Cascadia
News and information from the Oregon Department of Geology & Mineral Industries
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Where will it be tomorrow?

Our changing Oregon coast

Nowhere is nature's ability to shape the landscape more apparent than on the ocean shore. The ocean, aided by tides, rain, rivers, and currents, constantly and sometimes dramatically chops away at the land. The result of this natural process affects those who have chosen to live within this dynamic landscape. Our coastal communities are growing faster than ever before, but the price for some is homes abandoned and communities threatened by the same forces that drew people there. Our coast is also seismically active and subject to infrequent but severe catastrophic earthquakes and tsunamis that have flooded low-lying shores, bays, and river valleys. Television images of landslides and tsunamis also remind us how sudden and catastrophic these forces can be.

Inside this issue of Cascadia, *you'll learn how scientists at the Oregon Department of Geology and Mineral Industries are addressing the complex and sometimes costly questions of understanding coastal processes and the interaction between nature and man.*

The dynamic nature of Oregon's coastline is evident even along the same stretch of beach. Here in the Neskowin littoral cell, wave-caused erosion has stripped the beach and dunes of sand, threatening homes, while new dunes advance on other dwellings. You can learn more about littoral cells on page 8. (Photos: Jonathan Allan)

In this issue:

Who owns the beach?

Most people think Oregon's beaches are publicly owned. That's not entirely correct. The public does own the wet sand beach, up to the ordinary high tide line. But the dry sand beach is usually part of the adjoining upland property. In many cases, this is privately owned.

Even so, the public has a perpetual easement to use the dry sand beach up to the statutory vegetation line or the line of established upland shore vegetation, whichever is more inland. This easement is set out in the Oregon's Beach Bill. The Beach Bill guarantees the public unrestricted use of dry sand beaches, even those that are privately owned.

Many state agencies share responsibility for managing resources and uses in Oregon's coastline, which extends three nautical miles (5.6 kilometers) from shore. Many of these responsibilities are now guided by the policies of the Territorial Sea Plan. Even so, the task of coordinating policies and agencies is complicated.

As demand for coastal development increases, the geologic information the Department of Geology and Mineral Industries (DOGAMI) provides serves as a basis for prudent decision-making in resource development and land manage-

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Notes from your State Geologist

by Vicki S. McConnell
Oregon State Geologist

In 1999 the 71st Legislative Assembly of Oregon acknowledged the increased pressure on Oregon's coastlines and authorized DOGAMI to open a Coastal Field Office. The last time a field office for DOGAMI's Geologic and Services Program had been opened was in 1937 when the agency was formed! This action by the legislature speaks volumes about the interest and concern that Oregon has for its coastlines, beaches, headlands, and littoral cells. In early 2000 we announced at a DOGAMI Governing Board meeting the opening of the Coastal Field Office in Newport, Oregon with our permanent staff consisting of a Regional Geologist and a Coastal Geomorphologist.

We had several goals in mind for the new field office and its professional staff. Now after five years we can evaluate our performance and review our strategic plan. We have increased our knowledge of the processes that shape our coast and about how coastal communities view their relationship with those processes. Ultimately, our mission is to assist coastal communities with land-use decisions by helping communities understand the processes and hazards that shape our coastline. Coastal communities are not restricted to cities and counties but also state and federal agencies that have responsibilities to coastal residents and to stewarding the Oregon coast. See page 5 of this *Cascadia* for a list of some of the most involved state agencies.

Our first goal was to find a location for the field office that would be as accessible as possible to coastal communities. As the coastline of Oregon is about 360 miles (580 km) long there is no simple centralized location. We did, however, want to capitalize on a location with benefits for forming partnerships with coastal communities and organizations responsible for the health and welfare of the coast. After considering several excellent proposals for co-locating, we were delighted to accept the offer of the Oregon Coastal Zone Management Association (OCZMA) to co-locate in their Newport, Oregon office. The office is modest and not staffed for visitor information, but you can learn more about it and the staff by visiting our website: www.OregonGeology.com.

Ultimately, our mission is to assist coastal communities with land-use decisions by helping communities understand the processes and hazards that shape our coastline.

We recognize that coastal communities face a variety of hazards; some, such as the tsunami hazard, are unique to coastal areas. A primary scientific goal for the Coastal Field Office staff has been characterizing and mitigating for coastal hazards. Read up on some of our projects about tsunamis on page 4. We also recognize that the very processes that shape our coastline are not well understood and we lack basic data to increase our understanding. Feature stories throughout this *Cascadia* publication explain some of our projects to monitor and collect data that our partners, policy makers, and scientists alike can use for scientific and policy decision-making. Developing a means to distribute information and data is as important as collecting and compiling it. Our coastal staff regularly meets with coastal government and planners to explain coastal processes. They have organized several workshops to address tsunami evacuation and coastal processes. We now have a Coastal Processes and Hazards Working Group that meets to exchange information about activities and identify problems that could use a coordinated response effort.

In five years we have forged strong working relationships with many coastal communities to assist with hazard mitigation and education about coastal processes and response, and we have built a reputation as a "go-to" scientific team. We are coordinators with federal, state, and academic organizations to collect and distribute basic information about coastal processes ranging from wave energy to beach cobble migration (see page 6, Coastal Observatory story). Finally, we continue to listen to what the coastal communities tell us they need. This year we have included a proposal in our mapping program to initiate a geologic mapping project along the south coast in response to increases in population and development pressures on city and county governments.

What do the next five years hold? We want to complete all the tsunami inundation mapping for coastal communities and begin to develop maps for the less populated areas that host large visitor populations. Our work would include new information acquired from study of the Sumatra earthquake and tsunami of 2004. We want to expand our beach morphodynamic monitoring to include most of the northern coast and incorporate sand budget data. We plan to incorporate our dynamic revetment data into research for developing improved shoreline protection structures. We want to make all our data and maps available and interactive from our website.

It gives me great pleasure to announce we have had a banner first five years for the Coastal Field Office and we plan to continue with enthusiasm, genuine interest, and strong science.

Cape Lookout shoreline stabilization study

Please don't take the cobbles

by Jonathan Allan

Significant erosion along the Oregon coast during recent winters is the result of an unprecedented number of major storms that generated exceptionally high waves, together with the unusual impacts of the 1982-83 and 1997-98 El Niños. The erosion has been especially severe at Cape Lookout State Park on the northern Oregon coast.

Cape Lookout State Park is located at the south end of a "pocket beach" littoral cell, centered about 1.25 miles (2 km) north of Cape Lookout and at the south end of Netarts Spit. A significant cause of erosion here was the northward shift of beach sand within the littoral cell as a result of the southwesterly approach of waves during the El Niños, but most catastrophic were the series of extreme storms during the winter of 1998-99. El Niño erosion beginning in 1982 had eliminated the line of high dunes that provided protection to the park, so the 1998-1999 storms were able to inundate the park facilities. Maximum wave penetration reached inland some 410 feet (125 m).

(image courtesy of Dr. Paul Komar, Oregon State University)

With its protective dunes gone, the park could expect more damage during subsequent winters unless some form of shore protection was constructed.

The Oregon Parks and Recreation Department (OPRD) has the primary management control on deciding whether

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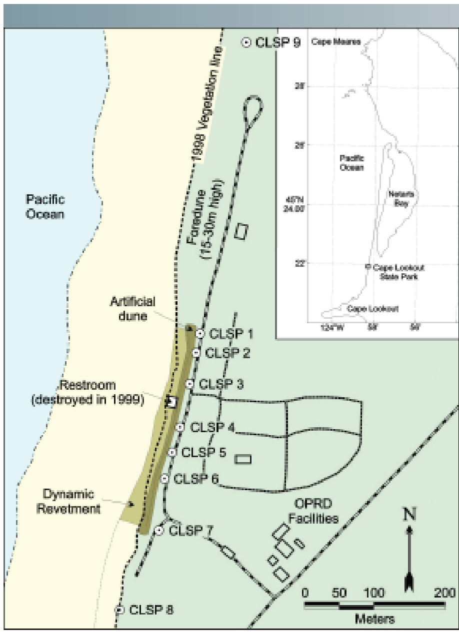

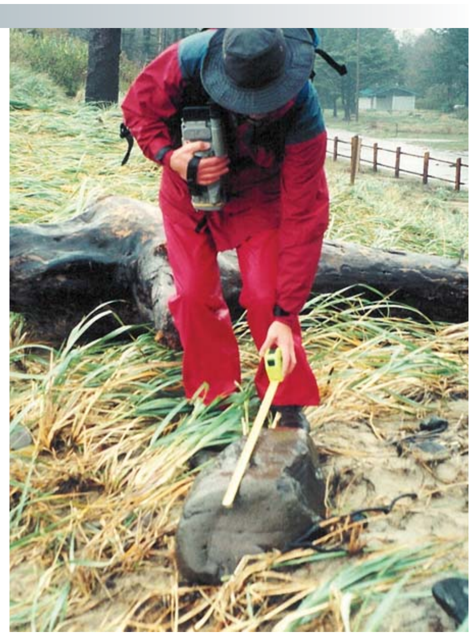

(left) **Cape Lookout State Park and the locations of survey transects used to monitor the dynamic revetment and artificial dune. *(right)* DOGAMI coastal geomorphologist Jonathan Allan checks the artificial dune after a major storm event. Although waves overtopped the dune, the combination of cobbles and construction techniques proved that this method of stabilization is a viable alternative to riprap. (Diagram and photo: Jonathan Allan)**

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Are you ready?

Tsunami hazard mitigation update

Two tsunami events on opposite sides of the world have galvanized Oregon coastal communities during the past year. First was the magnitude 9.3 subduction zone earthquake off the coast of Sumatra on December 26, 2004 that created a massive tsunami that killed hundreds of thousands of people around the Indian Ocean. The second event was the tsunami warning announced by the West Coast and Alaska Tsunami Warning Center and broadcast by NOAA on June 14th, 2005. The events were very different, but to people on the Oregon coast they meant the same thing—"you better get ready because you may have only minutes to save your life."

DOGAMI has been involved with tsunami hazard mitigation on the Oregon coast since the legislature passed Senate Bill 379 in 1995, which directed the agency to map the coast and create a "line" that indicates the worst case scenario runup for a tsunami following a subduction zone earthquake off the Northwest coast. Bill 379 also limited construction of new hospitals, schools, and other similar public-service buildings in tsunami flood zones and was the first step in ongoing efforts to prepare coastal communities for the eventuality of a tsunami similar in size to the one that struck Sumatra, India, and other south Asian countries.

Thanks in large part to the work done by Dr. George Priest of DOGAMI's Newport Field Office, coastal residents are embracing tsunami preparedness. Maps and evacuation brochures created by Priest, public education, and evacuation planning–as well as NOAA funded offshore detection systems–are part of an ongoing strategy to save lives and reduce losses from tsunamis.

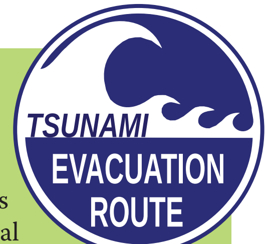
DOGAMI and Oregon Emergency Management Public Education specialists have traveled extensively along the coast, attending town halls and working with local communities to demystify tsunamis. But the June 14th tsunami warning from NOAA was a telling example of how much work still needs to be done before Oregon coastal communities are truly prepared.

Waldport's tsunami evacuation map clearly shows inundation areas, safe areas, and assembly areas.
http://www.oregongeology.com/sub/earthquakes/Coastal/tsubrochures/WaldportEvac.pdf

Learn about tsunami preparedness and review the June 14th After Action Report from OEM online at http://www.oregongeology.com/sub/news&events/OEMTsunamiWarningReport6-14.pdf

Darci Connor, Seaside Tsunami Outreach Coordinator, explains to Seaside middle school students how a tsunami can be generated from an earthquake offshore from the Oregon coast. (Photo courtesy of Kevin Cupples)

Seaside's Tsunami Outreach Program wins 2005 Excellence Award



The City of Seaside's Tsunami Awareness Outreach Program has been honored with a 2005 Award in Excellence in the Educational Outreach to General Public category by the Western States Seismic Policy Council. Under the leadership of Outreach Coordinator Darci Connor, the city hosted neighborhood, business, and school workshops, held a poster contest, and conducted a tsunami drill. Crucial to the program's success were many volunteers—students, business leaders, and neighbors. Pre- and post-event surveys showed that community members had a significantly better grasp of tsunami facts and disaster preparedness after the program. To learn more about Seaside's program and how your community can design a similar program, see *The City of Seaside's Tsunami Awareness Program Outreach Assessment: How to implement an effective tsunami preparedness outreach program, DOGAMI Open File Report O-05-10*, available from Nature of the Northwest (http://www.NatureNW.org).

Who owns the beach?

(continued from page 1)

ment. DOGAMI also provides information on coastal geologic hazards, water resources and marine minerals to the public. DOGAMI is also responsible for issuing permits for offshore oil and gas drilling in state waters and for regulating any such drilling or seabed mining operations.

New coastal staff —

Introducing Rob Witter

Dr. Robert C. Witter has joined the Oregon Department of Geology and Mineral Industries coastal office as a Regional Coastal Geologist.

"We are delighted to have Rob with us," said Dr. Jonathan Allan, DOGAMI Coastal Office section leader. "He brings a new dimension in paleoseismic research that will help extend our knowledge of Cascadia subduction zone earthquakes and tsunamis and will greatly aid our hazard assessment program here on the coast."

Dr. Witter has 12 years of research experience in the regional history of earthquakes and tsunamis along the Cascadia subduction zone. He has participated in geologic and seismic hazards studies funded by the U.S. Geological Survey, the U.S. Department of Defense, utilities, and the private sector. In addition to the Cascadia subduction zone, Dr. Witter has studied faults in California, Washington, Alaska, the Central U.S., and Turkey.

Dr. Witter has also participated in a National Science Foundation supported study of a 7,000 year geologic record of tsunamis triggered by great Cascadia earthquakes that struck the southern Oregon coast.

"I am very happy to be back in Oregon and excited to continue my research on coastal and geologic hazards," said Dr. Witter. "I look forward to finding innovative ways to reduce risk in Oregon's coastal communities posed by earthquakes, landslides and our changing climate."

Major state agencies involved in your Oregon beaches:

Oregon Department of State Lands (DSL) -
http://www.oregon.gov/DSL/
manages these lands on behalf of the State Land Board (the Governor, Secretary of State, and Treasurer) and has co-authority over rocky intertidal areas with the Oregon Parks and Recreation Department.

Oregon Parks and Recreation Department (OPRD) -
http://egov.oregon.gov/OPRD/
has authority over the "Ocean-shore Recreation Area" (that width of the ocean shore that is submerged by the daily tides) as well as the adjacent "dry sands beach" up to the "beach zone line" set in state law (approximately 16' feet above high tide). OPRD has management authority over rocky intertidal areas as well as upland state parks.

Oregon Department of Environmental Quality (DEQ) -
http://www.deq.state.or.us/
is responsible for water and air quality in Oregon's ocean area.

Oregon Department of Fish and Wildlife (ODFW) -
http://www.dfw.state.or.us/
regulates marine fisheries, protects marine wildlife, and manages marine habitat in state ocean waters, including rocky shores.

Oregon Department of Land Conservation and Development (DLCD) -
http://egov.oregon.gov/LCD/
is the primary agency for coordinating state ocean-resource management and planning activities.

Oregon State Marine Board (OSMB) -
http://www.boatoregon.com/
regulates boating activity in state waters.

Managing with Federal Agencies Oregon
has developed and maintains a close working relationship with many federal agencies in order to manage ocean resources and uses.

Oregon Department of Geology and Mineral Industries -
http://www.OregonGeology.com

Additional state agencies involved in your beaches include:

Oregon Water Resources Department (WRD) and the Water Resources Commission -
http://www.wrd.state.or.us/
administer state laws regulating the use of surface water and groundwater.

Ports Division of the Economic Development Department -
assists the state's Port Districts in promoting economic development.

Oregon Department of Forestry (ODF) -
http://oregon.gov/ODF/
manages three state-owned forests in the coastal zone totalling over 600,000 acres.

Oregon Department of Health Services (DHS) -
http://www.oregon.gov/DHS/
monitors the water quality of public water systems to ensure protection of public health including the quality of oysters and other shellfish to assure that they are safe for consumption.

Oregon Department of Energy (ODOE) -
http://www.oregon.gov/ENERGY/
provides staff support to the Energy Facility Siting Council (EFSC). EFSC administers the state's authority for siting, monitoring and regulating the location, construction and operation of major energy facilities.

Assessing the temporal and spatial variability of coastal change on the northern Oregon coast

Measuring beach morphodynamics—

by Jonathan Allan

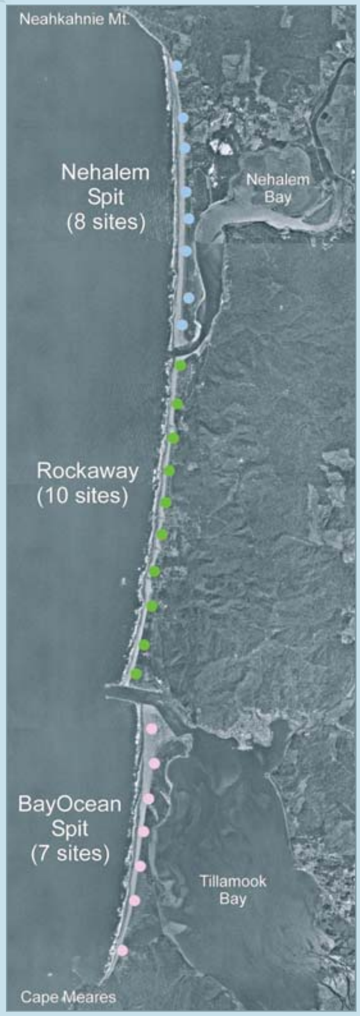
Our Oregon coast is an exceedingly dynamic environment. The coast is exposed to one of the most extreme ocean wave climates in the world—storm waves over 30 feet (9 m) high regularly pummel the shore. When combined with high ocean water levels, these storm waves can cause extensive beach and dune erosion in a very short time. Notable examples of erosion include Port Orford on the southern Oregon coast, the towns of Neskowin and Rockaway, and along much of Netarts Spit in the north.

To understand the impact of storm-induced erosion, DOGAMI Coastal Field Office staff, with partners from the Department of Land Conservation and Development Coastal Management Program (OCMP) and Oregon Parks and Recreation Department (OPRD), are studying the temporal and spatial variability of Oregon's beaches as part of a pilot beach shoreline study. This study will help scientists, coastal managers, and the public understand the impacts of storms on the coast by examining several key questions:

- What processes drive Oregon coastal changes?
- How often do erosion events occur, and how quickly do beaches respond to large wave events?
- How quickly do beaches recover from erosion episodes?
- What is the best form of protection for properties subject to erosion?

This project is part of a larger cooperative venture to establish a Pilot Coastal Ocean Observatory for the Estuaries and Shores of Oregon and Washington under the umbrella of the Northwest Association of Networked Ocean Observing Systems (NANOOS: http://www.nanoos.org/).

More detailed information on the pilot project can be found at http://www.ccalmr.ogi.edu/nanoos/.



Study Area: Rockaway Littoral Cell
For the first phase of the pilot beach shoreline study, DOGAMI is mapping the beach surface in three subcells of the Rockaway littoral cell (see page 8 of this *Cascadia* for more on littoral cells):

- **the south-central part of Nehalem Spit**
- **north of the Tillamook Jetties**
- **the central part of BayOcean Spit**

The initial survey of these three regions was carried out in November 2004.

Beach Processes in Oregon

Coastal processes contribute to sustained periods of erosion that can cause the toes of coastal dunes or high bluffs to retreat landward and threaten property and infrastructure located too close to the beach. Erosion events are generally driven by major storms that produce large waves coupled with high ocean water levels, which enable the wave swash to reach to much higher elevations at the shore.

Periodically, erosion processes may be enhanced due to climate events such as an El Niño. El Niños occur about every 2 to 7 years and increase the risk of beach erosion due to both an increase in mean wave heights and an increase in mean elevation of the sea. El Niños also influence the predominant tracks of the storms as they cross the North Pacific ocean, so that ocean waves tend to arrive at the shore mainly from a southwesterly direction. This last process can result in strong northward directed (longshore) currents landward of the wave breaker zone, which are capable of transporting large volumes of sand from the south ends of the littoral cells northward along the shore, where the sand accumulates.

Luckily, the erosion of Oregon's beaches is not entirely one way (i.e., landward and to the north). Periods of beach rebuilding during the summer and during periods characterized by lower average wave heights (e.g., the period 1988–1996), and by a return of sediments to the south ends of the littoral cells balance landward and northward erosion.

–Oregon's Coastal Ocean Observatory

Measuring Change

To understand how Oregon's beaches respond to waves and currents over time, during low tides we survey cross-shore beach profiles with a Trimble 5700/5800 Global Positioning System (GPS) mounted on a backpack. DOGAMI is currently surveying along the Rockaway cell and Clatsop Plains and will soon begin in the Neskowin cell. These surveys are typically carried out on at least a quarterly basis and/or after major storms.

The approach is to walk from the landward edge of the primary dune, navigating along a predetermined line using a hand-held computer, over the dune crest, and down the beach face to wading depth. This method can reliably detect elevation changes greater than 2 inches (5 cm) — well below normal seasonal changes in beach elevation, which typically varies by 3–9 feet (1–3 m).

To understand larger-scale changes in the shape and configuration of the beach, which may be due to the development of rip embayments, hotspot erosion effects as a result of El Niños, or the movement of sand waves along the beach, mapping of much larger stretches of shore is required. To achieve this, a GPS unit is mounted on a 6-wheel amphibious ATV vehicle, and the vehicle is navigated along predetermined survey transect lines at speeds of 6–10 miles per hour (10–15 km per hour). The region covered typically includes the low-tide line up to the toe of the dunes or bluffs. A computer mounted inside the vehicle displays the survey lines.

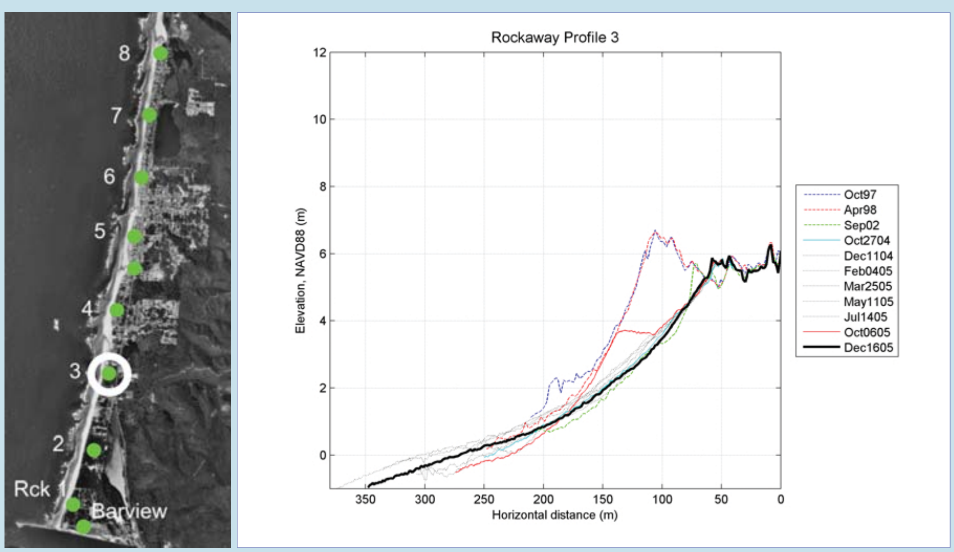
Transect lines are typically 50–65 feet (15–20 m) apart and extend some 2 miles (3.5 km) along the shore. Because the GPS unit samples every 1 second, surface mapping can generate a data set consisting of 10,000–15,000 survey points within each study area in just a few hours.

Using the Information

After the data are processed, various products, such as beach profiles, are derived. Beach profiles show response of the beach to variations in offshore wave energy (e.g. winter versus summer wave conditions) and to major storms (i.e. how much dune or bluff retreat occurred), data that are extremely useful when designating hazard zones along the coast.

All information is available through the OregonGeology website: http://www.oregongeology.com/sub/Nanoos1/objectives.htm

(Photos and diagram: Jonathan Allan; NANOOS logo: courtesy of Tom Guthrie)



Rockaway littoral cell #3 station (left) and beach profile (right) for surveys made 1997–2005. The profile highlights the seasonal response typical of Oregon's beaches, characterized by accretion during summer and erosion during winter, as well as the change caused by extreme storms between 1997 and 1998.

Shoreline change in littoral cells

by Jonathan Allan

The Oregon coast is about 360 miles (580 km) long is broadly characterized as long stretches of sandy beaches bounded by resistant headlands. These systems are referred to as littoral cells. There are at least 18 major littoral cells on the Oregon coast (see map below, right). Most of the shore (72%) consists of dune-backed sandy beaches; the rest is a mixture of bluff-backed beaches, rocky shores, and coarse-grained (gravel) beaches.

Because headlands extend into deep water, wave processes are generally regarded as unable to transport beach sediment around the ends of the headlands. As a result, headlands form a natural barrier for sediment transport, preventing sand exchange between adjacent littoral cells (see diagram below). Thus, a littoral cell is essentially a self-contained compartment, deriving all of its sediment from within that cell.

Beaches composed of loose sediment are among the most dynamic and changeable of all landform types, responding to complex variables that reflect the interaction of the processes that drive coastal change (waves, currents, and tides) and the underlying geological and geomorphological characteristics of beaches (e.g., sediment grain size, shoreline orientation, beach width, sand supply and losses).

Depletion of beaches along the Oregon coast is largely dependent on high-magnitude events such as the March 2-3, 1999, storm, or in response to enhanced periods of storm activity such as the 1982-83 and 1997-98 El Niños and 1998-99 winter. Collectively, these events resulted in some of the most significant examples of coastal retreat observed during the past three decades. For example, during the late 1990s dune erosion averaged about 38 and 49 feet (11.5 and 15.6 m) along the Neskowin and Netarts littoral cells, respectively, and as much as 180 feet (55 m) in some

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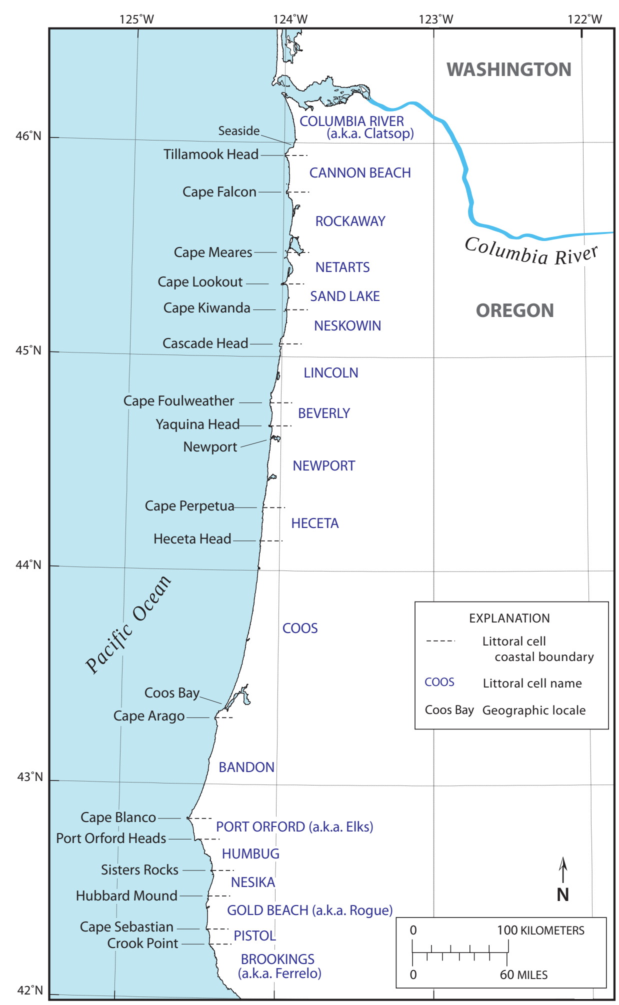
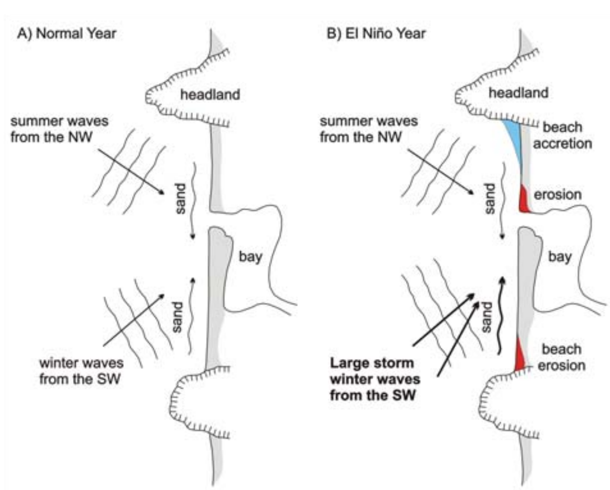
Aerial view of the Beverly Beach littoral cell on the northern Oregon coast. (Photo: Jonathan Allan)



Oregon's eighteen major littoral cells.



(A) **Normal longshore seasonal movement of beach sediment (gray areas) in an Oregon coast littoral cell.** ***(B)*** **El Niños cause abnormally large northward transport of sand, resulting in focused erosion (red areas) at southern ends of cells, north of bounding headlands, and north of migrating inlets. The opposite response is found south of headlands, where northward displaced sand accumulates (blue area), causing the coast to advance (accrete) locally seaward. (figure courtesy of Dr. Paul Komar, Oregon State University; map, Jonathan Allan)**

Cape Lookout State Park

(continued from page 3)

public citizens can construct riprap revetments or sea walls to protect their properties. Having often to deny such applications to the public, OPRD would have found itself in a politically awkward position if it constructed a "hard" structure in the park. Furthermore, OPRD wanted to avoid having an unnatural-looking structure separating the park grounds from its main attraction, the beach. OPRD decided to work with scientists from Oregon State University and DOGAMI to construct a dynamic revetment — dynamic in the sense of consisting of gravel and cobbles that can be moved by storm waves, as opposed to a conventional, static revetment built of large quarry stones.

The dynamic revetment in front of the park facilities, completed in 2000, is very much like a natural cobble beach and is designed to mimic in appearance and dynamic response the natural cobble beaches found elsewhere in the park and along the Oregon coast. For additional defense and in an attempt to restore the park to its former appearance, an artificial dune was constructed immediately landward from the dynamic revetment. The dune has a core of sand-filled geotextile tubes covered with loose sand and planted dune grass.

In July 2001, a monitoring program was established along the structures and on adjacent natural cobble beach sites. An unusual aspect of the study is the use of innovative tracking technology devices implanted in some cobbles so that DOGAMI coastal geomorphologist Jonathan Allan and other researchers can track the movement of cobbles to determine erosion rates.

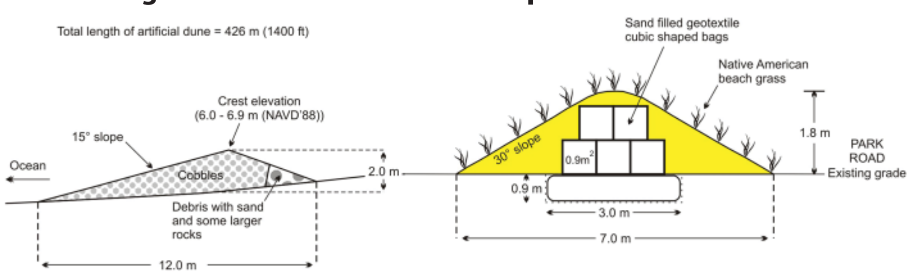
Taken together, the constructed dynamic revetment and artificial dune provide shore protection with the desired appearance of natural features found along Oregon's coast.

After five years of protection, these "Design with Nature" structures in Cape Lookout State Park can be viewed as a success. Had the structures not been built, recent winters storms would have washed into the park grounds and resulted in substantial clean-up costs that in total may have exceeded the $125,000 cost of building the cobble beach and dune.

In addition, these dynamic revetment and artificial dune prototypes provide a unique opportunity to study their response to coastal processes, with the potential for improvements in design criteria. The innovative Cape Lookout State Park dynamic revetment project demonstrates that such structures, in the right circumstances, can be effective, unobtrusive shore protection, even on the high-energy Oregon coast.

(top) **Unnatural-looking riprap shields Cape Lookout State Park restrooms from 1997-1998 El Niño erosion.** ***(middle photos)*** **In 1999 construction began on the dynamic revetment.** ***(bottom)*** **The constructed revetment and dune mimic natural cobble beaches found elsewhere in the park.**

Design and construction of the Cape Lookout revetment



Revetment design was based on natural cobble beaches nearby in the park that had protected the dunes: mean cobble size of ~60 to 90 mm (-5.9Ø to -6.5Ø); mean slope of 11 to 14 degrees (1-in-5 to 1-in-4); elevation of 8 to 9 m NAVD88. Construction was carried out in two phases:

Phase 1—
Artificial dune:
Fill of 2750 0.7 m^3 geotextile bags;
Total elevation 7 to 9 m, NAVD'88.

Phase 2—
Dynamic revetment/cobble berm:
Structure length = 300 m;
Crest elevation of 5.8 to 7.8 m, NAVD'88;
Beach slopes ~ 7 to 13 degrees.

(Top four photos: courtesy of Oregon Parks and Recreation Department; diagram and bottom photo: Jonathan Allan)

Shoreline change in littoral cells

(continued from page 8)

locations, damaging adjacent properties. Further south, erosion along the Garrison Lake shoreline near Port Orford was especially acute, resulting in retreat of beaches there by 328–394 feet (100–120 m).

Structures such as dams or harbors and development in beach areas can also cause the shoreline to change. Understanding littoral cells is therefore essential in planning for development and for protecting the beach.

Littoral cell study objectives focus on monitoring and measuring alongshore and cross-shore spatial and temporal variability, using methods such as morphology surveys (e.g., beach-profile surveys, Light Detection and Ranging [LIDAR] data surveys, and grain-size analyses) as well as wave-runup assessments.

Littoral cell studies provide local, state, and federal agencies scientific information important for the safe establishment of homes and infrastructure along the coast.

Development on Oregon's south coast requires new geologic mapping

Would you buy land on a landslide? Some eager and unsuspecting new homeowners have in new coastal neighborhoods. Development on the south Oregon coast is booming (Curry County alone saw an almost 2% increase in population in the last year), and many people are buying homes and land without first checking the geology underneath their property. With growth comes increasing pressures on land use and water supply, as well as increasing potential for hazards such as landslides, coastal erosion and groundwater contamination. But development and land-use decisions are being made with inadequate geologic maps.

With the guidance of the Oregon Geologic Map Advisory Committee, DOGAMI' Grants Pass Field Office staff will begin new, detailed geologic surface and subsurface mapping along a several kilometers wide coastal strip from the California border to Ophir, about 35 miles (56 km) north — an area targeted for unprecedented growth in the next decade.

"These new maps will help guide future development and mitigate hazards," said Vicki McConnell, State Geologist and Director of DOGAMI. "The maps will be tools that can be used in many ways — from learning about the geologic history of an area, to natural resource and hazard assessment, to providing information for intelligent land-use planning and growth."

In a departure from traditional 7.5′ quadrangle area mapping, the study area will be defined by development patterns, topography, and drainage basins. This approach provides the best use of available resources. New mapping will allow planners to better understand groundwater quantity and quality; landslide and coastal erosion hazards; Quaternary deposit distribution and engineering properties; soils; mineral resources; coastal features including headlands, sea stacks, and islands; tsunami inundation, flooding, and earthquake hazards; and debris fans.

"These new maps will mean better planned, safer communities," said McConnell. "It all starts with geologic mapping."

Thank you!

Thanks to the Oregon Department of Land Conservation and Development (LCD) for providing publications that helped us produce this issue.

Visit the Oregon Coastal Atlas website for interactive maps such as the one shown above: http://www.coastalatlas.net/.

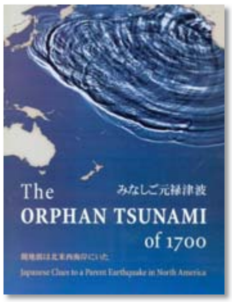
Know, know NANOOS

The U.S. Integrated Ocean Observing System (IOOS) is an emerging national infrastructure that seeks to meet society's need for observing, understanding and predicting the ocean. Identified needs include detecting and forecasting oceanic components of climate variability, facilitating safe and efficient marine operations, ensuring national security, managing resources for sustainable use, preserving and restoring healthy marine ecosystems, mitigating natural hazards, and ensuring public health. Regional ocean observing systems, which together will cover the entire U.S. coastal margin, are key components of IOOS. The Northwest Association of Networked Ocean Observing Systems (NANOOS) is the emerging regional observing system for the Pacific Northwest (PNW).

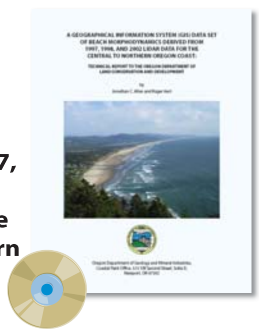
NANOOS is developing nowcast and predictive capabilities for the PNW environment, as well as interactive access to archival data, real-time data and selected forecasts. The Oregon Department of Geology and Mineral Industries is a leading partner in the PNW pilot program (see pages 6-7). To access interactive NANOOS data, visit http://www.nanoos.org/.

The NANOOS logo, by Mr. Tom Guthrie, a Tsimshian Tribal member, symbolically represents the protection of the coastal ocean ecosystem and the living beings of the Pacific Northwest that depend on the coastal ocean.

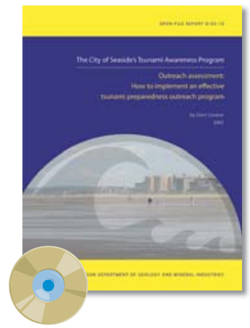
Coastal issues publications and more available now from Nature of the Northwest



The Orphan Tsunami of 1700: Japanese Clues to a Parent Earthquake in North America, USGS Professional Paper 1707, by Brian F. Atwater, Musumi-Rokkaku Satoko, Satake Kenji, Tsuji Yoshinobu, Ueda Kazue, and David K. Yamaguchi, 2005, University of Washington Press, 133 pp., $24.95. ISBN 0-295-98535-6.

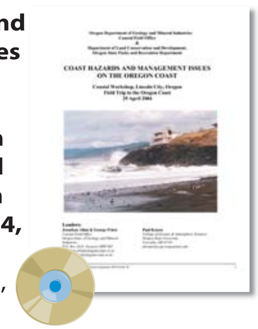


A Geographical Information System (GIS) Data Set of Beach Morphodynamics Derived from 1997, 1998, and 2002 LIDAR Data for the Central to Northern Oregon Coast, DOGAMI Open-File Report O-05-09 by Jonathan C. Allan and Roger Hart, Oregon Department of Geology and Mineral Industries, 2005, 16 pp., $10. Available on CD only. GIS data viewer on CD.



The City of Seaside's Tsunami Awareness Program: Outreach Assessment—How to implement an effective tsunami preparedness outreach program, DOGAMI Open-File Report O-05-10, by Darci Connor for Oregon Department of Geology and Mineral Industries, 2005, 78 pp., $10. Available on CD only.

Dynamic revetments for coastal erosion stabilization: A feasibility analysis for application on the Oregon coast, DOGAMI Special Paper 37, by Jonathan Allan, Oregon Department of Geology and Mineral Industries, 2005, 67 pp., $10. Available on CD only.



Coastal Hazards and Management Issues on the Oregon Coast, Coastal Workshop, Lincoln City, Oregon, Field Trip to the Oregon Coast 29 April 2004, DOGAMI Open File Report O-04-18, by Jonathan Allan, Paul Komar, and George Priest, Oregon Department of Geology and Mineral Industries, 2004, 24 pp., $10. Available on CD only.

A complete list of DOGAMI publications can be found online at: www.OregonGeology.com.

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Places to see

The dramatic southern Oregon coast near Myers Creek, south of Gold Beach, is characterized by prominent rocky headlands, coarse sand beaches and sea stacks. Sea stacks are remnants of headlands that have been eroded away by wave processes and subaerial weathering, leaving behind more resistant rock.

(Photo: Jonathan Allan)

Learn more about Oregon's geology by going online at www.OregonGeology.com.

Historical marker recalls the Great Tsunami of 1700

A new historical marker, located at the Schooner Creek Wayside on U.S. Highway 101 south of Lincoln City, recalls the great earthquake and tsunami of Jan. 26, 1700, that destroyed Native American villages along the Northwest coast. The marker overlooks the portion of Siletz Bay where ancestors of the Confederated Tribes of Siletz Indians had a village that was lost to the earthquake and tsunami.

Many State Agencies worked together on the marker for the common goal of history and safety. The Oregon Department of Geology and Mineral Industries oversaw the design and placement of the marker. Also involved were the Confederated Tribes of Siletz Indians and Chinook Winds Casino Resort, which helped organize a well-attended dedication ceremony on a beautiful September afternoon.

***(left)* Delores Pigsley, Confederated Tribes of Siletz Indians Chairperson, and Dr. Vicki McConnell, Oregon State Geologist, speak at the tsunami marker dedication ceremony (Photo: DOGAMI archive). *(right)* The new historical marker. (Marker design by the Oregon Travel Information Council.)**