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Marine Sciences Laboratory

A National Asset Focused on Energy and the Environment in Coastal Systems

Researchers at Pacific Northwest National Laboratory's Marine Sciences Laboratory in Sequim, Washington, deliver science and technology critical to the nation's energy, environmental, and security future. This unique facility is also the Department of Energy's only marine research laboratory.

Building upon a history of research in marine and coastal systems, the Marine Sciences Laboratory is rapidly establishing leadership by:

- ▶ enabling sustainable deployment of renewable energy sources in estuarine and coastal systems,
- ▶ predicting and responding to climate change, and
- ▶ detecting threats to national security in coastal environments.

Research and development at the laboratory relies on our signature capabilities in

- ▶ environmental chemistry
- ▶ water and ecosystem modeling
- ▶ environmental sensors
- ▶ ecotoxicology
- ▶ biotechnology
- ▶ national and homeland security.

ENABLING THE DEPLOYMENT OF RENEWABLE ENERGY

Producing energy from renewable sources promotes economic growth and national energy security. Identifying and managing the environmental impacts of renewable energy resources removes the primary roadblocks to harnessing them.

In the Pacific Northwest, hydroelectric dams are a major source of energy. However, fish mortality caused by turbines has been a major barrier to the sustainable growth of conventional hydropower. Researchers at the Pacific Northwest National Laboratory conducted the field and laboratory studies that formed the basis for a fish-friendly turbine that has proven to decrease fish injury and at the same time increase power production by 10 percent.

Obtaining meaningful energy from waves and tides faces similar challenges—ensuring structures operate without harming fish and wildlife, interfering with commerce, or deteriorating water quality. Researchers are developing new technologies to track aquatic species, assess their condition, and enhance survival. They have also developed a high-resolution model of water flow and quality throughout the Puget Sound and Georgia Basin, which can be used to guide environmental restoration and characterize the potential for tidal power development.

Achieving cost-effective production and processing of marine algae into fuels could lower our dependence on fossil fuels and, on a life-cycle basis, reduce greenhouse gas emissions. Our researchers are exploring the use of marine species, including algae, to enhance the development of ocean bio-energy as a clean, new energy source.



Researchers at the Marine Sciences Laboratory are dedicated to solving environmental challenges related to climate change and energy production in coastal systems including the Puget Sound and lower Columbia River.



U.S. DEPARTMENT OF
ENERGY

The Marine Sciences Laboratory site encompasses 150 acres of uplands and tidelands, about 7.5 acres of which has been developed for research operations.



The Marine Sciences Laboratory is uniquely suited to advance the potential of traditional and new sources of energy. Our staff are experts at

- ▶ determining coastal energy resource potentials,
- ▶ predicting and mitigating the impacts of energy systems on coastal systems, and
- ▶ optimizing production of biofuels (hydrogen, biodiesel, jet fuels) from marine algae.

PREDICTING AND MANAGING THE IMPACTS OF CLIMATE CHANGE

Like canaries in mine shafts of old, salmon and other aquatic species indicate the health of our rivers and coastal waters. With decades of experience, researchers are solving complex issues in coastal ecosystem and resource management through the use of sensors, experimental systems, advanced restoration techniques, and systems modeling. Our work has helped guide effective restoration of coastal systems, prevent unwanted impacts from infrastructure development, and inform important decisions on water management practices.

To make decisions that promote a sustainable economy and environment, government agencies and industries must understand the regional effects of climate change and make accurate predictions about future consequences

on infrastructure in the coastal ecosystem. Through an integrated analysis toolkit that quantifies effects of sea level rise, changing land use, and regional climate change on coastal and marine water quality and associated biological systems, policy makers are provided with the ability to evaluate land use and coastal habitat management options within the context of climate change. A prototype of this system is already being developed for the Puget Sound and the Gulf of Mexico.

Pacific Northwest National Laboratory experts are providing the science, predictive tools, and technologies to help water stewards and users rapidly and effectively assess, monitor, and adapt to changes in resource conditions driven by climate change, population increase, and changes to resource availability and demand within the coastal and near-shore region by:

- ▶ developing and deploying integrated science and technology solutions for restoring and protecting the health of the Puget Sound and surrounding watersheds, and
- ▶ assessing climate change impacts on regional aquatic systems.

DETECTING THREATS

Researchers employ advanced sensors and aquatic modeling to detect potential acts of terrorism in coastal waters, predict transport of radiological, chemical, and biological materials, and inform

effective responses. These systems are being developed to protect the vital points of entry for our nation's international port system, as well as the key population centers on our coasts.

ABOUT PNNL

Solving America's toughest problems is our business. With an unwavering focus on our missions, scientists and engineers at the U.S. Department of Energy's Pacific Northwest National Laboratory deliver science and technology to our clients. We translate discoveries into new knowledge, tools, and technologies in fundamental science, energy, the environment, and national security.

The main campus is located in Richland, WA. Other offices are in Washington, D.C., College Park, MD, Portland, OR, Seattle, WA, and Sequim, WA. The Marine Sciences Laboratory in Sequim is on 140 acres of tidelands and uplands at Sequim Bay. The facility has three research vessels, 14,000 square feet of laboratory space, and over 80 staff.

Everything we do promotes scientific discovery, provides educational opportunities, and benefits from PNNL's most valuable assets—our expertise, premier facilities, and a passion for science.

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