Tsunami: Are coastal residents ready?
FROM THE DIRECTOR

Welcome to the inaugural issue of Confluence, the first-ever periodical dedicated exclusively to Oregon Sea Grant program activities. You are receiving this because you have, in one way or another, expressed an interest in Oregon Sea Grant’s mission or its activities.*

The word “confluence” can be defined as the flowing together of two or more streams. In our case, Confluence depicts the integration or flowing together of research, education, and engagement to comprehensively address issues of importance to coastal stakeholders. This integrated approach is the hallmark of the National Sea Grant Program. Thus, each issue of Confluence will explore a particular topic via one or more feature stories plus several shorter articles, sidebars, and columns related to that topic to illustrate integration.

In this issue, for example, the feature story, “Elk Antlers Over the Bed,” shows how Oregon Sea Grant is addressing tsunami readiness through the work of coastal education and engagement by hazards specialist Pat Corcoran. Another article on the topic, “Who Is Most Affected by Tsunamis?” takes a hard look at how natural disasters affect different socioeconomic groups differently, often making preexisting inequalities even worse.

We do hope you enjoy this and subsequent issues of Confluence. We welcome your feedback and suggestions.

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On the Cover: Photo taken near the Port of Brookings, following wave surges during a tsunami warning along the Oregon coast in March 2011. Photo by Jamie Francis/The Oregonian.

*Our mission is to develop and support an integrated program of research, outreach, and education that helps people understand, rationally use, and conserve marine and coastal resources. Our activities respond to the needs of ocean stakeholders and act to stimulate Oregon’s economy.
Oregon Sea Grant has received a five-year, $2.6 million grant from the National Science Foundation to support the creation of a free-choice learning lab at Oregon State University’s Hatfield Marine Science Center in Newport.

The grant is the largest single research award to Oregon Sea Grant in its 40-year history and among the largest ever awarded to a Sea Grant program nationwide, according to program director Stephen Brandt.

Free-choice learning is the study of how people learn across their lifespan and across contexts where they have choice and control over that learning. Most of the learning people do over the course of their lives, including about the ocean and marine sciences, happens in such contexts.

“Studying how people learn is critical to Sea Grant because it can help us understand how best to communicate with the diverse public audiences who rely on us for research and education related to ocean and aquatic issues,” Brandt said.

Oregon Sea Grant and OSU researchers will conduct innovative research at the Hatfield Marine Science Center’s Visitor Center, a destination that attracts more than 150,000 visitors a year, and will collaborate with the public to gain a deeper understanding of what and how they learn. The funding will support cyber-learning – the use of networked computing and communications technologies to support learning – and exploit emerging technologies for real-time assessment and evaluations.

Guest scholars from academia, as well as museums, zoos, and aquariums nationwide will conduct research projects within the developing laboratory infrastructure. Projects will use state-of-the-art human-observation technologies that will be developed and deployed in the center.

“This new NSF award is strong recognition of the HMSC Visitor Center’s cutting-edge work,” said George Boehlert, director of HMSC. “The research now being developed will create new advances in delivery of marine science education to people of all ages.”

The research project will be led by Shawn Rowe, a faculty member in both Sea Grant and the OSU College of Education.

“Studying how people learn is critical to Sea Grant because it can help us understand how best to communicate with the diverse public audiences who rely on us for research and education related to ocean and aquatic issues,” Brandt said.

Visit the online version of Confluence for additional stories, videos, and information about Oregon Sea Grant research and activities: seagrant.oregonstate.edu/confluence
In a sunlit meeting room in the Astoria Holiday Inn, Patrick Corcoran is about to lay some bad news on eight members of the Oregon Trawl Commission.

This is the quarterly board meeting of the fishermen-funded and -run commission, organized under Oregon’s Department of Agriculture. The members of the commission represent the state’s fishing industry elite. These businessmen have millions of dollars invested in boats and processing facilities, and Corcoran is about to tell them that all this wealth, representing years—in some cases generations, of hard work—could disappear in an instant, washed out to sea or destroyed in harbor by a massive wave the likes of which no one has seen in the Pacific Northwest in over 300 years.

Corcoran, an Oregon Sea Grant Extension specialist, specializes in coastal hazards: storms, coastal erosion, and tsunamis. His talk to the board about tsunamis isn’t the first time he has handed out this particular brand of bad news. Over the years he has developed a unique style that presents scientific facts along with psychology and humor, a distinctive combination that has made him adept at giving people a diagnosis they don’t want to hear. Having been a facilitator for years, he is also a master of group dynamics.

For Corcoran, giving his talks isn’t only a job. It’s a vocation. The outgoing specialist enjoys interacting with groups. Just two days earlier, Corcoran returned from Burning Man, the weeklong art festival held in the Nevada desert. Rather than being tired from the celebrations, he is still visibly energized from the event. He will need this energy when he tells the commission the bad news. A 9.0 magnitude earthquake, followed by a tsunami similar to the one that devastated Japan, will one day strike Oregon’s coast, perhaps in the lifetimes of those in the room. But his real message isn’t catastrophe. It’s resilience.

The March 11 tsunami that laid waste to Japan’s east coast is still fresh in the minds of Oregon Trawl Commission members. The Commission’s director, Brad Pettinger, has already mentioned Sendai, the Japanese city that experienced some of the worst effects from the recent tsunami. Also fresh in their minds are those images: black waves crashing over a barrier in Miyako, Japan; lowland buildings crumbling under massive 30-foot-tall waves; people drowning in their cars.
The problem, he says, is that not only do most people not understand the difference between distant and local events, but Oregon’s coast, while it is prepared for the less-severe distant event, is not prepared for a local tsunami.

Corcoran tells the Commission it can and will happen here.

“When the earth shakes,” says Corcoran, “get the hell out of Dodge.” For people on the Oregon coast the shaking earth is a warning that means they have 15 to 30 minutes to get 50 feet or higher, because a tsunami is going to inundate the coast, damaging or destroying businesses and homes and potentially killing tens of thousands. “It means,” says Corcoran, “we will get what Japan got.” And the worst of it is, says Corcoran, is that unlike Japan—which despite the destruction was actually very prepared for just this kind of event—Oregon’s coastal residents are woefully unprepared for a massive tsunami. One reason, he says, is that a lot of people just don’t know large earthquakes and tsunamis happen here.

Corcoran asks the fishermen in the room about their experiences with the March 11, 2011, tsunami. Many have their stories. Rex Leech tells how he scrambled to get his boat out to sea in the early morning hours because he feared it would be damaged if he left it in the harbor. Pettinger says it was chaotic when the tsunami sirens went off in his northern California to Vancouver Island, where much of the town’s harbor was damaged. “But,” says Pettinger, “I’ll take Crescent City over Sendai any day.”

In Japanese cities such as Sendai, the tsunami was devastating. But 10 hours later, when it finally reached the United States’ west coast, the wave had lost most of its intensity. While it caused damage to boats and harbors on the U.S. coast—and did even carry some people out to sea, one of whom later died—the Japanese tsunami was more of a hassle than a hazard. For the Pacific Northwest, the March 11 tsunami was a distant event; the earthquake happened thousands of miles away. This distinction between a local and distant event is a critical one, Corcoran tells the group.

“The distant event is nothing to sweat,” says Corcoran. “If your boat gets banged up in the harbor, that’s what you have insurance for.” The problem, he says, is that not only do most people not understand the difference between distant and local events, but Oregon’s coast, while it is prepared for the less-severe distant event, is not prepared for a local tsunami.

It’s only been since the late 1980s, Corcoran tells the Commission, that scientists have discovered evidence of Oregon’s big historic earthquakes. The Pacific Northwest is the meeting point between two tectonic plates: the Pacific and the North American plates. Where the two plates overlap, an area called the Cascadia subduction zone, the Pacific plate is slowly moving underneath the North American plate. Stretching from northern California to Vancouver Island, the Cascadia subduction zone’s western edge extends 90 miles off the coast, while its eastern edge reaches to the Cascade mountain range. This subduction zone is very similar to the one that caused Japan’s recent earthquake and tsunami. As one tectonic plate is forced over another at about the rate it takes to grow a human fingernail, pressure builds up slowly. But, says Corcoran, like an archer’s bow drawing back, the longer the pressure builds, the more power there will be when it is finally released.

A magnitude-9.0+ earthquake extending along the entire Cascadia subduction zone is now believed to occur on average, once every 300 to 500 years. Corcoran tells the group. A partial rupture, reaching a magnitude of 8.0+, is estimated to occur on the southern half of the fault line once every 220 to 240 years on average. The last time the zone experienced an earthquake of either kind was a magnitude 9.0, in 1700. Corcoran waits for this to set in with the mariners. “We are 311 years into the 500-year cycle for a full rupture measuring magnitude 9.0,” he says. “We are overdue.”

“We are overdue,” Rex Leech repeats. “The number one message for me to leave you with today,” Corcoran tells the Commission members, “is to expect the Big One.” (continued next page)
As Corcoran’s stark facts settle on the room, the Commission members become grave. Leech mumbles under his breath: “It’s going to rock our world.”

Outside the meeting, sitting on the Columbia riverfront just underneath the fantastically long and earthquake-vulnerable Astoria-Megler Bridge, Corcoran says he could lecture about plate tectonics and tsunamis all day, but the scientific details really aren’t what’s important to coastal people. What is important to them, he says, is helping them respond to the event so that individuals and communities are resilient. On the individual level that means “learning to develop an eye for the landscape”—knowing where 50 to 100 feet above sea level is so you can run there after the earth stops shaking. It means knowing that the earthquake and tsunami probably won’t happen when everyone is sitting around the dinner table. It means knowing you will probably be separated from your loved ones, so you need to have those tough conversations with your family now about what to do when the tsunami hits. Corcoran says while getting people to understand the geology is pretty easy, getting them to appreciate the implications of the geology is much more difficult.

“Our neurology evolved to be afraid of things like lions and tigers and bears jumping on the path in front of us,” says Corcoran. “We have not evolved to worry about every-300+-year events.” For this reason, Corcoran says, making his message heard can be tough. “Most people are more concerned with their mortgage or losing their job. This is not something people think a lot about.” Corcoran says he finds similar resistance when helping Oregon’s coastal residents deal with the very slow but steady erosion of their coastline. So Corcoran works hard to, as he puts it, “meet people where they are at.” For example, he tries to find out what the individual’s experience with tsunamis has been and work from there. He is also keenly aware that his message isn’t always welcome.

Nobody wants to learn that they live and work in a tsunami inundation zone, but since 1995 as the Oregon Department of Geology and Mineral Industries has drawn up its tsunami inundation maps for the Oregon coast, that’s exactly what many residents and business owners have found out. For many people, discovering they own a home or a business in an inundation zone brings on denial. “It won’t happen to me,” or “It won’t happen in my lifetime” are responses Corcoran frequently receives when he presents. He also says he has faced resistance from businesses, be they hotels or sandwich shops, which don’t want to scare tourists away by advertising that a tsunami could wiped them out. The Sea Grant specialist says the reactions he often hears are similar to what doctors must hear when diagnosing a patient with terminal cancer. Nobody wants to receive a bad diagnosis, be it in a doctor’s office or on an inundation map. To soften the blow of the bad news, Corcoran has learned how to guide people through what he sees as a grieving process.

In 1969, psychiatrist Elisabeth Kübler-Ross wrote her seminal work On Death and Dying. In it she broke down the grieving process into five stages: denial, anger, bargaining, depression, and acceptance. Corcoran says when he tells people about the possibly of a Sendai-sized disaster on the Oregon coast he sees them move through Kübler-Ross’s stages. Denial is the most frequent response, but with the March 11 tsunami still active in the collective memory, that is changing. Corcoran says many of those he talks to are now past the denial phase, and have moved on to anger and bargaining. “Now all we have to do is hold our hands through depression and get to acceptance,” he had joked to the trawlers. This got a laugh from the room.

Indeed, Corcoran worked the room more like a stand-up comedian than an academic. His tone is informal, lighthearted, and full of jokes. When he talks to a crowd about preparing for an 8.0 or 9.0 earthquake, he doesn’t start by saying that most buildings in the Northwest are going to crumble because they aren’t designed to withstand such a powerful earthquake. He also doesn’t talk about how people will be separated from their loved ones by days, hours, and potentially even weeks because much of the region’s infrastructure, including many of its bridges and highway onramps, will collapse. No, he starts off with a joke.

“Those elk antlers over the bed might be sexy,” said Corcoran, “but they are not very safe when the earth starts shaking.” The Commission laughed in unison.

Corcoran says he uses humor in his work because it helps people get to acceptance, and in the resilience literature he has read, the ability to joke about your troubles—
be it the death of a loved one, a terminal diagnosis, or the sudden realization that you live in a tsunami inundation zone—a sign of mental health. The strategy seems to be working for him. This is the second time Corcoran had spoken to this group; in fact it was the Commission director, Pettinger, who invited Corcoran to speak again. But Corcoran wasn’t always sought out to speak on tsunamis.

Corcoran started working on coastal hazards in 2003 as part of an Oregon Sea Grant and National Oceanic and Atmospheric Administration-funded coastal storms outreach program. A year and a half into his new position, in late December of 2004, a massive tsunami caused by an earthquake in the Indian Ocean pummeled the coasts of Sumatra and Indonesia. Shaky amateur images of the tsunami filled the news. Corcoran, who was already putting a tsunami preparedness program into action, decided this was the moment to really start pushing the agenda. He met with his first stakeholder group about a month after the Sumatran tsunami, a date that also fell near the 305th anniversary of the last recorded local tsunami on the Oregon coast on January 26, 1700.

When Corcoran began his tsunami hazard outreach program, he located stakeholder groups from business owners and emergency managers to community groups organizing evacuation plans. He found ways to insert himself into their agendas, but as tsunamis captured news headlines with Sumatra in 2004 and Chile in 2010, stakeholders began to seek him out. But the March 11 Japanese tsunami changed everything. “I have people tell me,” says Corcoran, “Sumatra didn’t get me, Chile didn’t get me, but those images from Japan got me.” Corcoran says the combination of Japan’s being an industrialized country and the fact that the tsunami happened in the daytime and was heavily documented has really changed people’s minds. March 11 showed Northwesterners what to expect from a near-shore tsunami, says Corcoran. Now, he says, people are paying attention. But the specialist hopes people will do more than that. “Until there is behavior change, my job isn’t done,” says Corcoran.

After Corcoran left his meeting with the Commission, board members discussed his presentation. Over Subway sandwiches and canned soda, the members talked about what they would do when the tsunami happens. At one point the conversation turned survivalist, as the members compared the resources they could draw on in an emergency: one mentioned the fresh water he always has on hand, another, his earthquake kit. However, they all agreed they would probably be killed if they were in harbor on their boats when a local tsunami came in. Corcoran’s talk had clearly gotten under the skin of many of the Commission members. He also appears to have gotten the response we wanted from the group.

Commission Director Brad Pettinger said he was going to start distributing tsunami evacuation maps for the Brookings’ harbor. Rex Leech, the fisherman who scrambled to get to sea on March 11, said he would talk to his employees about the danger of tsunamis. He also said that when he went home later that night he would make a plan with his children about what to do when the earth shakes. Corcoran says small actions like these could be part of a larger attitude shift.

“The Oregon coast,” says Corcoran, “has gone from a culture that didn’t expect it [a large tsunami] to happen here to one where we are now starting to expect it to happen.” Despite the resistance to bad news, since beginning his position Corcoran has seen neighborhood groups organize tsunami evacuation plans, hotels and conventions centers have changed their tsunami response procedures, and local governments are updating policies regarding tsunami preparedness and response. Corcoran says he hopes Oregon’s coastal residents will continue to take these steps, however seemingly small, toward what he says is a larger sea change in attitude from denial to an acceptance that recognizes powerful tsunamis happen here. In the meantime, Corcoran says he will continue to talk to stakeholder groups. The specialist’s calendar is booked full of events where he will hand out bad news to help build resilience.

**“Until there is policy change or behavior change, my job isn’t done.”**

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**TO LEARN MORE ABOUT TSUNAMIS ON THE OREGON COAST...**

Check out Oregon Sea Grant’s brochure, “Three Things You Need to Know about Tsunamis,” written by Pat Corcoran and available online at http://seagrant.oregonstate.edu/sgpubs/onlinepubs/g11010.html (or you can order a hard copy free by calling 541-737-4849 or e-mailing Sea.Grant.Communications@oregonstate.edu).

- Visit the website maintained by Oregon’s Department of Geology and Mineral Industries (DOGAMI):
  - www.oregongeology.org/tsunclearinghouse/default.htm
- See the US Geological Survey’s website on tsunamis in the Pacific Northwest at http://walrus.wr.usgs.gov/tsunami/cascadia.html
- Visit Tsunami! at www.ess.washington.edu/tsunami/index.html, a website hosted by the University of Washington’s Department of Earth and Space Sciences. The site is “dedicated to providing general information about tsunamis, their causes and history as well as what to do in case of a tsunami.”
- Go to NOAA’s (National Oceanic and Atmospheric Administration) Tsunami pages: www.tsunami.noaa.gov/
We tend to think of natural disasters as equal-opportunity destroyers, affecting rich and poor alike. But Oregon Sea Grant researcher Lori Cramer, a sociologist at Oregon State University, says natural disasters, instead of affecting everyone equally, will often exacerbate preexisting inequalities. And, says Cramer, for poor and vulnerable groups on the Oregon coast, the Japanese tsunami on March 11, 2011, could be their wake-up call.

“There is a lot of good work going on around the science of tsunamis, but less so on the social dimensions related to tsunamis,” says Cramer. Her research is changing that. Recently, Cramer completed a series of interviews on the Oregon coast that found some populations could be more susceptible to the effects of a large near-shore tsunami than others. By interviewing people that work with groups Cramer considers vulnerable—including children, the disabled, the elderly, the homeless, and Spanish speakers—Cramer determined that these groups could be more adversely affected by a powerful tsunami than other, less-vulnerable ones.

There is an urgency surrounding Cramer’s research and what it suggests about vulnerable populations on Oregon’s coast because, according to the most recent science, it’s just a matter of time before a tsunami strikes the region.

Some scientists believe that, because the Pacific Northwest had its most recent Giant magnitude 9+ earthquake in 1700, the region is well overdue for a large earthquake and tsunami. However, as Cramer found out, many of Oregon’s coastal communities are unprepared for such an event. At no time was this more apparent than on March 11 last year, when a tsunami, caused by a magnitude 9.0 earthquake off the coast of Japan, hit the Pacific Northwest.

When the tsunami that destroyed much of the Japanese east coast reached the United States’ west coast 10 hours later, it had lost most of its energy. Boats were damaged in some west coast harbors, but the tsunami was hardly the disaster it was in Japan. However, the way individuals and groups on the U.S. west coast responded to this rather tame distant tsunami showed just how unprepared they are for a large, near-shore tsunami caused by a powerful local earthquake.

In the aftermath of the Japanese tsunami, Cramer traveled to more than 30 facilities, from homeless shelters to nursing homes, in Seaside, Newport, and Brookings. Interviewing facility managers as well as employees, she discovered myriad responses to the March 11, 2011, tsunami.

At one assisted-living home Cramer visited, the researcher noted that when the tsunami sirens went off, members of the facility’s staff seriously considered leaving work to go home and evacuate their families. At a group home that works with the disabled, the staff voiced concern that because their building was in a tsunami inundation zone, the 15 minutes expected for a tsunami to arrive after a major local earthquake would not be enough time to evacuate the building’s residents to the nearest high ground.
Cramer says responses like these suggest that the difficult conversations about what to do when a major tsunami occurs might not be happening at agencies that aid vulnerable populations.

“What are staff members’ obligations to their clients versus their families and friends?” asks Cramer. These are the kind of questions that need to be answered, she says.

Another issue that emerged from her interviews, according to Cramer, is that a number of facilities she visited lacked triage training, or the process of assigning and assessing emergency medical treatment based on need. This could mean some patients might get preferential treatment based on whether they were liked by the staff, rather than on their level of need. “And that’s the problem,” says Cramer. “It’s who is most likely to survive, not who do you like the most.”

Cramer also discovered in her interviews that there was a large disparity in how English-speaking and Spanish-speaking residents on the coast received and responded to information about the March 11 tsunami. English-speaking populations, says Cramer, relied more on official media outlets for their information. On the other hand, Spanish-speaking populations tended to rely on informal communication via cell phones and texting. Several groups of Spanish speakers—totaling over 100 individuals, according to one estimate Cramer received—even traveled to the foothills because they were under the impression that they were in an inundation zone (which they were not) and that the distant tsunami would inundate the lowlands (which it did not). Cramer says that while this group communicated well amongst themselves, the information they received from outside sources about what to do when a tsunami strikes was inaccurate and misled them. Cramer says that in the future she hopes emergency managers will be able to locate individuals who are members of these networks and will be able to relay accurate messages about tsunamis to Oregon’s Spanish-speaking population.

Cramer’s interest in the effect of tsunamis on vulnerable populations began before the Japanese earthquake, but within minutes of hearing about Japan’s tragedy the sociologist was on the phone with Oregon Sea Grant, requesting funds to gather some preliminary information about vulnerable populations on Oregon’s coast. OSG Director Stephen Brandt, approved funds for her research within hours of the phone call.

The following week, Cramer met with Patrick Corcoran, Oregon Sea Grant Extension specialist. Specializing in coastal hazards, including tsunamis, Corcoran was able to help Cramer locate subjects for her study. He also helped her train two graduate students who assisted in her research. A little over two weeks after Cramer’s initial proposal, she and her graduate students were on the coast conducting interviews. “Since my research questions were already formed,” says Cramer, “I was able to put together a research group in a matter of hours because I was already looking at this issue.”

An environmental sociologist, Cramer has examined issues ranging from how aging populations experience outdoor recreation to how fishing communities have adapted to natural and manmade changes in their environments. Examining vulnerable populations and tsunamis might seem like a departure from her other work, but Cramer sees the similarities. “It is really about how people and communities are able to adapt to environmental changes,” says Cramer, “and what resources they have that they can capitalize on.”

In a conversation with an employee at a facility that works with low-income families and the homeless, Cramer discovered that the survival strategies recommended for higher-income populations don’t work for low-income populations. One such strategy suggested by emergency managers is to have three to five days’ worth of meals available in one’s house to weather through the rough times. Cramer says this is unrealistic for low-income populations. “This kind of planning just doesn’t make sense when these people are struggling to put food on their tables each day.”

As one of her interviewees put it, for

“There is a lot of good work going on around the science of tsunamis, but less so on the social dimensions related to tsunamis,” says Cramer.

Nathan Gilles wrote the articles here and on page 4 as the 2011 Oregon Sea Grant science communication fellow.

Editor’s note: Spanish speakers can obtain a free brochure, “¡Tsunami! Cómo sobrevivir en la costa de Oregon” (know how to survive on the Oregon coast) from the Nature of the Northwest Information Center, 503-872-2750 (or visit www.naturenw.org). The brochure was produced by the Oregon Department of Geology and Mineral Industries in association with Oregon Emergency Management and Oregon Sea Grant.
Oregon Sea Grant summer scholars learn real-world science

What’s so great about being a summer scholar? Sarah Kolesar, research program specialist for Oregon Sea Grant and coordinator of our summer internship program, said, “provides a great opportunity for students and recent graduates to gain hands-on experience with marine science research and outreach projects, and learn about diverse career options in their field.”

So, what did the student scholars themselves say?

- Betty Mujica: “My favorite thing about my internship was being able to go visit all the seafood producers and people in the seafood industry in Oregon; they’re really passionate about Oregon’s natural resources! It was great to get to know them, and they all gave me seafood, which was really cool.” Betty helped conduct an economic analysis of the transportation of live Oregon seafood. “It’s beautiful here—and a lot different from Louisiana in the summer!” (Betty recently graduated from LSU in Agricultural Business and Economics.)

- Joanne Choi: “Science isn’t all about the lab or even field work. You have to spend time writing grants for funding; putting together reports, seminars, or presentations for meetings; and gathering information into summaries that are void of scientific jargon; so that the majority of people can understand them.” Joanne, a recent Yale grad, worked with her mentor, Steve Rumrill of South Slough National Estuarine Research Reserve, to assist with the restoration and recovery of native Olympia oysters.

- Lauren Dimock: “I read over 50 articles about climate change related to things as large as all the oceans on our watery planet, to as small as a single species in Newport’s own Yaquina Bay . . . my knowledge has increased tenfold since I came to Newport.” A junior at Willamette University in Environmental Sciences, Lauren also helped ODFW staff with both a spawning survey of herring and an update of a nearshore management plan.

In addition to internships that were cool, clarifying, and broadening, the other five summer scholars had a range of unique experiences, including:

- Diego Martin-Perez helped build an exhibit that highlights research on California sea lions and applications of the Life History Transmitter. He also gave tours and presentations about the Yaquina Bay estuary and the findings of the Ocean Quest surveys into the deep sea.

- Nicole Matthias worked on developing a means for policy makers, scientists, and the public to view underwater still images and videos of Oregon’s nearshore marine environment. She also worked to create a simple, intuitive map-based interface that will connect the underwater videos to their geographic locations along the seafloor.

—compiled in part from a report written by Steve Rumrill, President, Pacific Estuarine Research Society

New exhibit at Oregon Sea Grant’s Hatfield Marine Science Visitor Center highlights success of gear retrieval program

A new exhibit at the HMSC Visitor Center showcases the success of a two-year federal/state/industry partnership that employed fishermen to retrieve thousands of lost or abandoned crab pots off the Oregon coast.

_Derelict Crab Gear Recovery: Oregon Fishing Industry Partnerships_ chronicles the outcomes of the partner-
TWELVE NEW RESEARCH PROJECTS TARGET KEY ISSUES

For 2012–14 we are supporting research in the following key issue areas, directed toward creating an informed and engaged society and encouraging the investment in, and use of, sound science:

- Multiple Uses and Spatial Planning
- Watersheds and Water Resources
- Community Resilience to Coastal Hazards and Climate Change
- Fisheries and Seafood
- Coastal Learning and Decision Making

Following are the specific projects within each research category, along with the names of the researchers associated with each project.

**Multiple Uses and Spatial Planning**

Realized and Potential Larval Connectivity along the Oregon Coast
—Harold Batchelder, William Peterson

**Watersheds and Water Resources**

Modeling Myxozoan Disease in Pacific Salmon: Establishing Watershed Models for Predicting Effects of Climate Change
—Jerri Bartholomew

Tides, Freshwater and Winds: Modeling the Impacts of Currents on the Oregon Inner Continental Shelf and within Yaquina Bay Estuary
—James Lerczak, William Hanshumaker

**Community Resilience to Coastal Hazards and Climate Change**

Understanding, Forecasting and Communicating the Linkages between Hypoxia and Ocean Acidification in Oregon’s Coastal Ocean
—Francis Chan, Kristen Milligan

An Integrated Engineering-Economic Vulnerability Assessment Tool to Increase Tsunami Preparedness in Rural Coastal Counties
—Yong Chen, Pat Corcoran, Bruce Weber, Richard Sandler

Developing Realistic Metrics of Acidification Stress for Commercially Important Bivalves in Variable Habitats
—George Waldbusser, Burke Hales, Chris Langdon

**Fisheries and Seafood**

Predicting Habitat Quality of Juvenile English Sole and Dungeness Crab in Coastal and Estuarine Nursery Grounds
—Lorenzo Ciannelli

Taking Stock of Oregon’s Nearshore Fisheries: Development of Simple Assessment Tools for Better Management
—Selina Heppell

Geomagnetic Imprinting and Homing in Salmon and Steelhead
—David Noakes, Thomas Quinn, Carl Schreck, Shaun Clements, Michael Banks, Jennifer Nielsen, Andy Dittman, Ken Lohmann, Peter Klimley, Sam Chan

**Coastal Learning and Decision Making**

Successful Adaptation: Identifying Effective Process and Outcome Characteristics and Practice-Relevant Metrics
—Co-PI: Hannah Gosnell (lead PI: Pamela Matson; co-PI: Amy Snover; Associate PI: Susanne Moser)

Mate Choice in the Wild: Does it Account for Differences in Reproductive Success between Hatchery and Wild Coho Salmon
—Kathleen O’Malley

Toward Resilience and Sustainable Seafood Supply: Assessing Direct Marketing Approaches for the West Coast Fishing Communities
—Associate-PI: Jamie Doyle (lead PI: Barbara Walker; co-PIs: Carolyn Culver, Kimberly Selkoe, Caroline Pomeroy; Associate PI: Stephanie Mutz, Pete Granger, Jeff Feldner, Amber Von Harten, Heather Lahr)

Lost fishing gear is an international problem; nets; lines, traps and other gear left in the ocean can foul ships, endanger wildlife, and disrupt seafloor habitats.

The Oregon effort grew out of a 2006 pilot conceived by the Oregon Fishermen’s Cable Committee. Sea Grant helped the group win a modest proof-of-concept grant from NOAA, and monitored initial retrieval cruises to determine their success and check the recovered gear for dead or trapped marine life.

The broader project, launched in 2009, not only recovered tons of lost gear, but also advanced the understanding of the impact of derelict gear on marine resources. The new HMSC display includes a video documentary about the project intended to promote visitor awareness and stewardship of marine resources.
LEARN MORE!

Obviously, one 12-page publication can’t say everything there is to say about tsunamis or tsunami research. But there is a place you can go to learn more: seagrant.oregonstate.edu/confluence

There you’ll find an article about Oregon Sea Grant researcher Harry Yeh’s work toward addressing the question, “How far could a tsunami penetrate upriver?” (The answer might surprise you.)

You’ll also find a story originally published by NOAA about Oregon Sea Grant’s own Jim Good, who with OSU Extension designer Tom Weeks came up with those tsunami evacuation signs you see all along Oregon’s coast—and around the world.

Curious about what parts of the Oregon coast will be affected by a tsunami—and where to go if it happens? Check out “Find Tsunami Inundation Zones and Evacuation Routes Online.”

Oregon Sea Grant has produced several videos and publications about tsunamis, and you’ll find links to them, as well.

Finally, for those who can’t get enough information about tsunamis, there’s a comprehensive list of websites on the topic, including “Tsunami maps for the Oregon coast,” “NOAA Center for Tsunami Research,” and even “Tsunami links for kids.”