about which issues deserve priority and about how to allocate scarce resources.

Faculty

Aquatic and Fishery Sciences

Naiman, Robert
naiman@u.washington.edu

Wissmar, Robert
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Biology

Ammirati, Joseph
cort@u.washington.edu

Giblin, David
dgiblin@u.washington.edu

Kenagy, George J
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Forest Resources

Agee, James
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Brubaker, Linda
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Cross, Jason
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Edmonds, Robert
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Ewing, Kern
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Franklin, Jerry
jff@u.washington.edu

Gara, Robert
garar@u.washington.edu

Halpern, Charles
chalpern@u.washington.edu

Harrison, Robert
robh@u.washington.edu

Hinckley, Thomas
hinckley@u.washington.edu

Expertise

Structure and dynamics of lotic ecosystems; watershed ecology and management; the role of large animals in influencing ecosystem dynamics.

Riparian interactions; river ecosystem restoration; endangered salmon.

Fungus systematics and ecology with emphasis on macrofungi, including lichens; species level taxonomy of mycorrhizal, brown-spored agarics (mushrooms).

UW Herbarium collections.

Ecophysiology and behavior; reproduction and life history; population biology; evolution; mammalogy.

Effects of fire on forest ecosystems; fire behavior and management; wildlife habitat and silviculture.

Dendrochronology and palynology; responses of vegetation to climate change and disturbance at different temporal and spatial scales.

Landscape-level analysis, modeling, and planning; habitat conservation.

Forest soil microbiology (especially decomposition, nutrient cycling processes, and mycorrhizae); forest pathology (especially root and canker diseases); air pollution.

Restoration of ecosystems, including freshwater and coastal wetlands, prairie, shrub-steppe, arid lands, oak woodlands, oak savanna, montane and thornscrub vegetation types.

Natural forest ecosystems, especially old-growth forests; effects of changing environmental conditions, such as global change, on forest processes; management and landscape ecology.

Forest entomology and international forestry.

Community ecology; succession; ecology of montane/subalpine meadows; effects of forest management on plant diversity.

Forest soil science.

Tissue to whole tree responses to environmental stresses, particularly the water and nutrient relations; carbon economy; growth of trees from diverse ecosystems.

Faculty

Forest Resources (cont'd)

Lippke, Bruce

blippke@u.washington.edu

Marzluff, John

corvid@u.washington.edu

Peterson, David

wild@u.washington.edu

Raedeke, Kenneth

kraedeke@nwlinc.com

Reichard, Sarah

reichard@u.washington.edu

Rogers, Luke

lwrogers@u.washington.edu

Sprugel, Douglas

sprugel@u.washington.edu

West, Stephen

sdwest@u.washington.edu

Zabowski, Darlene

zabow@u.washington.edu

Interdisciplinary Arts & Sciences (UW Bothell)

Gold, Warren

wgold@u.washington.edu

Groom, Martha

groom@u.washington.edu

Interdisciplinary Arts & Sciences (UW Tacoma)

Banks, John

banksj@u.washington.edu

Landscape Architecture

Hill, Kristina

kzhill@u.washington.edu

Urban Design and Planning

Alberti, Marina

malberti@u.washington.edu

Expertise

Forest economics; global trade and environmental policy linkages; resources assessment; environmental/economic performance of renewable industrial materials; rural technology transfer.

Forest fragmentation and the nest predators of the endangered Marbled Murrelet and a variety of songbirds in coastal Washington; how birds respond to urbanization.

The effects of environmental stress on forest ecosystems, including flooding, fire, air pollution and most recently climatic change.

Large mammal ecology and conservation.

Traits of invasive plants; prediction of invasive ability; early detection and rapid assessment of new invaders; impacts of plant invaders on native ecosystems and plants; rare plant species.

Geographic Information Systems applications for forest management.

Scaling physiological processes from shoot level to stand level; shoot geometry; history, role and consequences of disturbance in natural ecosystems.

Vertebrate population dynamics and natural history; the evolution and ecology of mammals; patterns of vertebrate habitat use within forest ecosystems; wildlife management and conservation biology.

Forest soils; soil genesis and classification; biogeochemical cycling of forest soils.

Alpine ecology; plant adaptation to cold environments; ecosystem role of cryptobiotic crusts; restoration of alpine ecosystems; plant response to grazing and UV radiation.

Application of ecological and evolutionary theories to conservation problems; experimental population biology; tropical ecology and conservation; conservation biology.

Pattern and scale in natural and managed terrestrial landscapes; how plant diversity in a habitat may affect resident organisms; integrated pest management.

Developing urban design principles; prototypes that emphasize sustainability and ecological health.

The impacts of alternative urban development patterns on ecosystem dynamics.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Ammirati, Joseph F: Lichen Inventory at Camp Muir in Mount Rainier National Park (National Park Service)	\$7,500			
Brubaker, Linda B: Study of the Holocene Plant Fossil Record in the Skagit River Valley, Ross Lake (National Park Service)		\$67,500		
Chalker-Scott, Linda K: Ecology and Status of Whitebark Pine in the Cascade Mountains (National Park Service)		\$16,069		
Chalker-Scott, Linda K: Is Foliar Chlorosis in Rhododendron Due to Excess Soil Phosphorus? (WA Dept. of Agriculture)		\$25,014		
Cross, Jason C: Relating (Standing) Volume to Forest Floor and Canopy Decadence within the Olympic Experimental State Forest (U.S. Forest Service)			\$31,940	
Edmonds, Robert L: Precipitation Chemistry and Ecosystem Function in Olympic National Park (National Park Service)	\$61,800	\$52,500		
Edmonds, Robert L: Resistance in Pacific Madrone to Canker Fungi (City of Seattle, Department of Neighborhoods)		\$14,485		
Giblin, David E: Creating an On-Line Photographic Image Library for the Flora of Washington State (Washington Native Plant Society)			\$1,000	\$1,300
Giblin, David E: Surveying the Vascular Plants, Nonvascular Plants, and Lichens of the San Juan Islands (Washington Native Plant Society)				\$1,832
Halpern, Charles B: Assessment of Overstory and Understory Vegetation for the DEMO Project (U.S. Forest Service)		\$415,962	\$178,924	
Harrison, Robert B: Effects of Organic Matter Retention and Management on Long-Term Productivity of PNW Douglas-Fir Plantations (National Council on Air and Stream Improvement)	\$40,000	\$40,000	\$40,000	\$40,000
Harrison, Robert B: Effects of Organic Matter Retention and Management on Long-Term Productivity of PNW Douglas-Fir Plantations (U.S. Forest Service)				\$30,000
Lippke, Bruce R: Understanding Regeneration of Douglas-Fir at Fort Lewis (U.S. Forest Service)			\$42,731	
Rogers, Luke W: Land Use Change on Non-Federal Land in Western Washington (U.S. Forest Service)			\$150,000	
Weeks, Robin J: Spectral Characterization of Vegetation from the Cedar River Watershed (City of Seattle)	\$1,660			
Total for Terrestrial (Forests, Cities, and Rural)	\$110,960	\$631,530	\$444,595	\$73,132



Hazards

Puget Sound is, by the nature of its geologic setting and the social and natural processes that shape it, subject to a unique suite of natural hazards. In addition, the Sound demonstrates a unique sensitivity to the direct and indirect influences of population growth and development.

Through a variety of research and outreach, the UW advances the predictive science of natural and environmental hazards, and integrates the science with hazard risk assessment and risk management. Our work focuses on integrated scientific assessments and synthesis of multidisciplinary data, advanced modeling and forecasting, and decision support systems for land managers and policy-makers.

The information in this section is organized in the following categories:

- Air Quality
- Geologic Hazards
- Invasive Species
- Toxins



Air Quality

Air pollution is typically thought of as a problem that negatively affects air quality and impairs people's health. Scientists have recently shown, however, that air pollution also contributes to land and water pollution, which affects the health of Puget Sound's valuable living resources—its fish, shellfish, and other animals. Pollutants released into the air eventually return to the earth's surface, making their way into streams, rivers, and the Sound by runoff or through groundwater flow.

In Puget Sound, air quality is determined by human activities, urbanization patterns, and weather patterns that circulate air throughout the airshed. The air moves and disperses airborne chemicals that are emitted from a variety of human and natural sources, both from within and outside the region.

Examples of how the UW addresses air quality issues in the Puget Sound region:

- The UW Air Pollution Training Center provides air pollution training for state and local air pollution agency employees. The Center offers both on-campus and off-campus training for air quality professionals on a wide spectrum of air pollution issues. Topic areas include hazardous air pollutants, permitting, new source review, permit review of control devices, field evaluation of control devices, field evaluation of industrial ventilation systems, atmospheric dispersion modeling, continuous emissions monitoring, combustion system evaluation, and source sampling.
- Pollutants from outside our airshed also affect the Sound. UW researchers have shown that a mix of wind-borne pollutants from China and neighboring countries is reaching the West Coast of the United States and Canada as a result of surging economic activity, farm practices, and forest fires—half a world away. Although most of the pollutants are similar to ones already found in North America, and reach the United States in relatively low concentrations, they exacerbate health concerns by increasing year-round concentrations of gasses and tiny particles in the air.

Faculty

Expertise

Atmospheric Sciences

Covert, David

dcovert@u.washington.edu

Atmospheric chemistry; aerosol physics, chemistry and optics; aerosol instrumentation; climate effects and global distributions of aerosols.

Hobbs, Peter

phobbs@atmos.washington.edu

Cloud/precipitation physics; atmospheric chemistry; air pollution.

Mass, Clifford

cliff@atmos.washington.edu

Synoptic and mesoscale meteorology.

Civil and Environmental Engineering

Larson, Timothy

tlarson@u.washington.edu

Air quality (management aspects); atmospheric chemistry; measurement methods for atmospheric aerosols, precipitation scavenging; health effects of aerosols; source/receptor models.

Pilat, Michael

mpilat@u.washington.edu

Control of air pollutant emissions; emission source monitoring; toxic and hazardous air pollutants; aerosol particle technology; volatile organic compounds.

Environmental and Occupational Health Sciences

Kalman, David

dkalman@u.washington.edu

Environmental chemistry; detection and fate of chemical hazards in natural and man-made environments.

Liu, Lee-Jane

sliu@u.washington.edu

Human exposure assessment and analysis; environmental epidemiology; air pollution monitoring and modeling; passive/active air monitoring development.

Simpson, Christopher

simpson1@u.washington.edu

Analytical and environmental chemistry; biomarker development; human exposure assessment; air pollution monitoring.

Forest Resources

Edmonds, Robert

bobe@u.washington.edu

Forest soil microbiology (especially decomposition, nutrient cycling processes, and mycorrhizae); forest pathology (especially root and canker diseases); air pollution.

Peterson, David

wild@u.washington.edu

Effects of environmental stress on forest ecosystems, including flooding, fire, air pollution, and most recently climatic change.

Interdisciplinary Arts & Sciences (UW Bothell)

Jaffe, Daniel

djaffe@u.washington.edu

Atmospheric chemistry; urban and global air pollution; environmental education.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Covert, David S: Ultrafine Particle Measurements and Data Analysis for PNW2001 Field Experiment (Battelle Memorial Institute Research)	\$8,954			
Grue, Christian E: Source Apportionment of Seattle and Portland Air Toxics and PM2.5 Data (Washington State Department of Ecology)				\$45,200
Hobbs, Peter V: Airborne Studies of Mercury in Smoke (Electric Power Research Institute)	\$85,000			
Jaffe, Daniel A: Trans-Pacific Transport of Ozone, Carbon Monoxide, and Particulates (National Oceanic and Atmospheric Administration)	\$120,000			
Mass, Clifford F: Air Quality and the Pennsylvania State University/National Center for Atmospheric Research numerical model MM5 (Puget Sound Clean Air Agency)	\$25,000	\$25,000	\$25,000	\$20,000
Pilat, Michael J: Air Pollution Training Center (Environmental Protection Agency)		\$8,336		
Stoermer, Mark W: Puget Sound Basin Air Pollution Model (National Park Service)		\$10,000		
Total for Air Quality	\$238,954	\$43,336	\$25,000	\$65,200

Geologic Hazards

The Puget Sound Basin is an extensively urbanized area within a complicated geologic setting. It is host to numerous geologic hazards such as volcanic activity, earthquakes, faulting, tsunamis, landslides, liquefaction, and other ground failures. All of these hazards can ultimately influence the environmental health of our region by altering or destroying habitat, perturbing plant and animal communities, and damaging civic infrastructure.

Each year several thousand Pacific Northwest earthquakes are recorded, although only a few dozen are large enough to be felt. Most are in the Puget Sound region, and few cause any damage. However, based on the history of past damaging earthquakes and our understanding of the geologic history of the Pacific Northwest, we expect that damaging earthquakes (magnitude 6 or greater) will recur in our area.

Seismic activity in our region can also be an indication of increased volcanic hazards. The Cascade Range has more than a dozen potentially active volcanoes. When Cascade volcanoes do erupt, high-speed avalanches of hot ash and rock pyroclastic flows, lava flows, and landslides can devastate areas 10 or more miles away; and huge mudflows of volcanic ash and debris, called lahars, can inundate valleys more than 50 miles downstream.

Landslides are deadly, costly, and common throughout Puget Sound, where development in geologically unstable areas is widespread and heavy winter rainfall destabilizes steep slopes. Although it is impossible to predict the timing of individual landslide events, site-specific assessments of climate, geology, vegetation, and structural elements can usually identify potential landslide hazard areas.

Example of how the UW addresses geologic hazards in the Puget Sound region:

- The Pacific Northwest Seismograph Network (PNSN) is housed at the UW and operated jointly with the University of Oregon and Oregon State University. It is funded by the federal government and the State of Washington. Data from the monitoring network help scientists understand Pacific Northwest earthquake hazards, predict volcanic eruptions in the Cascades, and determine the location of faults and volcanic magma chambers.
- The Pacific Northwest Center for Geologic Mapping Studies (GeoMapNW) is a collaborative effort to develop new data and greater understanding of the geologic hazards of the central Puget Lowland. The Center produces detailed surface and subsurface geologic maps that can be used in vulnerability models, development planning, and critical areas ordinances throughout the region.
- The UW's Geotechnical Engineering program promotes research in such topics as the mechanics and properties of rock and transitional materials, underground construction, earthquake engineering, foundation soil improvement, and the remediation of contaminated soils and groundwater. The program is dedicated to providing engineering solutions to reduce losses associated with geologic hazards.

Faculty

Expertise

Civil and Environmental Engineering

Booth, Derek

dbooth@u.washington.edu

Consequences of geologic processes and materials on land-use: stream channels, river systems, hillslope stability, erosion, and groundwater; measurement and monitoring.

Eberhard, Marc

eberhard@u.washington.edu

Structural analysis and design; reinforced concrete; earthquake engineering; nondestructive testing.

Kramer, Steven

kramer@u.washington.edu

Soil mechanics; foundation engineering; geotechnical earthquake engineering.

Lehman, Dawn

delehman@u.washington.edu

Response of reinforced concrete structures to seismic loading.

MacRae, Gregory

macrae@u.washington.edu

Design of structures to withstand earthquakes.

Earth and Space Sciences

Bourgeois, Joanne

jbourgeo@u.washington.edu

Environmental and process analysis of clastic sediments and sedimentary rocks; interpretation of sedimentary structures; tectonics and sedimentation; paleoseismicity.

Creager, Kenneth

kcc@ess.washington.edu

Seismology and geophysical inverse theory.

Crosson, Robert

crosson@ess.washington.edu

Seismology; earth structure; tectonics; earthquake hazards.

Ludwin, Ruth

rludwin@u.washington.edu

Historical Pacific Northwest earthquakes.

Malone, Stephen

steve@ess.washington.edu

Seismicity of the Cascade volcanoes; earthquake and volcanic hazards; strong-motion seismology; computer applications in seismic data acquisition and network analysis.

Montgomery, David

dave@ess.washington.edu

Linkages between the physical processes that generate and redistribute sediments in natural landscapes.

Troost, Kathy

ktroost@u.washington.edu

Geologic mapping of the Seattle area.

Political Science

May, Peter

pmay@u.washington.edu

Policy design and implementation with particular emphasis on regulatory policy for environmental and hazards policies.

Urban Design and Planning

Freitag, Robert

bfreitag@u.washington.edu

Integration of hazard mitigation principles into a wide range of crisis, disaster, and risk management opportunities.

Westerlund, Frank

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Land use and environmental planning, urban and regional; growth management; remote sensing and GIS applications; natural hazard mitigation; biodiversity protection.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Beyers, William B: Household Impacts of the Nisqually Earthquake (National Science Foundation)	\$74,511			
Booth, Derek B: Geologic Mapping of the Tahuya Peninsula Area, Washington (U.S. Geological Survey)		\$13,050		
Booth, Derek B: Subsurface Geologic Database and Geologic Investigations, Bainbridge Island (City of Bainbridge Island)			\$75,444	
Booth, Derek B: The Quaternary Geologic Framework for the City of Seattle and the Seattle-Tacoma Urban Corridor (U.S. Geological Survey)	\$170,000	\$124,989	\$110,433	
Cowan, Darrel: S. Volcano Studies (U.S. Geological Survey)	\$18,032			
Creager, Kenneth C: Intraslab Earthquakes and 3-D Slab Structure in Cascadia (U.S. Geological Survey)		\$60,000		
Crosson, Robert S: 3-D Structure and Tectonic Interpretation of the Cascadia Crust and Subducting Slab from Seismic Hazards in the Puget Sound (SHIPS) and Earthquake Data (National Science Foundation)	\$133,823			
Crosson, Robert S: High-Resolution Earthquake Relocation in Cascadia (U.S. Geological Survey)		\$50,000	\$61,390	
Eberhard, Marc O: Database and Acceptance Criteria for Column Tests (University of California, Berkeley)	\$70,000	\$70,000	\$5,000	
Eberhard, Marc O: Database and Simulation/Performance Criteria for Reinforced Concrete Columns (Pacific Earthquake Engineering Research)			\$70,000	
Eberhard, Marc O: Post-Earthquake Prioritization of Bridge Inspections (Washington State Dept. of Transportation)		\$45,000		
Eberhard, Marc O: Relating Engineering Demand Parameters (EDPs) in Reinforced Concrete Bridges to Damage and Decision Metrics (Pacific Earthquake Engineering Research)				\$85,000
Kramer, Steven L: Evaluation of Liquefaction Hazards in Washington State (Washington State Department of Transportation)	\$200,000			
Kramer, Steven L: Performance-Based Earthquake Engineering Assessment of the Effects of Ground Liquefaction on Bridges (Pacific Earthquake Engineering Research)				\$84,997
Le Veque, Randall J: Tsunamis in 3-D Bathymetry (Oregon State University)			\$61,051	\$45,043
Lehman, Dawn E: Bar Buckling in Bridge Components (Pacific Earthquake Engineering Research)				\$85,000
Lehman, Dawn E: Cumulative Damage Models for Reinforcing Bar Buckling and Fracture in Reinforced Concrete Beams and Columns (University of California, Berkeley)				\$89,998

Grants and Contracts (cont'd)

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Ludwin, Ruth: Studies of Historic Earthquakes in Washington and Oregon (U.S. Geological Survey)		\$40,000		
Malone, Stephen D: Cooperative Operation of the Pacific Northwest Seismograph Network (U.S. Geological Survey)	\$732,894	\$685,462	\$432,357	\$1,458,077
Malone, Stephen D: Pilot Data Sets from Mt. St. Helens, Long Valley, and Yellowstone Volcanoes into WOVodat (U.S. Geological Survey)				\$25,000
Malone, Stephen D: Seismic Array: Studies of Cascadia Deep Tremor (National Science Foundation)			\$160,553	
May, Peter J: Societal Implications of Performance-Based Earthquake Engineering (University of California, Berkeley)				\$74,517
Montgomery, David R: Puget Slides Research (National Oceanic and Atmospheric Administration)		\$15,000		
Nesbitt, Elizabeth A: Earthquakes and Tectonics of the Pacific Northwest: Educational Outreach (National Science Foundation)	\$56,666			
Reed, Dorothy A: Performance of Electric Utility Lifelines in Urban Centers for Earthquake Hazards (National Science Foundation)	\$260,496			
Roeder, Charles W: Performance-Based Seismic Design of Concentrically Braced Frames (National Science Foundation)		\$296,278		
Willett, Sean D: Thermomechanical Models of Forearc Deformation at the Cascadia Subduction Zone (National Science Foundation)	\$83,600			
Yeh, Harry H: Coastal Effects of Tsunamis (National Science Foundation)		\$35,000		
Total for Geologic Hazards	\$1,800,022	\$1,434,779	\$976,228	\$1,947,632

Invasive Species

Non-native invasive species are species introduced deliberately or unintentionally outside their natural habitats where they have the ability to establish themselves, outcompete natives, and take over the new environments. The uncontrolled spread of introduced species is a problem throughout the world in all types of ecosystems.

Invasive species are threatening critical habitat and important commercial species in the Pacific Northwest and could lead to drastic changes in the ecology of estuarine, freshwater, and terrestrial systems. More than 50 exotic species have been identified in Puget Sound waters alone. The majority came from Asia or the East Coast. It is likely that most arrived with oysters planted for commercial aquaculture. Others are thought to have been brought in on the bottoms of ships or released into the Sound with ballast water. This last vector is an area of particular concern, as marine vessels take on and discharge millions of tons of ballast water daily in ports and harbors around the globe. Regardless of how they are introduced, once established, invasive species are almost impossible to eradicate.

Examples of how the UW addresses invasive species in the Puget Sound region:

- An informed and educated public is widely recognized as the cornerstone of effective prevention and control of aquatic non-indigenous species. The Washington Sea Grant Program at the UW is developing a series of educational products in collaboration with the State of Washington, the National Estuary Program, the U.S. Fish and Wildlife Service, and the Georgia Basin/Puget Sound International Task Force. The goal of these educational products is to increase awareness of aquatic invasive species and their potential impacts on the environment and economy.
- Washington Sea Grant also supports research on effective treatment and safe disposal of ballast water. Working closely with teams of scientists, engineers, and representatives from the shipping and regulatory communities, Sea Grant's Marine Ballast Water Specialist is exploring the effectiveness of various disinfection techniques and other technologies to treat ballast water onboard ships.
- UW researchers also are addressing a broad range of introduced species in terrestrial ecosystems, from invasive plants to invasive forest insects to invasive tree diseases. We explore the biology of invasive species and risk assessment methods to prevent their introduction and spread, and identify pathways by which the invaders enter our region.

Faculty

Expertise

Aquatic and Fishery Sciences

Hauser, Lorenz
lhauser@u.washington.edu

Application of molecular markers to problems in ecology and evolutionary biology; use of anthropogenic disturbance as evolutionary model systems providing insights into adaptation and genetic change.

Herwig, Russell
herwig@u.washington.edu

Marine ballast water and microbiology of aquatic environments.

Biology

Dethier, Megan
mdethier@u.washington.edu

Ecology of marine and estuarine shorelines.

Ruesink, Jennifer
ruesink@u.washington.edu

Thresholds in species interactions; introduced species; energy sources supporting estuarine productivity.

Forest Resources

Gara, Robert
garar@u.washington.edu

Forest entomology and international forestry.

Grevstad, Fritz
grevstad@u.washington.edu

Biological control of spartina.

Halpern, Charles
chalpern@u.washington.edu

Successional dynamics of forest and meadow communities of the Pacific Northwest.

Reichard, Sarah
reichard@u.washington.edu

Traits of invasive plants; prediction of invasive ability; early detection and rapid assessment of new invaders; impacts of plant invaders on native ecosystems and plants; rare plant species.

Interdisciplinary Arts & Sciences (UW Tacoma)

Secord, David
dave@u.washington.edu

Experimental marine ecology; invertebrate zoology; evolution; symbiotic interactions; conservation biology; biological control; biology of cnidarians and other clonal organisms.

Marine Affairs

Klinger, Teresa
tklinger@u.washington.edu

Application of genetic, population, and ecosystem studies to marine environmental decision making.

Washington Sea Grant Program

Copping, Andrea
acopping@u.washington.edu

Marine environment and water quality; marine science/marine policy.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Echols, Louie S: Aquatic Nuisance Species 2003–2005 (National Oceanic and Atmospheric Administration)			\$284,181	\$283,137
Echols, Louie S: Impacts and Dynamics of Two Introduced Drills Consuming Cultured and Threatened Oysters (National Oceanic and Atmospheric Administration)	\$33,457	\$33,909		
Grevstad, Fritzi: Surveys for Native Enemies of Knotweed Species in Washington State (U.S. Forest Service)				\$39,642
Halpern, Charles B: Modeling Distribution of High-Priority Exotic Plant Species (National Park Service)			\$27,484	\$40,000
Herwig, Russell P: Aquatic Nuisance Species: Control and Mitigation (University of North Carolina)		\$69,331	\$33,965	
Herwig, Russell P: Ballast Water Monitoring and Treatment (U.S. Department of the Interior)			\$50,000	
Herwig, Russell P: Ballast Water Treatment Research (Northeast-Midwest Institute)		\$121,908	\$121,504	
Herwig, Russell P: Demonstration of Ship-Board Ozone Treatment (University of North Carolina)		\$29,920		
Herwig, Russell P: Laboratory Experiments with a Filtration and Hypochlorite System for Removing and Inactivating Marine Organisms Present in Ballast Water (Severn Trent Services)				\$110,000
Herwig, Russell P: Patterns Of Non-Native Species Transfer in Ballast Water (Smithsonian Institute)				\$21,170
Herwig, Russell P: Surrogate Species Screening for Ballast Water Treatment Technologies: Bacteria And Zooplankton (Woods Hole Oceanographic Institution)				\$137,496
Herwig, Russell P: University of Washington UL Light Research (Northeast-Midwest Institute)	\$43,868			
Reichard, Sarah E: Ecological Effects and Control of Japanese Knotweed (<i>Polygonum cuspidatum</i>) (National Park Service)			\$31,510	\$32,296
Ruesink, Jennifer L: Understanding the Influence of Non-Indigenous Smooth Cordgrass on Food Web Dynamics (National Oceanic and Atmospheric Administration)		\$13,000		
Total for Invasive Species	\$77,325	\$268,068	\$548,644	\$663,741



Toxins

One of the most obvious human impacts on coastal and marine ecosystems is the introduction of pollutants, toxins, and excess nutrients from land-use and development. Both point and non-point sources, intentionally released into an ecosystem or arriving as byproducts and spills, can have deleterious consequences on the natural environment.

Contaminants can enter Puget Sound from a wide range of sources including transport from the ocean, rivers, and streams; shoreline erosion; urban runoff; permitted industrial and municipal discharges; combined sewer overflows; and atmospheric fallout. In some areas of the Sound, such as urban waterways, concentrations of contaminants are high enough to injure marine life, shellfish and fish, and even human health. Although sediments, water, and biota in the Sound were considerably more contaminated several decades ago than they are today, many challenges remain.

Examples of how the UW addresses toxins in the Puget Sound region:

- Pesticide, herbicide, and fertilizer application can have dramatic impacts on fish and wildlife through direct and indirect contact. Improper application, excessive concentrations, and overuse of pesticides and fertilizers are common practices in urban shoreline areas where artificial landscapes are desired by landowners. We are assessing the hazards pesticides and aquatic herbicides pose to salmon.
- Some of the most popular sport fish in Lake Washington contain surprisingly dangerous levels of toxic chemicals called PCBs. These chemicals are suspected human carcinogens, and consumption of tainted fish has been linked to learning deficits in children. UW researchers worked with the Washington State Department of Health and King County Department of Natural Resources and Parks to evaluate the contaminants in fish from Lake Washington. Pikeminnows collected in the lake contained up to 1,000 parts per billion (ppb) of PCBs—the highest level ever measured in any Washington fish species. The next highest concentration of total PCBs was observed in large cutthroat trout at 377.4 ppb. The generally accepted safe levels are considered to be 50-100 ppb. All fish species collected from Lake Washington had detectable levels of mercury as well. These data resulted in immediate health advisories warning anglers to limit their consumption and minimize their risk.

Faculty

Expertise

Aquatic and Fishery Sciences

Beauchamp, David
davebea@u.washington.edu

Fish behavior; acoustics; ecosystem modeling; and bioenergetics.

Grue, Christian
cgrue@u.washington.edu

Wildlife toxicology and wildlife science.

Hauser, Lorenz
lhauser@u.washington.edu

Population genetics; molecular ecology; evolutionary biology.

Environmental and Occupational Health Sciences

Gallagher, Evan
evang3@u.washington.edu

Molecular environmental toxicology; species' differences in susceptibility to toxicity.

Kalman, David
dkalman@u.washington.edu

Environmental chemistry; detection and fate of chemical hazards in natural and man-made environments.

Liu, Lee-Jane
sliu@u.washington.edu

Human exposure assessment and analysis; environmental epidemiology; air pollution monitoring and modeling; passive/active air monitoring development.

Meschke, John
jmeschke@u.washington.edu

Pathogen survival, mobility, and detection in the environment; microbial risk assessment; water and wastewater treatment; public health and environmental microbiology.

Forest Resources

Edmonds, Robert
bobe@u.washington.edu

Forest soil microbiology (especially decomposition, nutrient cycling processes, and mycorrhizae); forest pathology (especially root and canker diseases); air pollution.

Interdisciplinary Arts & Sciences (UW Bothell)

Henry, Charles
clh@u.washington.edu

Soil amendments; fate of contaminants in soils; nutrient cycling; recycling; composting; bioremediation; biosolids management; product life cycle analysis.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Beauchamp, David A: Fish Contaminant Levels in Lake Washington (Washington State Department of Health)				\$20,000
Grue, Christian E: Aquatic Herbicides and Juvenile Salmon- an Assessment of Exposure and Effects (Washington State Department of Ecology)			\$74,862	
Grue, Christian E: Assessing the Hazards Pesticides in Surface Waters Pose to Salmon (Washington State Commission on Pesticide Registration)				\$19,432
Grue, Christian E: Comparison of the Effects of Surfactants and Smoltification in Pacific and Atlantic Salmon (U.S. Geological Survey)		\$8,605	\$6,146	
Grue, Christian E: Effects of Rodeo and R-11, R-11, LI700, Agri-Dex and Hasten on Fertilization and Embryogenesis in Pacific Oysters (Washington State University)	\$25,182			
Grue, Christian E: Fertilization and Embryogenesis in Pacific Oysters Exposed to Rodeo and R-11 (U.S. Geological Survey and Washington State Department of Ecology)	\$6,782	\$5,000		
Grue, Christian E: Herbicides and Salmon Smoltification (Washington State Department of Ecology)		\$57,627		
Grue, Christian E: Toxicity of Herbicide Tank Mixes Used to Control Spartina on Juvenile Salmonids (Washington State Commission on Pesticide Registration)				\$13,890
Total for Toxins	\$31,964	\$71,232	\$81,008	\$53,322

Regional Communities and Economies

Shorelines have wide appeal, which means demands are high for recreational, business, and residential developments near the water. Coastal areas only make up 10 percent of the landmass of the United States, and yet more than 50 percent of Americans live on the coast. By 2025, the Department of Commerce predicts that nearly 75 percent of Americans will live in coastal counties.

The rapidly growing population in the Puget Sound region, has brought a corresponding rise in coastal pollution and environmental degradation. In response, communities must balance social and environmental values, promoting economic development while maintaining the integrity of coastal ecosystems.

The UW conducts research to better understand the interconnectivity between the economy and the environment and implement outreach programs that expand the scientific understanding of community planners, business leaders, and citizens. Furthermore, the UW provides technical assistance to help communities plan infrastructure development, manage their natural resources, analyze policies and incentives that have environmental consequences, evaluate their tourism potential, and adapt new technologies to meet emerging business opportunities.

The information in this section is organized in the following categories:

- Culture
- Fisheries Management
- Forestry Management
- Public Health
- Transportation
- Urban Infrastructure and Planning

Culture

The natural and human environments form a closely interrelated system. The natural environment can be seen as a total ecosystem, influenced by such ecological factors as climate, plant succession, energy exchanges, and biogeochemical cycles. Human factors affecting the ecosystem include: population pressures on the land; the market economy and its fluctuations; the social structures and social relations involved in the use, exploitation, and conservation of a particular natural resource; and human attitudes contributing to changes in the natural-human system.

The unique environmental qualities of the Puget Sound region are strong influences in the lifestyles of the peoples who live or have lived here. We take pride in, and profit from, a reputation for pristine landscapes with abundant wildlife. It is against the backdrop of a seriously degraded environment that the character of our culture and identity becomes vulnerable.

Examples of how the UW addresses culture and the environment in the Puget Sound region:

- Recognizing a fundamental web linking quality of life to ecology, long-term economic vitality, social vibrancy, and a coherent and integrated built environment, the UW's Northwest Center for Livable Communities seeks to promote awareness of these connections and affect the creation of more livable communities through applied research and community initiatives. The work of the center is primarily directed toward incorporating principles of livability into decisions concerning the built environment. For example, we work to preserve open spaces and agricultural, historic, and cultural resources in the landscape, as well as spaces for various recreational activities. We also encourage coordination over transportation, environmental protection, and economic development among governments and private entities within the region.
- Environmental history is a rich collection of inquiries into the transformation of the natural world by human action and the consequences for both nature and people. Changes in attitudes and behaviors toward nature and past and present conservation and environmental movements are also examined. An example of the UW's contributions to this field in Puget Sound is our work conducting historical research and developing interpretive materials that document agricultural practices on three Whidbey Island prairies at Ebey's Landing National Historical Reserve.
- Numerous programs in American cities offer teens and adolescents opportunities to do service work in forest landscapes. There is little empirical evidence, however, regarding any benefits these youth receive through participation in such service work. We have launched a pilot research project to better quantify and communicate the benefits gained by adolescents who are involved in these types of projects in the Pacific Northwest. Measurable outcomes can expand understanding of youth benefits and help organizations improve their youth programs.

Faculty

Expertise

Anthropology

Hunn, Eugene
hunn@u.washington.edu

Ethnobiology; cultural ecology; cognitive anthropology; language and culture; Native North/Middle America.

Lape, Peter
plape@u.washington.edu

The use of archaeological and documentary analysis to investigate the impacts of cross-cultural entanglements.

Stein, Julie
jkstein@u.washington.edu

Archaeology; geoarchaeology; archaeological sediments; site formation processes; shell middens; Northwest Coast; New World.

Architecture

Badanes, Steven
sbadanes@u.washington.edu

Sustainable building technology; public art; community based design/build; architecture.

Forest Resources

Bradley, Gordon
gbradley@u.washington.edu

Forest land use planning; environmental impact assessment; urban forest issues; conservation area planning; urban ecology.

Brubaker, Linda
lbru@u.washington.edu

Dendrochronology and palynology; responses of vegetation to climate change and disturbance at different temporal and spatial scales.

Kearney, Anne
akearney@u.washington.edu

Cognitive factors in environmental perception, decision making, and problem solving; effects of environments and environmental change on human functioning; effective communication/information transfer.

Lee, Robert
boble@u.washington.edu

Human communities and development; change of forestry institutions.

Wolf, Kathleen
kwolf@u.washington.edu

Environment and behavior concerning urban ecology and landscapes, urban forestry.

Wott, John
jwott@u.washington.edu

The interaction of people and plants, including plant identification, selection, maintenance, design and evaluation.

Geography

Beyers, William
beyers@u.washington.edu

The relationship between environmental characteristics and settlement change in the United States; modeling the interaction between human and environmental systems.

History

Findlay, John
jfindlay@u.washington.edu

History of the Pacific Northwest and the North American West.

Nash, Linda
lnash@u.washington.edu

Environmental history and the American West.

Faculty

Expertise

Interdisciplinary Arts & Sciences (UW Tacoma)

Kucher, Michael
kucher@u.washington.edu

History of technology and the environment; impact of the fur trade on aquatic ecosystems in the Pacific Northwest.

Landscape Architecture

Hou, Jeffrey
jhou@u.washington.edu

Community design; everyday landscapes; design activism; informal participation; ecological and cultural multiplicity in the urban landscape.

Manzo, Lynne
lmanzo@u.washington.edu

Environment and behavior in urban space, focusing on issues of place attachment, place identity, community participation and development as well as the politics of place.

Rottle, Nancy
rottle@u.washington.edu

Use of design as a means to create places that are culturally meaningful, ecologically healthy, and experientially resonant.

Marine Affairs

Christie, Patrick
patrickc@u.washington.edu

Tropical coastal zone management, participatory research and planning, establishment and monitoring of marine protected areas, and quantitative research methods.

Miller, Marc
mlmiller@u.washington.edu

Cultural anthropology, tourism planning, marine affairs, natural resource management, ethnographic methods.

Urban Design and Planning

Abramson, Daniel
abramson@u.washington.edu

Comparative urban design, historic preservation and neighborhood planning.

Blanco, Hilda
hblanco@u.washington.edu

Pragmatism and planning theory, planning ethics, mixed use land use, state growth management and the new urbanism, and the importance of neighborhood commercial activities for sustainable communities.

Born, Branden
bborn@u.washington.edu

Land use/regional planning, planning processes, social justice, food systems.

Miller, Donald
millerd@u.washington.edu

Urbanization processes, urban spatial structure, planning theory and evaluation, public service planning, consumer behavior and demand for public services.

Mugerauer, Robert
drbobm@u.washington.edu

Sustainability; impact of information technology; values, social and cultural factors in design and planning.

Purcell, Mark
mpurcell@u.washington.edu

Urban political economy, urban geography, democracy, citizenship.

Ryan, Dennis
frango@u.washington.edu

Urban design and planning as communicative process; community and the socio-cultural dimensions of planning and place; issues associated with urban change and continuity.

Wagner, Frederick
fwagner@u.washington.edu

Land use/legal aspects of urban planning; health policy across urban and rural communities in developed and developing countries.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Bradley, Gordon A: An Ethnohistory of Traditionally Associated Native Populations for Ebey's Landing National Historical Reserve (National Park Service)				\$25,000
Brubaker, Linda B: Native Americans and the Pacific Northwest Environment: An Interdisciplinary Study (National Park Service)		\$30,000		
Findlay, John M: Environmental History of the Hudson's Bay Company (National Park Service)	\$15,000	\$5,000		
Findlay, John M: Olympic National Park National Register Nominations - Park Trail System (National Park Service)		\$5,000		
Hunn, Eugene S: Local Perceptions of Salmon Habitat Restoration: An Ethnographic Study of Science-Based Conservation and Social Conflict in the Pacific Northwest (National Science Foundation)				\$11,985
Lape, Peter: Cedar River Watershed: Our Ancestors, Our Past (King County Office of Cultural Resources)			\$13,500	
Nash, Linda: Environmental History of San Juan Island National Historical Park (National Park Service)		\$10,000		
Rottle, Nancy: Environmental History Research and Interpretation: Agricultural Land Use at Ebey's Landing National Historical Reserve (National Park Service)				\$29,500
Stein, Julie K: Watmough Bay Archaeological Site Stabilization Project - Lopez Island (U.S. Department of Interior, Bureau of Land Management)				\$18,072
Wagner, Fredrick W: Northwest Center for Livable Communities (U.S. Department of Housing and Urban Development)			\$223,538	
Wolf, Kathleen: Youth in Nature Learning and Forest Ecosystem Programs: Assessing Psychosocial and Social Impacts, Benefits and Behaviors (U.S. Forest Service)		\$35,000		
Total for Culture	\$15,000	\$85,000	\$237,038	\$84,557

Fisheries Management

Today's environmental, economic, and policy challenges require fisheries managers to use a broad range of tools to effectively manage the limited natural resources they are responsible for sustaining. Pollution and poorly planned coastal development degrade estuarine and coastal nursery habitats. Non-native invasive species disrupt ecosystems. Unsustainable fishing practices deplete valuable fish populations, resulting in social and economic dislocation, reduced biodiversity, and altered aquatic ecosystems.

Over the past three decades, commercial harvests of Puget Sound fish and shellfish have plummeted. Some fish, such as pollock and whiting, have been hit so hard that the fisheries are now severely restricted. As a consequence, the American Fisheries Society named Puget Sound and adjacent Canadian waters as one of four primary geographic "hot spots" in the United States with fishery stocks at risk.

Examples of how the UW addresses fisheries management in the Puget Sound region:

- Fishing has always been among the most challenging professions. However, today's fishermen and fishery managers face unprecedented challenges that threaten ecosystems and livelihoods. The Washington Sea Grant Program addresses fishing industries in Washington State in a variety of ways: (1) provides training classes, workshops, and testing for safety certifications; (2) provides education and technical assistance on seafood handling, quality control, safety and use; and (3) conducts applied research projects to maximize the use of fisheries resources through control of bycatch.
- The Pinto (or Northern) abalone is the smallest of the abalones, a shellfish known for its delicate flavor and beautiful mother-of-pearl shell. In Washington waters its distribution appears to be limited to the Strait of Juan de Fuca and San Juan Islands. Diving surveys conducted since 1979 show a large-scale decline in abalone abundance due to overharvest. UW researchers are collecting the baseline information necessary to make informed decisions on whether a supplementation program in pinto abalone should be implemented.

Faculty

Expertise

Aquatic and Fishery Sciences

Armstrong, David
davearm@u.washington.edu

Crustacean ecology; fisheries population dynamics.

Beauchamp, David
davebea@u.washington.edu

Fish behavior; acoustics; ecosystem modeling; bioenergetics.

Conquest, Loveday
conquest@u.washington.edu

Statistical methods for data analysis; sampling/field design; general methodology for environmental monitoring and natural resource management.

Friedman, Carolyn
carolynf@u.washington.edu

Health management, conservation, and culture of marine invertebrates.

Gallucci, Vincent
vgallucc@u.washington.edu

Stock assessment; sharks; artisanal fisheries; fisheries management.

Hilborn, Ray
rayh@u.washington.edu

Fisheries population dynamics and management; natural resource conservation; fishery resources of the west coast of the United States, Canada, New Zealand and Australia.

Naish, Kerry-Ann
knaish@u.washington.edu

Conservation genetics; quantitative genetics; evolution; molecular genetics; genome mapping; aquaculture; salmonids; shellfish.

Punt, Andre
aepunt@u.washington.edu

Biomathematics, multispecies modeling, population dynamics, and stock assessment.

Wissmar, Robert
wissmar@u.washington.edu

Riparian interactions; river ecosystem restoration; endangered salmon.

Marine Affairs

Christie, Patrick
patrickc@u.washington.edu

Tropical coastal zone management; participatory research and planning; establishment and monitoring of marine protected areas; quantitative research methods.

Fluharty, David
fluharty@u.washington.edu

Natural resource policy; climate variability and fishery management; international management of fisheries and marine mammals; nonrenewable natural resource management.

Hershman, Marc
hershmj@u.washington.edu

Legislative, administrative, and socioeconomic aspects of the uses of the coastal zone and its resources; coastal planning and management; port development; and exclusive economic zone use and governance.

Huppert, Daniel
huppert@u.washington.edu

Marine resources economics; salmon conservation; water and hydropower economics; marine fisheries management

Klinger, Teresa
tklinger@u.washington.edu

Application of genetic, population, and ecosystem studies to marine environmental decision making.

Miller, Marc
mlmiller@u.washington.edu

Cultural anthropology; tourism planning; marine affairs; natural resource management; ethnographic methods.



Faculty

Expertise

Public Affairs

Brock, Jonathan
jbrock@u.washington.edu

Public management; managing people; labor-management relations; conflict resolution; agency improvement strategies.

Washington Sea Grant Program

Copping, Andrea
acopping@u.washington.edu

Marine environment and water quality; marine science/marine policy.

Granger, C A Peter
pgranger@u.washington.edu

Fishing as a business.

Melvin, Edward
emelvin@u.washington.edu

Reduction of seabird bycatch.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Armstrong, David A: Geoduck Clam Research, Management and Aquaculture (Washington State Department of Natural Resources)			\$100,029	
Armstrong, David A: Salmon in the School (Seattle Public Utilities)		\$20,939		
Beauchamp, David A: Develop Worst Case Analysis for Cedar River Hatchery SEIS (Seattle Public Utilities)			\$7,000	
Brock, Jonathan: NW Straits Commision Evaluation (Washington State Department of Ecology)			\$70,000	
Copping, Andrea E: Analysis and Recommendations for Management of Northern Puget Sound Marine Protected Waters (Washington State Department of Ecology)		\$110,440		\$119,700
Echols, Louie S: Washington Sea Grant: Regional Fisheries Extension (National Oceanic and Atmospheric Administration)	\$15,000	\$30,000		
Friedman, Carolyn: Restoration and Aquaculture of the Northern Abalone (Haliotis Kamtschatkana) in Washington State (National Oceanic and Atmospheric Administration)			\$274,418	
Granger, Pete: Bellingham "Fishermen's Wharf": Direct Marketing Concept for Commercial Fishermen (Washington State Department of Agriculture)		\$15,500		
Granger, Pete: Technical Assistance Curriculum Package of Trade Adjustment Program in Washington State (Washington State University)			\$87,250	\$38,000
Hershman, Marc J: Assessing the Potential for a Regional Ocean Governance Pilot Project in the Pacific Northwest (National Oceanic and Atmospheric Administration)				\$141,366
Total for Fisheries Management	\$15,000	\$176,879	\$538,697	\$299,066

Forest Management

Forest management is an applied science that involves managing forest ecosystems within increasingly complex social environments. Forested lands encompass wilderness and park-like ecosystems, intensively managed timber plantations, and urban environments. Healthy forests must be managed in a holistic and balanced manner within the overall context of environment and development, taking into consideration the multiple functions and uses of forests, including traditional uses. Forest products and services include wood and wood products, water, food, medicine, fuel, shelter, employment, recreation, habitats for wildlife, landscape diversity, and carbon sinks and reservoirs.

Forest management policy has changed recently in Western Washington with the intent of protecting critical habitat for northern spotted owl, the marbled murrelet, salmon, and bull trout. Economic impacts from these changes have resulted in rural job losses and an increasing disparity between timber rural and urban incomes. The expectation is that future changes driven by salmon protection may be even greater. In addition, our forests are constantly threatened by the harmful effects of pollution, uncontrolled fires, pests, and diseases.

Examples of how the UW addresses forest management in the Puget Sound region:

- Increasing complexity from changing environmental regulations, such as the Forest and Fish Agreement in Washington State, and the recognition that new research findings are well ahead of implementation suggest the need for more rapid technology transfer. Efforts to mitigate the substantial and widening gap between urban and rural incomes depend upon more successful technology transfer as well. As a consequence, the UW, Washington State University Cooperative Extension, and U.S. Forest Service established the Rural Technology Initiative (RTI) as a pilot project to accelerate the implementation of new technologies in rural forest resource-based communities. RTI provides rural forest managers with the best scientific knowledge and tools needed to solve today's complex forest management problems.
- Forest product exports from Washington and Oregon have been declining and mills have been forced to shut down because of local raw material shortages, while Canadian products have replaced U.S. products in many markets. The Center for International Trade in Forest Products (CINTRAFOR) works in partnership with state and federal agencies, trade associations, and forest industry managers, providing research data collection and analysis, policy review, information dissemination, and the ability to bring multidisciplinary skills together in problem-solving efforts.

Faculty

Expertise

Anthropology

Peña, Devon

dpena@u.washington.edu

Agroecology; environmental justice; environmental history and ecological politics; social movements; transborder communities and transnationalism; complexity theory in ecosystem sciences.

Forest Resources

Agee, James

jagee@u.washington.edu

Effects of fire on forest ecosystems; fire behavior and management; wildlife habitat and silviculture.

Bradley, Gordon

gbradley@u.washington.edu

Forest land use planning; environmental impact assessment; urban forest issues; conservation area planning; urban ecology.

Calhoun, John

jcalhoun@u.washington.edu

Forest management; habitat conservation.

Cross, Jason

crossco@u.washington.edu

Landscape-level analysis, modeling, and planning; habitat conservation.

Eastin, Ivan

eastin@u.washington.edu

Marketing strategies and international trade of forest products and marketing of lesser-known timber species.

Gara, Robert

garar@u.washington.edu

Forest entomology; international forestry.

Gustafson, Richard

pulp@u.washington.edu

Processes that allow mills to produce a superior product with a minimal environmental impact; process simulation; fiber composites.

Halpern, Charles

chalpern@u.washington.edu

Community ecology; succession; ecology of montane/subalpine meadows; effects of forest management on plant diversity.

Hanley, Donald

dhanley@u.washington.edu

Extension forestry; small-forest management; forestry continuing education.

Lee, Robert

boblee@u.washington.edu

Human communities and development; change of forestry institutions.

Lippke, Bruce

blippke@u.washington.edu

Forest economics; global trade and environmental policy linkages; resources assessment; environmental/economic performance of renewable industrial materials; rural technology transfer.

Paun, Dorothy

dap@u.washington.edu

Small diameter timber and business performance; buyer-seller partnerships; paper industry financial analyses; pricing strategies in international countertrade.

Perez-Garcia, John

perjohn@u.washington.edu

Trade analysis and modeling of forest sector.

Faculty

Expertise

Forest Resources (cont'd)

Peterson, David
wild@u.washington.edu

The effects of environmental stress on forest ecosystems, including flooding, fire, air pollution and most recently climatic change.

Rogers, Luke
lwrogers@u.washington.edu

Geographic Information Systems applications for forest management.

Ryan, Clare
cmryan@u.washington.edu

Natural resource policy formulation and implementation; environmental conflict management; collaborative processes; water resource policy and management; urban ecology.

Schiess, Peter
schiess@u.washington.edu

Stream-roads interactions and timber harvest planning as a subset of landscape-level analysis.

Schreuder, Gerard
gsch@u.washington.edu

International trade of forest products; tariff and non-tariff barriers; econometric projections; the role of forestry in economic development.

Wagar, J Alan
jawagar@u.washington.edu

Urban forestry; urban forest inventory; cost-effective management.

Wolf, Kathleen
kwolf@u.washington.edu

Environment and behavior concerning urban ecology and landscapes; urban forestry.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Agee, James K: Development of Research Strategies in Conservation Biology in the Skagit River Watershed (National Park Service)				\$10,255
Agee, James K: Prioritizing and Measuring Effectiveness of Fuel Treatments in the Pacific Northwest Using the Fuel Characteristic Classification System (FCCS) (U.S. Forest Service)			\$141,823	
Bradley, Gordon: Developing Models of Visitor Use and Associated Impacts for the Paradise Developed Area and Adjacent Wilderness Zones in Mount Rainier National Park (National Park Service)		\$39,970		
Bradley, Gordon A: Review of Travel Simulation Models for Planning and Management of Mount Ranier National Park (National Park Service)		\$15,000		
Bradley, Gordon A: Selecting Visitor Carrying Capacity Indicators and Proposing Potential Standards for Mount Ranier National Park (National Park Service)			\$115,400	
Bradley, Gordon A: Understanding Public Reactions to Alternative Forest Harvesting Practices at Capitol Forest near Olympia, Washington (U.S. Forest Service)	\$39,596		\$84,592	
Calhoun, John M: Change on the Olympic Peninsula 1990–2000: Implications for Local Area Planning and Development (U.S. Forest Service)		\$30,711		
Calhoun, John M: Landscape Analysis Supporting Department of Natural Resources Sustainable Harvest on the Olympic Experimental State Forest (Washington State Department of Natural Resources)				\$33,600
Calhoun, John M: Riparian Silvicultural System Design and Assessment in the Olympic Experimental State Forest (Washington State Department of Natural Resources)	\$35,994			
Calhoun, John M: Serving Olympic Region Management Priorities through GIS (U.S. Forest Service)		\$38,944		
Cross, Jason C: Reducing Errors in Classifying Young-Forest/ Marginal (Northern Spotted) Owl Habitat within the Olympic Experimental State Forest (U.S. Forest Service)			\$33,430	\$40,188
Grue, Christian E: Red Alder Growth and Yield Model Database Development (Washington State Department of Natural Resources)	\$37,834			\$15,000
Lippke, Bruce R: Development of an Assessment and Planning Strategy for the Integration of Multiple-Use Management Objectives on the Forestlands of the City of Bremerton (City of Bremerton)			\$63,822	
Lippke, Bruce R: Templates for Forest Sustainability on the Olympic Experimental State Forest (U.S. Forest Service)			\$52,073	
Peña, Devon: Assessing the Impacts of the Northwest Forest Plan on Forest-Based Communities (U.S. Department of Agriculture)				\$26,709
Perez-Garcia, John M: An Economic Assessment of DNR Timber Values on the Olympic Peninsula (U.S. Forest Service)			\$31,886	
Peterson, David: A Clearinghouse for Biological and Geospatial Information on the Olympic Peninsula (U.S. Geological Survey)	\$54,577			

Grants and Contracts (cont'd)

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Peterson, David: A Clearinghouse for Natural Resources Data at North Cascades National Park (U.S. Geological Survey)	\$15,829			
Rogers, Luke W: Small Forestland Owner Parcel Identification and Compilation for Jefferson and Clallam Counties (Washington State Department of Natural Resources)				\$10,000
Ryan, Clare M: Identification of Ross Lake Social Science Needs, North Cascades Park Service Complex (National Park Service)			\$6,900	
Schiess, Peter: Access and Road Management Strategy for the Reese Watershed Unit (Washington State Department of Natural Resources)			\$44,703	
Total for Forest Management	\$183,830	\$124,625	\$574,629	\$135,752

Public Health

Environmental factors are the predominant determinants of health in individuals and communities. The 20th century saw unprecedented public health triumphs in the developed world—improvements in water quality, cleaner air, and the removal of lead from gasoline—though these problems remain critical in other parts of the world. In the 21st century we face such challenges as global climate change, illnesses caused by novel infectious agents, and environmental pollutants that act like hormones.

On the surface, Puget Sound appears to be a pristine environment. In actuality, it contains a wide variety of environmental contaminants that are contributing to its overall decline: pesticides from agricultural, industrial, and home applications; mercury from thermometers, barometers, dental amalgams, electrical switches, and novelty items; phthalates from personal care products; and many more. These toxic materials have all made their way into the Sound through contaminated streams and rivers, surface and groundwater runoff, atmospheric deposition, and direct dumping.

Examples of how the UW addresses the impacts of environmental change on public health issues in the Puget Sound region:

- In September 2003 commercial shellfish beds near Port Townsend were closed due to high concentrations of domoic acid, a toxin produced in large quantities by algal blooms. This was the first domoic acid-based closure in Washington’s heavily populated Puget Sound region. The UW’s Pacific Northwest Center for Human Health and Ocean Sciences was created in response to the critical need to understand links between ocean processes and human health. The Center investigates how environmental conditions trigger blooms of harmful algae in our marine waters and ultimately, how these blooms impact public health.
- The Northwest Center for Particulate Air Pollution and Health at the UW is one of five centers around the country funded by the U.S. Environmental Protection Agency to study the effects of particulate matter and ozone (otherwise known as soot and smog) on human health. Our research contributes to decisions about air quality standards and to the understanding of how our region is affected by the quality of our air.

Faculty

Expertise

Civil and Environmental Engineering

Steinemann, Anne
acstein@u.washington.edu

Drought, water management, environmental impacts, health effects of pollutants, sustainability.

Environmental and Occupational Health Sciences

Faustman, Elaine
faustman@u.washington.edu

Identification of biochemical mechanisms of developmental toxicity and to develop new methods for the evaluation of health risks posed by environmental agents.

Kalman, David
dkalman@u.washington.edu

Environmental chemistry, detection and fate of chemical hazards in natural and man-made environments.

Kaufman, Joel
joelk@u.washington.edu

Occupational and environmental asthma; occupational and environmental factors in cardiovascular disease; surveillance.

Kissel, John
jkissel@u.washington.edu

Human exposure assessment; environmental risk assessment; hazardous waste management; soil cleanup; water quality.

Koenig, Jane
jkoenig@u.washington.edu

The respiratory and cardiac health effects of air pollution, especially the responses of individuals judged to be susceptible.

Liu, Lee-Jane
sliu@u.washington.edu

Human exposure assessment and analysis; environmental epidemiology, air pollution monitoring and modeling; and passive/active air monitoring development.

Meschke, John
jmeschke@u.washington.edu

Pathogen survival, mobility, and detection in the environment; microbial risk assessment; water and wastewater treatment; and public health and environmental microbiology.

Shusterman, Dennis
dennis3@u.washington.edu

Upper respiratory tract effects of air pollutants and clinical latex allergy.

Simpson, Christopher
simpson1@u.washington.edu

Analytical and environmental chemistry, biomarker development, human exposure assessment, air pollution monitoring.

Takaro, Timothy
ttakaro@u.washington.edu

Exposure, surveillance and genetic factors in immunologic lung disease; effectiveness of home environmental interventions in childhood asthma; and health effects of climate change.

Vedal, Sverre
svedal@u.washington.edu

Health effects of air pollution, especially particulate matter; occupational lung disease.

Medicine and Health Services

LoGerfo, James
logerfo@u.washington.edu

Healthy aging; assessing quality of medical care; cost effectiveness of different care strategies; determining the impact of technology on outcomes of care; medical informatics.

Public Affairs

Cullen, Alison
alison@u.washington.edu

Environmental exposure and risk analysis; particulate air pollution and public health risk; climate impacts on hydropower; decision making under uncertainty.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Faustman, Elaine M: Pacific Northwest Center for Human Health and Ocean Studies (National Science Foundation)			\$774,000	\$823,969
Koenig, Jane Q: EPA UW Northwest Research Center for Particulate Air Pollution and Health (Environmental Protection Agency)		\$1,705,221	\$1,725,421	\$1,650,000
Liu, Lee-Jane Sally: Investigation of Spatial and Temporal Variation of Air Toxins in the Seattle Area (Washington State Department of Ecology)	\$35,374			
LoGerfo, James P: Auditing Communities for Walkability and Bikability (Centers for Disease Control)	\$174,092	\$150,162	\$74,841	
Total for Public Health	\$209,466	\$1,855,383	\$2,574,262	\$2,473,969

Transportation

The relationship between surface transportation and the environment is profoundly complex. Motor vehicles are the largest source of urban air pollution, generating more than two-thirds of the carbon monoxide in the atmosphere, a third of the nitrogen oxides (which react to form smog), and a quarter of the hydrocarbons (which also form smog). As noted in the section on Air Quality, pollutants released into the air eventually return to the earth's surface, making their way into streams, rivers, and lakes by runoff or through groundwater flow.

Transportation also has a significant direct impact on water quality. Runoff from roads, bridges, parking lots, and other impervious surfaces can pollute drinking water and lead to changes in water chemistry that degrade habitat quality. This significant non-point pollution source deposits road salt, dirt and dust, fertilizers, pesticides, antifreeze, engine oil, rubber and metal deposits, litter, and other pollutants into aquifers, lakes, rivers, streams and, in this region, Puget Sound.

Examples of how the UW addresses the environmental impacts of transportation in the Puget Sound region:

- The UW, Washington State University, and the Washington State Department of Transportation have established a cooperative transportation research agency, the Washington State Transportation Center (TRAC), that is housed at the UW. As part of a broad portfolio of transportation-related research, TRAC researchers investigate transportation technologies and alternatives that improve air and water quality. In particular, intelligent transportation systems research provides the technology to enable people to make smart travel choices. This research includes efforts to enhance public transit, bicycle/pedestrian facilities, ridesharing programs and facilities, and technologies that improve traffic flow and vehicle emissions.
- Current federal and state transportation laws mandate public participation in long-range planning, capital improvement programming, and major investment study decision situations. UW's Participatory Geographic Information System for Transportation (PGIST) project is studying how GIS and internet technologies can improve public participation in transportation decision making. We are working with regional agencies and stakeholders to develop and evaluate on-line tools for expanding public participation in transportation improvement programming for the central Puget Sound region.

Faculty

Expertise

Civil and Environmental Engineering

Nihan, Nancy
nihan@u.washington.edu

Transportation planning and systems analysis.

Rutherford, G. Scott
scottrut@u.washington.edu

Transportation planning and engineering; transit planning; demand forecasting.

Wang, Yin Hai
yinhai@u.washington.edu

Intelligent transportation systems; traffic modeling and simulation; image processing.

Computer Science and Engineering

Borning, Alan
borning@cs.washington.edu

Land use, transportation, and environmental modeling; human-computer interaction; constraint-based languages and systems.

Electrical Engineering

Dailey, Daniel
dailey@its.washington.edu

Time series modeling of physical phenomena; optimization; distributed computing, networking.

Geography

Nyerges, Timothy
nyerges@u.washington.edu

Geographic Information Systems (GIS); spatial decision support systems and group decision making; transportation and environmental analysis using GIS; human-computer interaction and spatial cognition.

Public Affairs

Carlson, Daniel
kareli@u.washington.edu

Community and economic development; transportation and land use.

Waddell, Paul
pwaddell@u.washington.edu

Land use and transportation policy; urban simulation modeling.

Urban Design and Planning

Vernez-Moudon, Anne
moudon@u.washington.edu

Urban design; city form and neighborhood studies; design research.

Washington State Transportation Center

Hallenbeck, Mark
tracmark@u.washington.edu

Transportation systems and infrastructure.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Boon, Catherine Bradshaw: Regional Multi-Modal Automatic Vehicle Location Demonstration Project (Sound Transit)	\$20,000			
Boon, Catherine Bradshaw: Regional Smart Bus Demonstration Project (Sound Transit)	\$25,000			
Carlson, Daniel: Disseminating and Growing Metro's Commute Partnership Experience in the Cascadia Region (King County Department of Transportation)	\$8,557			
Carlson, Daniel: Transportation Demand Management Study (Washington State Department of Transportation)				\$29,374
Dailey, Daniel J: A General Automata Model for Use with Real Freeway Data to Perform Congestion Prediction (Washington State Department of Transportation)		\$75,000		\$75,000
Dailey, Daniel J: Development of a Statistical Algorithm for Real-Time Prediction of Transit Vehicles Under Adverse Conditions-Research Report (Portland State University)		\$15,122		
Dailey, Daniel J: Implementation of Transit Vehicles as Speed Probes for Traffic Management and Traveler Information in Addition to Performance Monitoring (Washington State Department of Transportation)		\$125,000		
Dailey, Daniel J: Mobile Data Communications for Bus and Rail Automatic Vehicle Location (Sound Transit)		\$199,936		
Dailey, Daniel J: Multi-Modal Busview and MyBus Support (Sound Transit)		\$89,254		
Dailey, Daniel J: MyBus Software Interface Project (Sound Transit)		\$126,257	\$72,743	
Dailey, Daniel J: MyBus, BusView, Sign Software and Associated Applications Transfer and Training (Sound Transit)				\$23,000
Dailey, Daniel J: The Automated Use of Uncalibrated CCTV Cameras as Quantitative Speed Sensors (Washington State Department of Transportation)			\$150,000	
Dailey, Daniel J: The Use of Weather and Weather Model Data to Predict Non-Recurring Traffic Congestion (Washington State Department of Transportation)			\$130,000	
Hallenbeck, Mark E: Evaluation of the Effects of Changes in HOV Lane Hours of Operation (Washington State Department of Transportation)			\$136,000	
Hallenbeck, Mark E: Evaluation Review of the WSDOT Freeway and Arterial Management Effort (FAME) (Washington State Department of Transportation)			\$25,000	
Hallenbeck, Mark E: Freeway Performance Analysis (Washington State Department of Transportation)	\$209,000		\$10,000	
Hallenbeck, Mark E: HOV Lane Evaluation and Monitoring (Washington State Department of Transportation)	\$344,100		\$379,000	\$15,465

Grants and Contracts (cont'd)

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Hallenbeck, Mark E: Intelligent Transportation Systems (ITS) Evaluation Framework (Washington State Department of Transportation)				\$300,000
Hallenbeck, Mark E: WSDOT Incident Response Evaluation: Measurement of Recurring versus Non- Recurring Congestion (Washington State Department of Transportation)		\$100,000	\$30,000	
Nyerges, Timothy L: An Internet Platform to Support Public Participation in Transportation Decision Making (National Science Foundation)			\$1,148,366	\$711,978
Vernez-Moudon, Anne: Washington State Trends in Commuting and Non-Work Travel (Washington State Department of Transportation)				\$15,340
Total for Transportation	\$606,657	\$730,569	\$2,081,109	\$1,170,157

Urban Infrastructure and Planning

Our infrastructure encompasses the physical assets of a municipality, such as roads and buildings, that support our social and economic activities. Well-managed infrastructure is essential to our region's growth, economic development, safety and quality of life. It is essential to making Puget Sound an attractive place to live and do business.

Thoughtful planning presents opportunities for the improved management and use of our region's existing infrastructure assets as well as options for managing demand more efficiently. Government and private planners around Puget Sound are increasingly moving toward more proactive planning strategies as our population is projected to continue its unprecedented growth. Consequently, planners are looking to employ forecasts and other advanced tools from land use and transportation models as primary inputs for their analyses.

Examples of how the UW addresses urban infrastructure and planning issues in the Puget Sound region:

- The UW Center for Urban Simulation and Policy Analysis has created UrbanSim, a simulation model that incorporates the interactions between land use, transportation, and public policy for integrated planning and analysis of urban development. Its purpose is to help citizens and local governments make more informed decisions about major transportation and land use issues by projecting the long-term consequences of the different alternatives. The policy instruments used to leverage development trends and patterns are too often debated and decided with little understanding of the underlying forces shaping urban land, labor, and transportation markets, and therefore lead all too often to unintended consequences and inefficiencies. UrbanSim integrates the analysis of market behavior with the analysis of land policies and infrastructure choices to facilitate more informed public investments and choices.
- Researchers at the UW Urban Ecology Research Lab study urban landscapes as hybrid phenomena that emerge from the interactions between human and ecological processes. Using the Puget Sound region as our scientific laboratory, we apply a variety of techniques for describing the heterogeneous nature of the urban landscape with advanced GIS and remote sensing techniques. We are studying landscape change and building a land-cover change model of this region. Our research is linked to practice by developing guidelines with the best available science. This approach assists planners and decision makers in reaching more informed decisions about development and environmental impacts.
- The UW Institute for Hazards Mitigation Planning and Research explores ways to integrate hazards mitigation principles into a wide range of crisis, disaster, and risk management opportunities. We work with local government and community partners to prepare hazard identification and vulnerability assessments. These include a profile of each hazard, an assessment of vulnerability, and coordination of public outreach.

Faculty

Expertise

Aquatic and Fishery Sciences

Simenstad, Charles
simenstd@u.washington.edu

Estuarine/coastal ecology; food web structure; juvenile salmon ecology.

Architecture

Badanes, Steven
sbadanes@u.washington.edu

Sustainable building technology; public art; community based design/build; architecture.

Loveland, Joel
loveland@u.washington.edu

Energy use in buildings, lighting and energy use, ecological design, global warming trends and long-term changes in energy use in buildings.

Miller, David E
dmiller@millerhull.com

Environmental architecture in the Pacific Northwest.

Civil and Environmental Engineering

Booth, Derek
dbooth@u.washington.edu

Consequences of geologic processes and materials on land-use: stream channels, river systems, hillslope stability, erosion, and groundwater; measurement and monitoring.

Burges, Stephen
sburges@u.washington.edu

Surface water hydrology; urban hydrology; hydrologic mitigation; hydrologic design; applications of remote sensing; stream and river channel dynamics.

Eberhard, Marc
eberhard@u.washington.edu

Structural analysis and design, reinforced concrete, earthquake engineering, nondestructive testing.

Lehman, Dawn
delehman@u.washington.edu

Investigation of the response of reinforced concrete structures to seismic loading using experimental and analytical methods.

Lowes, Laura
lowes@u.washington.edu

Numerical simulation of structural systems under dynamic and static loading.

MacRae, Gregory
macrae@u.washington.edu

Design of structures to withstand earthquakes.

Mannering, Fred
flm@u.washington.edu

Traffic flow theory, networks, econometric methods, equilibration in transportation markets.

Petroff, Catherine
cpetroff@u.washington.edu

Sediment transport, coastal engineering, and environmental fluid mechanics.

Stanton, John
stanton@u.washington.edu

Structural engineering, analysis, and design, focusing primarily on seismic engineering issues.

Faculty

Expertise

Computer Science and Engineering

Borning, Alan
borning@cs.washington.edu

Land use, transportation, and environmental modeling; human-computer interaction; constraint-based languages and systems.

Construction Management

Daniali, Saeed
sdaniali@u.washington.edu

Application of fiber reinforced composites; use of recycled materials in construction; high performance materials for structures subjected to earthquake forces; hazardous mitigation of existing facilities.

Geography

Beyers, William
beyers@u.washington.edu

The relationship between environmental characteristics and settlement change in the United States, and modeling the interaction between human and environmental systems.

Industrial Engineering

Zabinsky, Zelda
zelda@u.washington.edu

Global optimization with applications to engineering design.

Landscape Architecture

Hill, Kristina
kzhill@u.washington.edu

Developing urban design principles and prototypes that emphasize sustainability and ecological health.

Horner, Richard
rrhorner@u.washington.edu

Impacts of urbanization on natural systems and the monitoring, planning and design of stormwater management systems.

Hou, Jeffrey
jhhou@u.washington.edu

Community participation, cultural and ecological design, environmental planning, grassroots environmental actions, and issues of indigenous people and natural resources.

Johnson, Julie
jmjsama@u.washington.edu

How the design of neighborhoods and urban open space can support community life and ecological processes.

Streatfield, David
buzzz@u.washington.edu

Cultural values used historically in place making in urban and rural landscapes.

Winterbottom, Daniel
nina@u.washington.edu

Urban and community landscape design; vernacular landscapes; therapeutic gardens; sustainable design; the craft and detailing of built forms.

Marine Affairs

Hershman, Marc
hershmj@u.washington.edu

Legislative, administrative, and socioeconomic aspects of the uses of the coastal zone and its resources; coastal planning and management; port development; and exclusive economic zone use and governance.

Oceanography

Logsdon, Miles
mlog@u.washington.edu

Spatial pattern analysis in ecosystem sciences; applications of Geographic Information Science (GIS) and remote sensing in ecosystem models.

Faculty

Expertise

Public Affairs

Waddell, Paul
pwaddell@u.washington.edu

Land use and transportation policy; urban simulation modeling.

Urban Design and Planning

Alberti, Marina
malberti@u.washington.edu

The impacts of alternative urban development patterns on ecosystem dynamics.

Blanco, Hilda
hblanco@u.washington.edu

Pragmatism and planning theory; planning ethics; mixed use land use; state growth management and the new urbanism; neighborhood commercial activities for sustainable communities.

Born, Brandon
bborn@u.washington.edu

Land use/regional planning; planning processes; social justice; food systems.

Freitag, Robert
brfreitag@u.washington.edu

Integration of hazard mitigation principles into a wide range of crisis, disaster, and risk management opportunities.

Miller, Donald
millerd@u.washington.edu

Urbanization processes; urban spatial structure; planning theory and evaluation; public service planning; consumer behavior and demand for public services.

Mugerauer, Robert
drbobm@u.washington.edu

Sustainability; impact of information technology; values, social and cultural factors in design and planning.

Ryan, Dennis
frango@u.washington.edu

Urban design and planning as communicative process; community and sociocultural dimensions of planning and place; issues associated with urban change and continuity.

Vernez-Moudon, Anne
moudon@u.washington.edu

Urban design; city form and neighborhood studies; design research.

Wagner, Frederick
fwagner@u.washington.edu

Land use/legal aspects of urban planning; health policy across urban and rural communities in developed and developing countries.

Westerlund, Frank
fwest@u.washington.edu

Land use and environmental planning, urban and regional; growth management; remote sensing and GIS applications; natural hazard mitigation; biodiversity protection.

Urban Studies (UW Tacoma)

Carlson, Tom
carlson@u.washington.edu

GIS and remote sensing for change detection in Puget Sound salt marshes and surrounding lowlands; modeling urban space and creating population density surfaces for cities.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Alberti, Marina: Land Cover Change Model for Central Puget Sound (King County Water and Land Resources Division)			\$183,657	
Alberti, Marina: Landscape Benchmarks Project (Washington State Department of Community, Trade and Economic Development)			\$70,008	
Alberti, Marina: Operational Remote Sensing Solutions for Estimating Total Impervious Surface Areas and the Contribution to that Area Made by Transportation (Washington State Department of Transportation)				\$92,000
Beyers, William B: Impacts of Growth Management on Local Governments (Washington State Office of Financial Management)				\$52,550
Blanco, Hilda J: Activity-Friendly Communities: Physical Environmental Determinants of Walking and Biking, and Their Policy Implications for Land Use and Urban Development (Robert Wood Johnson Foundation)			\$32,994	
Booth, Derek B: WSU-Pierce County Low Impact Development Monitoring (Washington State University)			\$19,253	
Borning, Alan H: Interaction and Participation in Integrated Land Use, Transportation, and Environmental Modeling (National Science Foundation)	\$3,012,000	\$250,000		
Borning, Alan H: Software Architectures for Microsimulation of Urban Development, Transportation and Environmental Impact (National Science Foundation)	\$352,128	\$247,872	\$15,000	
Burges, Stephen J: Aerial Flights Using the MASTER Sensor: King County (King County Water and Land Resources Division)	\$10,000			
Burges, Stephen J: Aerial Overflights Using the MASTER Sensor: City of Seattle (City of Seattle)	\$10,000			
Freitag, Robert: City of Everett Washington Hazard Mitigation Plan (City of Everett)			\$12,000	
Freitag, Robert: City of Shoreline Washington Hazard Mitigation Plan (City of Shoreline)			\$30,000	
Freitag, Robert: City of Sulton/Tetra Tech Hazard Mitigation Plan (Tetra Tech EM, Inc.)			\$17,424	
Freitag, Robert: County of Snohomish Washington Hazard Mitigation Plan (Snohomish County)			\$60,000	
Freitag, Robert: Hazards Mitigation Document (City of Redmond)	\$10,000			
Freitag, Robert: Kimball Creek Floodplain Course (City of Snoqualmie)		\$9,000		
Freitag, Robert: The Snohomish County All Natural Hazards Mitigation Plan (Tetra Tech EM, Inc.)				\$15,000

Grants and Contracts (cont'd)

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Grue, Christian E: Biodiversity Planning at the County Level Using Washington GAP Analysis Data-Validation, Refinement and Application of Existing Model (U.S. Geological Survey)		\$53,245	\$13,641	
Grue, Christian E: Puget Sound Water Quality Action Team (PSWQAT) Demonstration Project for Evaluating Smart Growth/Alternative Futures (Washington State Department of Ecology)	\$30,000	\$10,000		
Logsdon, Miles G: Strategic and Practical Use of Remotely Sensed Data in Emergency Management (SPURS-EM) (Washington Military Department, Emergency Management Division)		\$320,601		
Loveland, Joel E: Daylighting Education at the Seattle Lighting Design Lab (Northwest Energy Efficiency Alliance)	\$321,540	\$260,000	\$741,970	\$279,866
Simenstad, Charles A: Inventory and Mapping of Docks and Piers within the City of Seattle (City of Seattle)		\$19,706		
Vernez-Moudon, Anne: GIS Land Use Analysis Tool (Washington State Department of Transportation)			\$100,000	
Vernez-Moudon, Anne: Integrating Land Use and Transportation Investment Decision-Making (Washington State Department of Transportation)	\$21,900			
Vernez-Moudon, Anne: Transportation-Efficient Land Use and Development Patterns (Washington State Department of Transportation)	\$99,882			
Waddell, Paul A: Integrating Land Use, Transportation, and Air Quality Modeling (Environmental Protection Agency)				\$700,000
Westerlund, Frank V: Review and Refinement of Hazard Mitigation Planning Documents (City of Redmond)		\$10,788	\$6,000	
Zabinsky, Zelda B: Port of Tacoma Simulation and Optimization Research (Port of Tacoma)			\$36,184	\$13,816
Total for Urban Infrastructure and Planning	\$3,867,450	\$1,181,212	\$1,561,669	\$1,153,232



Water

Water is critical to the Pacific Northwest, and especially the Puget Sound region. The availability of adequate supplies of clean water, and the health of water resources and watersheds, are major concerns facing communities. Even in the rainfall-rich Pacific Northwest, controversies abound as demands increase for already stressed water supplies. Further, effects of both local and global phenomena, from urbanization to climate change, create additional uncertainties about our region's water future.

The University of Washington strives to provide the highest quality science to address these issues to ensure the sustainability of our water resources. The overall goals of this research are to examine the multiple linkages among human activities, environmental changes, and the water and natural resources of Puget Sound. We use a range of scientific methods and information, such as field data, computer models, and satellite images, in addition to working directly with stakeholders to address critical issues and improve the availability and quality of our water resources. As an example, forecasts of seasonal temperature and precipitation, provided up to a year in advance, can save water agencies and industries millions of dollars per year in avoided impacts. And studies of the effects of instream flow on habitat can help us to set targets to mitigate the impact of low flows on fish.

The information in this section is organized in the following categories:

- Water Quality
- Water Resources



Water Quality

Clean water is a precious resource on our planet. Without it, our lives and our well-being are jeopardized. In the Puget Sound watershed we are faced with multiple threats to the quality of our water. Failing on-site sewage treatment and disposal systems, livestock in or near streams, storm water runoff, erosion from poor land use practices, and application of lawn care products send toxins, bacteria, and other harmful substances into our streams and into Puget Sound directly. Pumping untreated sewage and contaminated bilge water overboard from boats, fuel spills, and litter also degrade our water resources.

Examples of how the UW addresses water quality in the Puget Sound region:

- Changing behavior through education and community involvement is vital to preserving our region's water quality. Two Washington Sea Grant Program water quality specialists and three Washington State University cooperative extension agents combine their technical expertise and the resources of both universities to provide watershed-wide education programs, technical assistance, and information to local governments, tribes, industry, schools, and other water resource users.
- The cumulative impact of repeated small oil spills can devastate a marine environment. Elimination of these small spills is essential to ensuring the health and productivity of our coastal waters. The Washington Sea Grant Program established an Oil Spill Prevention Education Program to help eliminate the causes of small spills. Educational materials and strategies have been developed not only to enhance public awareness of the impact of oil spills, but to change boater attitudes and encourage the adoption of safe oil-handling procedures and recycling as alternative to pollution-prone operations and disposal.
- In response to seemingly random closures of shellfisheries on the Olympic Peninsula due to outbreaks of marine biotoxins and domoic acid contamination of razor clams, the Olympic Region Harmful Algal Bloom (ORHAB) Partnership was formed. As a partner in the ORHAB project, the UW has been attempting to characterize the physical conditions associated with production and movement of toxic blooms through the use of observational data and numerical modeling studies.

Faculty

Expertise

Applied Physics Laboratory

Newton, Jan
newton@u.washington.edu

Biological oceanography, coastal and estuarine dynamics, climate and human impacts on water quality.

Civil and Environmental Engineering

Benjamin, Mark
markbenj@u.washington.edu

Physical-chemical water and wastewater treatment; removal of metals from water; adsorption processes; membrane-based technologies; natural organic matter in water treatment systems.

Booth, Derek
dbooth@u.washington.edu

Consequences of geologic processes and materials on land-use: stream channels, river systems, hillslope stability, erosion, and groundwater; measurement and monitoring.

Brett, Michael
mtbrett@u.washington.edu

Eutrophication and regulation of algal biomass and secondary production in lakes; reservoir operation and limnology; pesticide impacts on aquatic biology; aquatic food web processes.

Ferguson, John
jferg@u.washington.edu

Microbial and chemical processes in anaerobic treatment; corrosion and corrosion control in municipal water systems; advanced biological wastewater treatment systems.

Korshin, Gregory
korshin@u.washington.edu

Aquatic and general environmental chemistry.

Stensel, H. David
stensel@u.washington.edu

Biological nutrient removal; oxygen transfer and substrate utilization in fixed film systems; bio-degradation of toxic pollutants; biofilters for toxic gas treatment.

Environmental and Occupational Health Sciences

Kissel, John
jkissel@u.washington.edu

Human exposure assessment; environmental risk assessment; hazardous waste management; soil cleanup; and water quality.

Meschke, John
jmeschke@u.washington.edu

Pathogen survival, mobility, and detection in the environment; microbial risk assessment; water and wastewater treatment; public health and environmental microbiology.

Shin, Gwy-Am
gwyam@u.washington.edu

Environmental health microbiology; removal/inactivation of waterborne microorganisms by water and wastewater treatment processes; and development of proper methods.

Forest Resources

Bolton, Susan
sbolton@u.washington.edu

Effects of land use on water quantity and quality; hydrologic effects on stream biota; ecological engineering.

Strand, Stuart
sstrand@u.washington.edu

Microbial processes for remediation of organic contaminants of groundwater, soil and sediment; phytoremediation; biological wastewater treatment processes.

Wecker, Miranda
mwecker@u.washington.edu

Olympic Natural Resources Center marine programs.

Faculty

Expertise

Interdisciplinary Arts & Sciences (UW Tacoma)

Gawel, James
jimgawel@u.washington.edu

Environmental and aquatic chemistry.

Landscape Architecture

Hill, Kristina
kzhill@u.washington.edu

Developing urban design principles; prototypes that emphasize sustainability and ecological health.

Horner, Richard
rrhorner@u.washington.edu

The impacts of urbanization on natural systems; the monitoring, planning and design of stormwater management systems.

Oceanography

Devol, Allan
devol@u.washington.edu

Marine and freshwater biogeochemistry; sediment diagenesis; oceanography of anoxic systems; carbon fluxes; sources, sinks, and fluxes of organic material in lakes, oceans and rivers.

Frost, Bruce
frost@ocean.washington.edu

Zooplankton ecology; phytoplankton-grazer interactions; zooplankton-fish interactions.

Hickey, Barbara
bhickey@u.washington.edu

Dynamics of coastal oceanography; estuary-ocean interactions; eastern boundary current systems; circulation in submarine canyons; buoyant plumes; flow over sills; and semi-enclosed basin circulation.

Kawase, Mitsuhiro
kawase@u.washington.edu

Simulation of circulation in Puget Sound; coupling of sea ice and ocean circulation in Japan/East Sea; deep circulation in the south Atlantic Ocean.

Washington Sea Grant Program

Copping, Andrea
acopping@u.washington.edu

Marine environment and water quality; marine science/marine policy.

King, Teri
guatemala@u.washington.edu

Marine water quality.

Anne Nelson
annen2@u.washington.edu

Marine water quality.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Booth, Derek B: High Point Flow and Water Quality Monitoring (Seattle Public Utilities)		\$125,968		
Brett, Michael T: A Study of How Plankton Seasonal and Depth Distribution Relates to Clogging Events at the City of Everett Drinking Water Treatment Plant (City of Everett)			\$72,125	
Brown, Gardner M: The Value of Storm Water Management Practices (WA Dept. of Transportation)		\$75,000		
Copping, Andrea E: Underwater Reconnaissance (Puget Sound Water Quality Authority)	\$15,000			
Devol, Allan H: Profiling Mooring Support for King County Regional Wastewater Services Plan: Northern Marine Outfall Studies (King County Water and Land Resources Division)		\$51,376	\$149,271	\$6,670
Echols, Louie S: Small Oil Spill Prevention Education Program (Washington State Department of Ecology)	\$170,000		\$170,000	
Frost, Bruce W: Access to Pacific Region Harmful Algal Bloom Data (National Marine Fisheries Service)	\$59,928	\$40,000		
Granger, Pete: Simple Techniques to Reduce Nitrogen from On-Site Sewage Systems (Puget Sound Water Quality Authority)				\$45,000
Hickey, Barbara M: ORHAB: Washington Harmful Algal Bloom (HAB) Monitoring (National Oceanic and Atmospheric Administration)	\$257,226		\$244,500	\$40,500
Hill, Kristina: Natural Drainage System Analysis (Seattle Public Utilities)				\$6,900
Kawase, Mitsuhiro: Marine Outfall (King County Water and Land Resources Division)	\$18,071			
Kawase, Mitsuhiro: Modeling Support for King County Regional Wastewater Services Plan - Northern Marine Outfall Studies (King County Water and Land Resources Division)	\$219,468			
Massmann, Joel W: Infiltration Characteristics, Performance and Design of Storm-Water Facilities (Washington State Department of Transportation)	\$6,000			
Wecker, Miranda S: Olympic Region Harmful Algal Bloom (National Oceanic and Atmospheric Administration)			\$92,500	\$69,500
Total for Water Quality	\$745,693	\$292,344	\$728,396	\$168,570



Water Resources

Water has always been a valuable resource, and conflicts over water supplies are increasing. In our region, residents have historically enjoyed an abundance of clean water. This is no longer the case. Unprecedented population and economic pressures have fueled a growing demand for water, and new supplies are limited. We increasingly lack adequate water resources when and where they are needed for communities and the natural environment.

At the extreme, our region is facing more frequent and severe drought conditions and water shortages. Drought is a creeping and costly disaster. It develops insidiously, and can inflict billions of dollars of damage throughout a state in a single drought year. Further, no region or sector is immune to drought impacts, which can linger for years after the drought event. However, many drought impacts can be mitigated with advance warning, preparedness, and response plans.

Multi-objective water allocation problems further complicate our water resource challenges. Their solutions will require interdisciplinary approaches that combine scientific studies and policy analyses. To this end, our research covers critical issues such as drought planning, optimization of water resource systems, sustainable water resources development, climate and hydrologic forecasts for water management, transboundary water conflicts and resolutions, river restoration, and watershed management.

Examples of how the UW addresses water resources in the Puget Sound region:

- The UW Water Center helps solve water resource problems by conducting scientific research, understanding relationships between ecosystems and human actions, and creating solutions to water resources conflicts. To prepare for droughts and respond more effectively, the Water Center is leading a comprehensive program on regional drought issues. Through scientific research, education, and outreach, we provide advance warning of drought events, monitor and assess drought conditions, develop drought plans, and enable decision-makers to reduce the risks and damages of droughts.
- The Climate Impacts Group's research in the area of regional hydrology and water resources has the broad goals of: (1) understanding the implications of climate variability in the context of water resources development, water management practice, and evolving water policy; (2) developing better long-range streamflow forecasts at lead times of six months to one year; (3) projecting the impacts of future climate change on regional water resources and evaluating possible mitigation alternatives; and (4) incorporating information about climate variability and change into operations and planning for water supply planning and management of oil spills, and to change boater attitudes and encourage the adoption of safe oil-handling procedures and recycling as alternative to pollution-prone operations and disposal.
- The Puget Sound Regional Water Supply Forecast is a product of the UW's Climate Impacts Group, the Water Resources Planning and Drought Management Group, and the Puget Sound Regional Synthesis Model (PRISM) Project. The forecast provides information about the current and near future state of the major river basins that are sources of municipal water to the majority of the population in the Puget Sound region and is intended for water managers and others interested in Puget Sound water resources.

Faculty

Expertise

Civil and Environmental Engineering

Booth, Derek

dbooth@u.washington.edu

Consequences of geologic processes and materials on land-use: stream channels, river systems, hillslope stability, erosion, and groundwater; measurement and monitoring.

Burges, Stephen

sburges@u.washington.edu

Surface water hydrology; urban hydrology; hydrologic mitigation; hydrologic design; applications of remote sensing; stream and river channel dynamics.

Lettenmaier, Dennis

dennisl@u.washington.edu

Hydroclimatology; surface water hydrology; GIS and remote sensing.

Palmer, Richard

palmer@u.washington.edu

Water resource management; optimization and simulation techniques; risk analysis; systems analysis; expert systems.

Steinmann, Anne

acstein@u.washington.edu

Drought; water management; environmental impacts; health effects of pollutants; sustainability.

Wood, Andrew

aww@u.washington.edu

Quantitative modeling; assessment and prediction in hydrology; water resources.

Earth and Space Sciences

Troost, Kathy

ktroost@u.washington.edu

Geologic mapping of the Seattle area.

Electrical Engineering

Tsang, Leung

leung@ee.washington.edu

Remote sensing; wave scattering and propagation in random media; high frequency interconnects; computational electromagnetics; optoelectronics.

Forest Resources

Bolton, Susan

sbolton@u.washington.edu

Effects of land use on water quantity and quality; hydrologic effects on stream biota; ecological engineering.

Ryan, Clare

cmryan@u.washington.edu

Natural resource policy formulation and implementation; environmental conflict management; collaborative processes; water resource policy and management; urban ecology.

Public Affairs

Brock, Jonathan

jbrock@u.washington.edu

Public management; managing people; labor-management relations; conflict resolution; agency improvement strategies.

Grants and Contracts

Principal Investigator: Project (Funder)	FY2002	FY2003	FY2004	FY2005
Bolton, Susan M: Review and Recommendations of Methods Suitable for Development of Synthetic Hydrographs for Ungauged Basins with National Parks of the North Coast and Cascades Network (National Park Service)			\$21,499	\$44,250
Booth, Derek B: Cedar Moraine Safety Study (Landau and Associates)		\$7,000		
Booth, Derek B: Geologic Database and Geologic Interpretations for King County (King County Wastewater Treatment Division)	\$820,843			
Booth, Derek B: Groundwater of Vashon and Maury Islands (Office of King County Executive)			\$75,000	
Brock, Jonathan: Options for Funding the State's Water Resource Programs (Washington State Department of Ecology)				\$153,878
Brock, Jonathan: Water Acquisition Program Assessment Project (Washington State University)			\$28,034	
Lettenmaier, Dennis P: Development and Enhancement of University of Washington West-Wide Seasonal Hydrologic Forecast System (National Oceanic and Atmospheric Administration)				\$175,000
Lettenmaier, Dennis P: Development of Hydrologic Nowcast and Forecast Products Using Land Data Assimilation (National Oceanic and Atmospheric Administration Research)			\$55,000	
Palmer, Richard N: Developing Analysis Techniques to Incorporate Climate Change Information into Seattle's Long-Range Water Supply Planning (Seattle Public Utilities)	\$100,000			
Palmer, Richard N: The Use of Mid-Range Streamflow Forecast and Models of Fish Response for River Management in the Puget Sound (City of Tacoma/Tacoma Public Utilities)			\$60,000	\$35,000
Troost, Kathy G: Geologic Mapping Studies for Issaquah King County Groundwater Area (King County Department of Water and Land Resources Division)				\$45,000
Troost, Kathy G: Geologic Mapping Studies for Redmond-Bear Creek Valley King County Groundwater Area (King County Department of Water and Land Resources Division)				\$63,564
Tsang, Leung: Assimilation of EOS Remote Sensing Data for Hydrologic Forecasting in the Pacific Northwest (National Aeronautics and Space Administration)				\$117,529
Wood, Andrew W: Assessment of Conservation Management Practices in Klamath River Basin (Natural Resources Conservation Service)				\$52,000
Total for Water Resources	\$820,843	\$7,000	\$239,533	\$686,221



Resources

Berman Environmental Law Clinic

<http://www.law.washington.edu/Clinics/Environmental.html>

Bringing a renewed focus to the law school's environmental track, the Berman Environmental Law Clinic seeks to familiarize students with emerging issues in environmental law through investigations, case developments, and consultations with faculty, practicing lawyers and scientific experts from various fields such as zoology, biology, aquatic and fisheries sciences, marine affairs, civil and environmental engineering, forest resources, environmental health, medicine and ecology.

A hallmark of the clinic is its interdisciplinary approach. An advisory board comprising UW scientists, community activists, business and tribal leaders, and other experts, will help to identify the region's main environmental issues and work with students to reach out and solve or help solve problems. In collaboration with faculty advisors and practicing lawyers who specialize in environmental law, clinic students conduct investigations and research, consult with scientific experts, develop and initiate cases, and represent clients before courts and administrative agencies. Students also conduct research into emerging issues in environmental law and contribute to scholarly publications.

The clinic's caseload covers all aspects of environmental law from issues of air and water pollution, nuclear power plant sites, wildlife and marine protection, fisheries, toxics, to the Federal Advisory Committee Act and NEPA. Students participate in a carefully supervised practice experience that includes interviewing clients and witnesses, gathering evidence informally and through legal discovery, as well as counseling clients and negotiating on their behalf. Working closely with stakeholders, including citizen and environmental groups, Native Americans, industry, local, state and federal governments, students work to solve or help solve regional environmental problems. Among the clinic's primary goals are to immerse students in a wide variety of environmental legal matters, and increase students' understanding of, and appreciation for, the region's natural treasures and environmental health.

Primary Contact:

Mr. Michael Robinson-Dorn

Assistant Professor of Law

Director, Kathy and Steve Berman Environmental Law Clinic

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Climate Impacts Group

<http://www.cses.washington.edu/cig>

The Climate Impacts Group (CIG) engages in climate science in the public interest, working to understand the consequences of climate variability and climate change for the U.S. Pacific Northwest (PNW). CIG's unique focus is on the intersection of climate science and public policy—performing basic research aimed at understanding the consequences of climate fluctuations for the PNW, and promoting application of this information in regional decisions.

CIG's assessment examines climate impacts on four diverse, yet connected, natural systems of the PNW—water, forests, salmon and coasts—and the human socioeconomic and/or political systems associated with each. CIG works to provide regional planners, decision makers, and natural resource managers with valuable knowledge about the ways in which crucial regional resources are vulnerable to changes in climate, and how this vulnerability could best be reduced.

The CIG research approach comprises:

- natural sciences research – to understand and quantify the consequences of climate variability and change for PNW climate and natural resources,
- social sciences research – to understand the human systems associated with natural resources management in the PNW and the role that human choices play in determining climate impacts, and
- outreach and interaction with the regional stakeholder community – to link large-scale climate forecast information to local/regional management needs.

CIG has developed close connections with the public, private, and North American tribal groups and agencies responsible for managing the region's water, forest, fishery, and coastal resources in order to ensure that our research results in information and products that are not only useful, but also used to shape decisions in the PNW. As a result of this interaction, CIG has gained a clear picture of the current use and perceived value of climate forecasts by natural resource managers, insight into their decision calendars, and an understanding of institutional barriers to adaptability. Stakeholders benefit from the development of improved tools and information for planning, such as resource forecasts and regional- and resource-specific interpretations of global climate change.

Primary Contact:

Dr. Edward Miles
CSES Co-Director, CIG Principal Investigator
Professor, School of Marine Affairs
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edmiles@u.washington.edu

Northwest Environmental Forum

<http://www.nwenvironmentalforum.org/>

The Northwest Environmental Forum is a collaborative meeting and work space that brings together decision makers and stakeholders to apply scientific and policy information to address critical environmental and natural resource management issues. Potential users include resource and environmental agencies; energy, forest, agriculture, and real estate interests; and land conservancies, environmental groups, tribes, and NGOs.

Decision Making

Stakeholders and decision makers can discuss complex and often contentious issues in a neutral and science-rich setting. The flexible meeting spaces will support breakthrough discussions with scientists, decision support tools, presentation and data visualization technologies, and groupware. Clients will be able to compare ideas and alternative solutions, better understand and weigh trade-offs, and move toward resolution of complex issues.

Collaborative Analysis

Scientists and policy staff will collaborate on research and analytical work that supports decision making. Spaces and tools will be arrayed so workers can organize their ideas and thoughts. Experts from diverse organizations will be able to participate directly and use advanced analysis and data displays and sophisticated information modeling tools.

Information Repository

Complex projects need access to multiple databases and other information that often exist at dispersed locations. By providing on-line access to information, the Forum will be a centralized information access site to enable teams and individuals to acquire, process, and store information. Quick and virtual access to information will enable scientists and policy makers to question, analyze, and identify potential solutions.

Educational Observatory

Forum space will have access for classroom interaction and student participation and work. Virtual access to environmental and natural resources projects will provide teaching, research, and project opportunities. Collaborative work by participants will afford new learning space and opportunities for innovative teaching and research applications.

Primary Contact:

Mr. Brian Boyle
Forum Leader
College of Forest Resources
Phone: 206-616-8640
bboyle@u.washington.edu

Puget Sound Regional Synthesis Model (PRISM)

<http://www.prism.washington.edu>

The PRISM (Puget Sound Regional Synthesis Model) is a major UW program created by faculty, staff and students with funds from internal university sources to integrate a number of environmental models for the Puget Sound Basin in a cross-disciplinary science approach. PRISM is significantly leveraged by external grants and partnerships with organizations throughout the region.

The following PRISM working groups focus on integrating modeling and measurement efforts to develop a more complete understanding of Puget Sound:

- Atmosphere
- Biotic Resources
- Informatics
- Landscape Dynamics
- Physical Template
- Nearshore
- Marine Waters
- Urban Forcing
- Water Resources

Recognizing that collaboration provides opportunities for sharing data, information, and knowledge between scientists, students, decision makers, and the community, PRISM has also initiated a focused effort in the management of earth science information.

Finally, the PRISM Advanced Classroom identifies, evaluates, and delivers the components needed to teach concepts that address the scientific learning opportunities significant to the Puget Sound area. PRISM encompasses the full diversity of issues related to the integration of earth science and education science and suggests the next generation of geosciences discovery will come from those people whose geosciences education is built upon accessibility to data, visualization techniques, and prototype tools that help support developing better hypothesis and analysis skills. Web delivery of the PRISM physical template, model outputs and undergraduate curriculum represents the current day baseline from which the advanced classroom will evolve.

Primary contact:

Dr. Jeffrey Richey
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Washington Sea Grant Program

<http://www.wsg.washington.edu>

Washington Sea Grant Program serves communities, industries and the people of Washington state, the Pacific Northwest and the nation through research, education and outreach 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.

By bringing together individuals and organizations within the university, the state, the region, and the nation, the Washington Sea Grant Program serves as a catalyst for and facilitator of marine research. The following lists provide a summary of current and continuing (2004-2007 funding period) Sea Grant research and outreach projects that focus on or are directly relevant to problems or opportunities within the Puget Sound region. Primary areas of interest for Sea Grant research and outreach include Living Marine Resources, New Technologies, Ecosystem Health, Economic and Community Development, and Education, Training and Public Information. These critical program areas make up the headings under which projects can be found. Project team institutions are included in parentheses following each project title.

Living Marine Resources

Conserving marine resources while providing for their beneficial use and exploitation, thus ensuring sustainable harvests and healthy populations in the future.

- Spatial Dynamics, Recruitment Trends and Sustainability of Puget Sound Geoducks (UW; Consejo Nacional De Investigaciones Cientificas Y Tecnicas, Argentina; Department of Fish and Wildlife)
- Recolonization of the Upper Cedar River by Anadromous Salmonids (UW; NOAA)
- Dendroecological Reconstruction of Salmon Abundance in Pacific Northwest Rivers (UW)
- Assessing Changes in Inshore Northwestern Washington Marine Bird Populations From 1979 to 2005 (Western Washington University)
- Development of a Spatially-Explicit, Biophysical Model of Puget Sound Nearshore Processes (UW)
- Long-Term Changes in Genetic Diversity and Population Structure of Pacific Herring in Puget Sound (UW)
- Genome Mapping of Growth and Growth-Related Traits in Coho Salmon (UW; WSU; Oak Ridge National Laboratory)
- Understanding Dispersal and Recruitment Dynamics of a Key Marine Invertebrate Species (Pinto Abalone) Using Molecular Techniques for Larval Identification (UW; Taylor Shellfish Company, Inc.; Washington Department of Fish and Wildlife)
- Juvenile Salmon Response to Intertidal Eelgrass Landscape Structure (UW; University of South Florida; Point No Point Treaty Council)

New Technologies to Enhance Ocean Productivity

Creating and applying technologies that show promise for expanding the horizons of ocean exploration, leading to deeper understanding of marine coastal processes, greater resilience among ocean resources, and the development of new products from the sea.

- Remotely Monitoring Killer Whales by Characterizing Vocalizations From Individuals (UW)
- Miniaturized Sonar System for Shark Imaging (UW)

Ecosystem Health

Understanding the marine environment and protecting it from the deleterious effects of human activities, including contamination from terrestrial and ship-borne sources, degradation of nearshore, upland and open-water habitats, overharvesting of fish, shellfish, algae and invertebrates, and introductions of non-native plant and animal species.

- Controlling Introductions of Ballast Water Organisms (UW)
- Redesign and Testing of Water Intake Systems for the Control of Aquatic Nuisance Species Analysis of a Toxic Alga in Stasis (UW)
- Linking Variability in Cell Motility to Harmful Algal Bloom Formation by *Heterosigma Akashiwo* (UW)
- Exposure of Salmonids to Carbaryl Following Application to Control Burrowing Shrimp (UW; Washington Department of Fish and Wildlife)
- Linking Nearshore Processes With Intertidal Diversity in Puget Sound (UW; Washington Department of Natural Resources)
- Sediment Dynamics and Sustainable Estuaries: a Field and Modeling Approach (Western Washington University)
- *Spartina* Eradication and Education Service-Learning Project (Langley Middle School/South Whidbey School District; WSU)
- *Spartina* Control Handbook (UW; WSU)
- Beach Watch Intertidal Education Program (Re Sources for Sustainable Communities)
- Impacts and Dynamics of Two Introduced Drills Consuming Cultured and Threatened Oysters (UW; Washington Department of Fish and Wildlife)

Economic and Community Development

Assisting marine and coastal-dependent enterprises, agencies and communities in making sound business, planning and development decisions that provide economic benefits to local communities and to the region, while managing resources for sustainability.

- Coastal Community Development Program in Washington and the Pacific Northwest (Washington Sea Grant Program, UW)
- Shoreline/Coastal Planners Group Educational Effort (Washington Sea Grant Program, UW)
- Educational Activities and Technical Support for Shellfish Growers (Washington Sea Grant Program, UW)

Education, Training and Public Information

Educating the workforce and informing the public as a means of sustaining the vitality of marine resources and the enviable lifestyle in Washington State and the Pacific Northwest.

- Regional Water Quality Education Project (Washington Sea Grant Program, UW)
- Marine Oil Spill Prevention Education Project (Washington Sea Grant Program, UW)
- Recreational Divers Monitoring for Aquatic Nuisance Species (Washington Sea Grant Program, UW)
- Outreach and Education on Aquatic Nuisance Species (Washington Sea Grant Program, UW)
- Educational Support, Salish Sea Expeditions (Salish Sea Expeditions)

Primary contact:

Ms. Penelope Dalton
 Director, Washington Sea Grant Program
 Phone: 206-543-6600
pdalton@u.washington.edu

The Water Center

<http://depts.washington.edu/cwws>

The mission of the UW 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. The Center serves as a catalyst for interdisciplinary research, bringing together expertise from a range of scientific, natural resources, engineering, and policy disciplines. Our research focuses on the scientific and societal aspects of water—demands and supplies; physical, chemical, and biological characteristics; time and space variability; watershed processes; and economic, ecological, and equity considerations. The Center integrates research with education and outreach, thereby uniting researchers, students, professionals, and the public in a collaborative effort to solve problems.

Research

The Center helps solve water resource problems by conducting scientific research, understanding relationships between ecosystems and human actions, and creating solutions to water resources conflicts. Center research addresses these areas, among others: drought impacts and preparedness; the intersection of policy, science, and management; salmonid natural history; linkages between riparian, and aquatic systems; stormwater management; monitoring; stream rehabilitation.

Education

The Center is designed to help university students develop both scientific depth and interdisciplinary breadth of knowledge in water resources. In the collaborative setting of the Center, students work together with faculty and research staff on projects, often teaming up with scientists and officials from off-campus. Activities stress on-the-ground field experience and applications.

Outreach

The Center actively communicates scientific information to decision-makers, practitioners, and the public in order to improve understanding of water resources and its relationships with human activities. Through its outreach and technology-transfer initiatives, the Center brings new research findings and scientific information into widespread usage.

Primary contact:

Dr. Anne C. Steinemann
Director, The Water Center
Professor, Civil and Environmental Engineering
Professor, Evans School of Public Affairs
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cwws@u.washington.edu

Interagency Partnerships

Management and stewardship of the Puget Sound watershed requires skillful policy development and resource management supported by sound science. Due to the complex issues facing Puget Sound, and the numerous agencies and organizations with management responsibilities within the Sound, these scientific foundations must be highly interdisciplinary and well integrated.

In addition to implementing the specific grants listed in this inventory, often in partnership with scientists from federal and state agencies, UW scientists play a key role in regional interagency collaborations by providing strategic leadership, research products, and educational opportunities. Partnering institutions have mutual benefits and interests, including a broadened scope of scientific services, increased technical capabilities, and increased diversity of expertise and institutional perspectives represented.

The following are examples of the UW's central role in interagency partnerships within the Puget Sound watershed:

The goal of the **Hood Canal Dissolved Oxygen Program (HCDOP)** is to determine the sources of low dissolved oxygen in Hood Canal and the effect on marine life. HCDOP works with local, state, federal, and tribal government policy makers to evaluate potential corrective actions that will restore and maintain a level of dissolved oxygen that will reduce stress on marine life. HCDOP is a partnership of 28 organizations that conducts monitoring and analysis and develops potential corrective actions to address the low dissolved oxygen problem in Hood Canal. HCDOP has two integrated and complementary arms: the Integrated Assessment and Modeling study and the Corrective Action and Education group. The UW leads the integrated Assessment and Modeling study. (Contact: Jan Newton, newton@apl.washington.edu)

The **Northwest Straits Commission** provides guidance and offers resources to the marine resources committees (MRCs), with the goal of mobilizing science to focus on key priorities and coordinating regional priorities for the ecosystem. The Commission's principal work is to: (1) Provide focus on the overall health of the Northwest Straits marine ecosystem; (2) Develop and propose scientifically sound recommendations to existing governmental authorities; and (3) Direct and coordinate scientific, technical and financial support to the MRCs. The Commission serves as a sort of "board of directors" for the Northwest Straits Marine Conservation Initiative. Its members represent each of the marine resources committees, tribes, the Puget Sound Action Team and additional appointments by the Governor, including leadership from the UW. (Contact: Andrea Copping, acopping@u.washington.edu)

Open Space Seattle 2100 is a coalition of urban leadership that is working to develop a comprehensive open space network vision for Seattle's next 100 years that will complement the city's predicted growth and density, and to build the broad constituency required to implement this vision. The UW is joining with leaders and citizens from civic, environmental, professional, neighborhood and community groups to create plans for connected open space that will serve residents, businesses, and natural systems in the coming century. (Contact: Nancy Rottle, nrottle@u.washington.edu)

The UW's **Pacific Northwest Center for Human Health and Ocean Sciences** was created in response to the critical need to understand links between ocean processes and human health. The Center investigates how environmental conditions trigger blooms of harmful algae in our marine waters and ultimately how these blooms impact public health. Scientists and students from the UW work in partnership with scientists from the National Oceanographic and Atmospheric Administration (NOAA), Washington State Department of Health, Washington State Department of Ecology, the Institute for Systems Biology, and the University of Maryland. (Contact: Virginia Armbrust, armbrust@ocean.washington.edu)

The **Pacific Northwest Seismic Network (PNSN)** operates seismograph stations and locates earthquakes in Washington and Oregon. 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. The PNSN is operated jointly by the UW, the University of Oregon, and Oregon State University, and is funded by the U.S. Geological Survey, U.S. Department of Energy, and the State of Washington. (Contact: Stephen Malone, malone@ess.washington.edu)

The **Puget Sound Ambient Monitoring Program (PSAMP)** brings together local, state, and federal agencies, coordinated by the Puget Sound Action Team, to assess trends in environmental quality in the Sound. Information from the program is used to evaluate the effectiveness of the management plan and set priorities for the work plan. Through PSAMP studies, data on marine and fresh waters, fish, sediments and shellfish in Puget Sound have been collected since 1989; surveys of nearshore habitat have been conducted since 1991; marine bird populations have been surveyed since 1992; and marine bird contamination has been studied since 1995. Several UW scientists serve the PSAMP as advisors. (Contacts: Jan Newton, newton@apl.washington.edu; Jeff Richey, jrichey@u.washington.edu)

The **Puget Sound Nearshore Ecosystem Restoration Project (PSNERP)** is a large-scale initiative that affords a unique opportunity to tackle some of the foremost habitat restoration needs in the Puget Sound basin. The project is among the larger habitat restoration and preservation endeavors planned in the United States. The goals of PSNERP are to identify significant ecosystem problems along the Puget Sound shoreline and evaluate potential solutions to restore and preserve critical nearshore habitat. The project is a cooperative effort among government organizations, tribes, industries and environmental organizations. University faculty, scientists and students contribute significantly to the scientific analyses and recommendations by the Project's Nearshore Science Team (NST). Several UW scientists serve on the PSNERP Steering Committee and NST. (Contacts: Andrea Copping, acopping@u.washington.edu; Megan Dethier, mdethier@u.washington.edu; Miles Logsdon, mlog@u.washington.edu; Jan Newton, newton@apl.washington.edu; Charles Simenstad, simenstd@u.washington.edu)

UW's **Water Center** maintains close collaborations with agencies and industries with responsibilities for water and natural resources in the Puget Sound region. We currently have projects with more than 15 agencies, and regular communication with nearly 3,000 constituents. Together with our external partners, we pursue scientific research to address critical issues faced by decision-makers in the region. The Center serves as a catalyst for interdisciplinary problem-solving and societal outreach, bringing together UW expertise (from engineering, forest resources, ocean and fishery sciences, and public affairs, among others) with professionals and the public. (Contact: Anne C. Steinemann, acstein@u.washington.edu; The Water Center, cwvs@u.washington.edu)

Facilities

Puget Sound Field Stations

Big Beef Creek, Seabeck

Description: Big Beef Creek is located on the eastern shore of Hood Canal. The creek is in excellent condition and flows through a deep canyon with forest typical of western Washington. The predominant trees are Douglas fir, western red cedar, and alder. A series of beaver dams has created about 20 acres of swamp and alder forest that add to the diversity of freshwater wetlands. Emerging from the swamp, the creek flows over a weir and into a small estuary with mud flats, grassy meadows, and a small salt marsh. The site also includes 40 acres of tidelands—mostly mud flat, rich in marine invertebrates. Four species of salmonids spawn in area streams. Teaching and research activities include natural history, artificial rearing studies, and whole-life-history studies of organisms that alternate between fresh and salt water. Emphasis is on ecological studies and the effects of increasing urbanization in the Puget Sound basin.

Acreage: 400 acres

Buildings: Freshwater laboratories, dry lab facilities, hatchery building, meeting room, maintenance shed, dry storage, five cabins

Equipment: Approximately 10 acres of sluices, pools, pump rooms, and wet labs associated directly with fisheries operations



Blue Glacier, Mt. Olympus, Olympic National Park

Description: Established in 1957, the Blue Glacier field station is one of only a few permanent research stations alongside a glacier in the world. It is located in a designated wilderness with restrictions on activities.

Acreage: Approximately 10 acres

Buildings: Main hut and two outbuildings

Equipment: Automated equipment to record weather observations and seismic recorder



Friday Harbor Laboratories, San Juan Islands

Description: The Laboratories' research facilities are located on a 484-acre site on the east side of San Juan Island. Both the land on which the Laboratories are sited and the adjacent marine waters are biological preserves. The Friday Harbor Laboratories (FHL) also includes biological preserves at Point Caution, Argyle Lagoon, Garrison Bay, and False Bay, on San Juan Island; Parks Bay and Cedar Rock/Squaw Bay on Shaw Island; and Iceberg Point and Point Colville on Lopez Islands. The preserves provide a wide range of protected terrestrial and marine environments, including direct access to salt waters that are relatively free from pollution. Many species of fish are present in the salt waters surrounding FHL. Representatives of nearly all major groups of marine algae and invertebrates are found in the intertidal zone and in the adjacent waters. The plant community ranges from very dry to moist types. Hawks, eagles, herons, song birds, and sea birds are all present. FHL provides facilities for research and instruction in the areas of marine biology, oceanography, zoology, and botany.

Acreage: 1,856 acres

Buildings: FHL has 66 buildings, including extensive laboratory facilities for marine biology. Lecture halls can accommodate audiences of up to 75 persons. The library contains 15,000 volumes. A large dock provides moorage, storage and diving facilities and is protected by a floating breakwater. Floating docks located adjacent to the main pilings are equipped with live boxes.

Equipment: Specialized equipment includes centrifuges, oscilloscopes, microscopes, and molecular biology equipment for lab work as well as a 58-foot research vessel and other equipment related to specimen collection



Joe E. Monahan Findley Lake Reserve, *Upper Cedar River Watershed (southeastern King County)*

Description: The Findley Lake Reserve is located in the upper reaches of the Cedar River watershed, a natural, high-elevation, forested stream basin. Set aside by the Seattle Water Department in 1972 as an ecological preserve, the area is primarily forested, with a mixed stand of old growth mountain hemlock and silver fir. The lake's elevation is approximately 1100 meters and the upper part of the watershed has a maximum elevation of 1500 meters. The terrain is alpine and talus, ranging from flat lands to cliffs. A wide variety of productivity, mineral cycling, tree physiology, and forest meteorology studies have been conducted at Findley Lake.

Acreage: 640-acre watershed

Buildings: Cabin and storage shed

Equipment: Pelton wheel generator, lysimetry equipment, Onan propane generator

Lee Forest, Snohomish County

Description: The area is lowland forest (mostly mature Douglas fir and red alder) and is completely surrounded by developed and developing residential neighborhoods. Utility of the property is narrow due to the title restriction and the neighborhood. Title requires that research emphasize forest biology.

Acreage: 160 acres

Buildings and Equipment: None

Olympic Natural Resources Center, Forks

Description: Olympic Natural Resources Center (ONRC) was created by the Washington State Legislature and has been operational since 1995. Located adjacent to Olympic Experimental State Forest, the Center provides instruction and conducts research on natural resource management practices, which integrate ecological and economic values. The Center's education programs include technical and professional information transfer. The forest and marine resources of the Olympic Peninsula provide the main focus of the Center's work. ONRC's Marine Program is focused on the control of spartina in Willapa Bay and on algal blooms.

Acreage: 40 acres

Buildings: Approximately 20,000 square feet, with labs, conference rooms, administrative offices, prop room/storage, library, residences and dining facilities

Equipment: Field forestry equipment



Charles Lathrop Pack Demonstration Forest, South Pierce County

Description: Pack Forest is used for graduate and under-graduate academic programs, research, conferences, continuing education and public outreach. The forest cover is predominantly Douglas-fir, with some red alder, hemlock and cedar. Substantial forest stand diversity ranges from new plantations to old-growth. The site also includes meadows, streams (intermittent to river), wetlands, and ponds. Terrain varies from flat to steep and elevation from 600 to 2000 feet.

Acreage: 4,250 acres

Buildings: Forty-five buildings, including garages, houses, apartments, dormitories, cabins, class and conference rooms, laboratory, meeting rooms, dining facility, faculty and staff offices, mechanical and warehouse buildings, and physical plant buildings

Equipment: Specialized forestry, research and logging equipment, maintenance equipment, and vehicles



Thompson Research Site, Lower Cedar River Watershed, Southeastern King County

Description: Dominated by relatively pure stands of second-growth Douglas fir and red alder, the site has provided the opportunity to investigate the ecology, productivity, and nutrient dynamics of forest ecosystems. It is currently used for class field trips. It is closed to the public.

Acreage: N/A

Buildings: Cabin, trailer for supply storage, pump house, open shed

Union Bay Natural Area, Seattle

Description: Built on the site of the former Montlake dump, Union Bay Natural Area is a large outdoor laboratory and demonstration area comprised of open grasslands, wetlands, woodland, shoreline, and riparian corridor. The Center for Urban Horticulture (CUH), of which Union Bay Natural Area is a part, adjoins the natural area. CUH, which is a unit of the College of Forest Resources, supports research, education, and outreach programs in the field of environmental horticulture, urban forestry, public garden management and ecology. The Union Bay site also includes a research nursery area and greenhouses. Research includes wetlands and prairie restoration and management, landscape plant testing, comparative landscape management practices, plant taxonomy, and compost testing.

Acreage: 50 acres

Building: Offices, laboratories, greenhouse, conference facilities, library, herbarium

Equipment: Audiovisual equipment, grounds maintenance equipment



Washington Park Arboretum, Seattle

Description: The Washington Park Arboretum (WPA) is a living plant museum, containing over 4400 different taxa totaling nearly 10,000 accessions. In addition, it is estimated that the grounds support over 10,000 native trees. It is the largest collection of temperate woody plants in the Northern Hemisphere. Collections are selected and arranged to display their beauty and function in urban landscapes, to demonstrate their natural ecology and diversity, and to conserve important species and cultivated varieties for the future. In addition to its manicured areas, the park also includes wetlands along Union Bay. Research includes studies on selection and appropriateness of exotic trees and shrubs for the Northwest, such as flowering cherries; and Japanese maples; studies on plants from climates similar to the Northwest, such as New Zealand and Chile; and evaluation of native trees and shrubs within an urban forest and park land. The Arboretum serves the public, students at all levels, naturalists, gardeners, and nursery and landscape professionals with its collections, educational programs, interpretation, and recreational opportunities. It is managed cooperatively by the University of Washington and the Seattle Department of Parks and Recreation.

Acreage: 230 acres

Buildings: Donald G. Graham Visitors Center (offices, visitor and interpretation center, meeting/classrooms), maintenance barn and yard, curatorial annex, UW greenhouse, Pat Calvert Greenhouse, and Stone Cottage

Equipment: Grounds maintenance and big tree equipment



Research Vessels

Clifford A. Barnes Research Vessel

Moored on Portage Bay, Seattle



Description: The *R/V Clifford A. Barnes*, a 65-foot vessel, is owned by the National Science Foundation and operated by the School of Oceanography. The vessel has overnight capacity for six scientists and carries a crew of two. It is used for research and instruction, primarily in the sheltered waters of Western Washington and British Columbia. Non-UW use is encouraged.

Equipment: A working deck, crane, and a small, non-specialized laboratory space

Centennial Research Vessel

Moored at Friday Harbor Laboratories

Description: The *R/V Centennial*, a 58-foot vessel, was built in 1990 as a commercial trawler and seine fishing boat and was subsequently modified for longline and pot fisheries. From 1990 to 2002, the vessel participated in numerous different fisheries in the Gulf of Alaska and the Pacific Coast and is configured with all the equipment and hydraulics necessary to support bottom and mid-water sampling devices (trawls, dredges, plankton nets, etc.), water column sampling devices (CTD, Niskin bottles), acoustic sampling devices and deployment of a remotely operated vehicle (ROV).

The conversion to a research vessel was done in 2002. Class field trips of short duration (< 36 total persons on board) can be comfortably supported. The vessel is also well suited for research cruises of longer duration, with berthing and accommodations for parties of up to six. It is used for research and instruction primarily in the sheltered waters of Western Washington and British Columbia. Non-UW use is encouraged.

Equipment: A Deep Ocean Engineering Phantom II ROV with plasma display screen, a working deck, crane, and a small, non-specialized laboratory space



Thomas G. Thompson Research Vessel



Description: The *R/V Thomas G. Thompson* is owned by the Office of Naval Research and operated under a charter party agreement by the UW School of Oceanography for the American ocean research community. It is 274 ft. in length, with a 52.5-ft. beam, and at full load has a 19-foot draft. The normal cruising speed is 12 knots, and can accommodate 22 officers and crew, 36 scientists, and 2 marine technicians. It is used for research primarily in the Pacific Ocean. Non-UW use is encouraged.

Equipment: The *R/V Thomas G. Thompson* is one of the most sophisticated research vessels afloat, equipped with precision navigation, bottom mapping, satellite communications systems, and scientific instrumentation.

Sources

Faculty Expertise

Faculty listed in this directory are those with 1) current projects or recent experience in the Puget Sound region, or 2) expertise in a subject that is particularly relevant to our region. The descriptions of faculty expertise were taken from the UW Graduate School database of faculty interests. These lists include only active UW faculty and research scientists as of November 1, 2005.

Grants and Contracts

The projects included in this inventory were selected from the UW Office of Sponsored Programs database of all grants and contracts received by the UW from July 1, 2001 to June 30, 2005. Gifts to the UW are not included. The fiscal year indicates the period in which project funds were received from the funding agency (e.g., funds for a grant listed under FY2005 were received between July 1, 2004, and June 30, 2005).

This inventory includes only those grants and contracts that are directly related to some aspect of the health of the Puget Sound environment. Basic research is not included unless it is in a subject that is uniquely relevant to our region. Although most projects could fall under several topic areas, each grant/contract was assigned to one primary topic to avoid duplication. Finally, although only one individual is listed for each grant or contract, it should be noted that many projects support multiple investigators.

This inventory is intended to be a living document. If you have information you believe should be added, deleted, or changed in any way, please contact Stephanie Harrington, stephah@u.washington.edu or 206-543-0878.