# Coastal Storms Program helps residents prepare for severe weather

I'm here for the weather!" says Patrick Corcoran, OSU Sea Grant Extension educator based in Astoria, Oregon. Corcoran has been the outreach coordinator for the NOAA Coastal Storms Program, a partnership between Oregon Sea Grant and the National Oceanic and Atmospheric Administration (NOAA).

The program's goal is to engage local stakeholders in the development of new data, models, and tools that will be most useful in predicting, preparing for, and responding to severe coastal weather and storms.

The geographic focus of this effort is the lower Columbia River and the coastal waters from Grays Harbor, Washington, to Tillamook Bay, Oregon. The area is notorious to mariners as the "graveyard of the Pacific" for its extreme winter weather, high surf, and dangerous bar conditions.

"My job," says Corcoran, "is to help NOAA develop the most useful models and tools for people in this region." Sea Grant's role is to connect local stakeholders and potential users of the tools with the NOAA researchers developing them, "in order to maximize the local utility of the data, models, and tools," says Corcoran.

This scenario is one that Oregon Sea Grant Extension's Coastal Storms Program is working to prevent.

The Coastal Storms Program (CSP) is spending nearly $3.5 million on six projects in the region. The projects draw from across four NOAA line offices and several program offices.

One of the projects is a new NOAA weather buoy, deployed 70 miles west of Tillamook Bay, Oregon. "The buoy is loaded with state-of-the-art meteorological and oceanic data measurement instruments," says Corcoran, allowing it to measure standard atmospheric and ocean data. In addition, a new device called an Acoustic Doppler Current Profiler, mounted on the hull of the buoy, is measuring ocean currents.

"The buoy helps improve the accuracy of National Weather Service forecasts for marine and coastal waters," Corcoran says, "and is particularly useful in issuing small-craft advisories that distinguish between inner and outer waters."

Closer to shore, selected water-level stations along the coast and up the Columbia River have been upgraded with sensors and meteorological packages that can measure wind speed, direction, gusts, air temperature and barometric pressure, water temperature, and conductivity. The stations provide hourly transmissions of six-minute water level and hourly meteorological observations.

"These enhancements," Corcoran says, "provide for a denser network of water level and surface measurements and increase the accuracy of forecasts and the safety of vessels."

Because vessel safety depends to a large degree on the weather and its effect on the ocean, the National Weather Service (NWS) is helping to address the issue via a computer model of near-shore wave dynamics along the Washington and Oregon coasts. "Accurate near-shore wave forecasts are of critical importance to the safety of commercial and recreational mariners," Corcoran says, "and the NWS model uses near real-time data to visually portray the dynamics of Grays Harbor, the Columbia River, and Tillamook Bay, which will improve the accuracy of coastal weather and bar forecasts."

To better understand how coastal storms influence erosion, navigation hazards, and the impact of dredge materials, the CSP project team from NOAA's National Ocean Service (NOS) is developing a three-dimensional computer model of the Columbia River. The model initially was developed by researchers at the Oregon Graduate Institute, and the model's scripts are being transferred, retrofitted, and validated in accordance with NOS standards.

"This project is thus converting a research model into a product for use by the general public," Corcoran says. Results from the model provide real-time and forecasted water levels, currents, temperature, and salinity. Hourly "nowcasts" (reports on current conditions) and 24–48 hour forecasts "will be particularly useful to navigators, fishermen, hazardous spill responders, and search-and-rescue teams in the area," Corcoran says.

Another facet of coastal storms is runoff and its effects on the environment. One CSP project is focusing on the impacts of toxins in storm runoff on fish. Researchers with NOAA Fisheries have identified sources of contaminants in the lower Columbia River, paying particular attention to the impact of these toxins on pre-spawn female coho salmon in restored urban watersheds.

The researchers performed a risk assessment to identify a short list of chemicals to study and then used biological assays to determine the effects of those chemicals most likely to be elevated during and after storms. Next they will identify concentrations of contaminants that exceed thresholds for adverse effects. Finally, they will incorporate recommendations for mitigating potential ecological effects into contingency planning efforts for coastal storm response agencies.

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In further efforts to protect the environment, NOAA researchers and colleagues in state and federal agencies have updated Environmental Sensitivity Index (ESI) maps for the lower Columbia River. "ESI maps serve as quick references for oil and chemical spill responders and coastal zone managers," Corcoran says. These high-resolution maps identify a variety of shoreline habitats, biological resources, and areas of human use. The biological resources include various subsets of birds, marine mammals, terrestrial mammals, reptiles, fish, and invertebrates. Human uses include boat ramps and marinas, hatcheries, ferries, locks and dams, water intakes, parks, and fishing grounds.

People who live near bodies of water are naturally interested in knowing whether the area is susceptible to flooding. Another product of the CSP is a user-friendly GIS tool that depicts the most vulnerable areas to flooding caused by coastal storms. "The tool helps planning and permitting agencies, transportation managers, and emergency response agencies identify an area within a shoreline segment and examine what level of shoreline erosion or flooding is likely," Corcoran explains, "based on near real-time data collected from tide gauges and buoys"—including CSP's weather buoy.

The tool employs an improved model based on analyses of the total water levels, and the effect of wave run-up superimposed on the tides, to assess the potential maximum extent of coastal flooding. Tsunami inundation zones have been added to the tool, and information from past storms can also be analyzed to guide current planning. "It's another example of the emerging form of decision-support tools that incorporate near real-time data into their analysis and display," Corcoran says.

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