

Choosing and buying residential property in the coastal zone

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Living in the coastal zone

If you're like most people, you enjoy going to the Oregon coast. The ocean and bays are beautiful sights, and nothing is more enjoyable than a long walk on one of Oregon's fine beaches.

Many people enjoy the coastline so much that they would like to have a permanent or vacation home overlooking the pounding surf or a quiet bay. It's no wonder there's a great demand for building sites along our coast.

Some of Oregon's coast is off limits to home construction, and some is not. As more people build there, and more areas are protected from building, there are fewer areas to build on. This means that poorer sites become more desirable. So it's good to know how to tell if a site is a safe one or not—*before you purchase any property.*

Building or purchasing a house on a piece of land near the beach is risky business. The ocean is beautiful, but it's also powerful and dangerous (figure 1). If you watch a beach or bluff above the ocean from year to year, you can see that the ocean changes the area almost constantly. What ocean forces are at work to make this change happen?

Ocean forces at work

You may have heard the biblical story about the man who built his house on sand and ended up losing



Figure 1.—A victim of beach erosion, this house tumbles to the beach at Cove Beach.

it to the sea. Ocean forces work on all earth materials, sand or solid rock, trying to break it apart. Rock substrate is likely safer, but even that depends on elevation, the shape of the foreshore, surrounding rock structure, etc. So the makeup of the earth material a house is built on is very important.

Many forces act on our shoreline, so it's no wonder beaches change from year to year and season to season. If you visit a certain beach during both winter and summer, you already know the beach looks very different from season to season.

During winter, local storms create short steep waves that pick

up the sand from the beach and deposit much of it farther offshore. By the end of winter, all you see is a rocky beach with little sand. When summer comes, smaller waves move the sand back on the beach (see figure 2). So sand is constantly moving in and out with the seasons.

When several winter storms occur one right after the other, there's no chance for the beach to rebuild itself in between. The result

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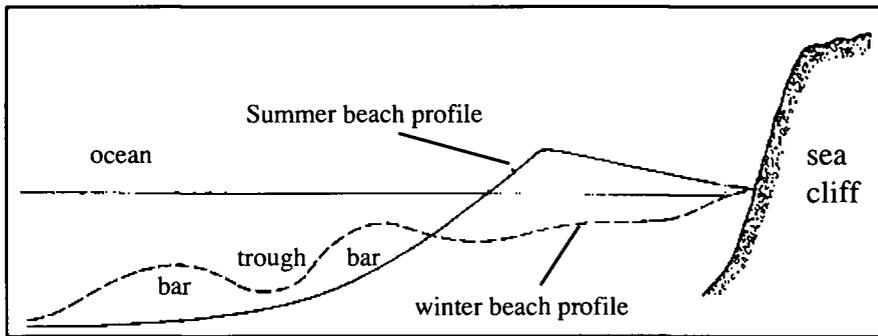


Figure 2.—Summer and winter profiles

is usually severe erosion. Further, if storms occur during high tides (when water levels are higher), even more erosion will occur.

Bluff erosion

The erosion of coastal bluffs, like beaches, is a constant process. Waves, wind, and running water act together on rock to cause slumping and landslides.

The attack on bluffs can be caused by waves eating away at the toe of the bluff. With high bluffs, wind and rain may attack the sandy bluff face. Seepage of water through the bluff layers also can cause slipping and slumping.

Some bluffs along our Oregon coast are made of volcanic rock, which is very hard and not easily eroded. But many of our bluffs are made up of sedimentary rock (sandstone, limestone, or mudstone), which is crumbly and easily eroded.

Sliding bluffs

Often our bluffs are a combination of sedimentary and volcanic rocks. Water from the land often seeps between two different layers of rock, causing a "slick" surface over which another rock layer can slide.

Top-heavy bluffs

Adding weight or removing vegetation from a bluff or bank can also trigger a landslide if the area is already slide-prone. So bluffs and banks along our coast can be dangerous places to build homes.

An example of erosion on the Oregon Coast occurred at Jump-Off-Joe in Newport. When people first wrote about Jump-Off-Joe in the 19th century, it was a narrow peninsula protruding hundreds of feet into the Pacific Ocean at Newport.

But by the early 1990's, all that was left was a nearshore sea stack. Today, it's barely noticeable—the sea stack long ago disappeared under the constant beating of waves.

In December 1943, more than a dozen houses were destroyed just south of Jump-Off-Joe when a landslide of several acres carried them down to the beach.

In fact, between 1939 and 1973, the bluffs surrounding the slide retreated about 240 feet (an average of 5.7 feet per year). This area could easily qualify as one of the most active and unstable land forms on our coast.

With this history, you could assume that it wouldn't be a likely spot for further development. But in mid-1981 the landslide site of 1943 was bulldozed, and 39 residential lots were applied for and approved.

Amid much debate, the owner's application for a sea wall was denied. The owner abandoned the residential development and decided to build a condominium apartment on top of Jump-Off-Joe. No sea wall was required for this, and local laws didn't apply to the development. The complex was almost completed, but erosive forces in the area had already begun. The ocean side of the building dropped at least 2 feet before the building was completed.

Beach erosion

Besides the makeup of the rocks and sand on the shoreline, wave action is the most important force shaping the coastline. Wind blowing on the sea surface causes waves to build up. The waves travel along with the wind, building as they go.

When the winds weaken or disappear, the waves continue in the same direction, losing little of their energy. As the waves approach the shore, they increase in height.

Another force constantly at work is the longshore current. When waves strike the shoreline at an angle (not head on), sand is picked up and moved offshore, then carried in by the next wave.

The result, as shown in figure 3, is that sand is moved along the beach. This movement is called *littoral drift*. In Oregon, littoral drift can change direction with the season.

This constant shifting of sands on the beaches can indirectly influence the building sites. It can affect the abundance of sands on a beach that absorb the impact of winter waves and storms (see figure 3).

Rip currents, sometimes called *rip tides* or *undertows*, are also important forces along our coast.

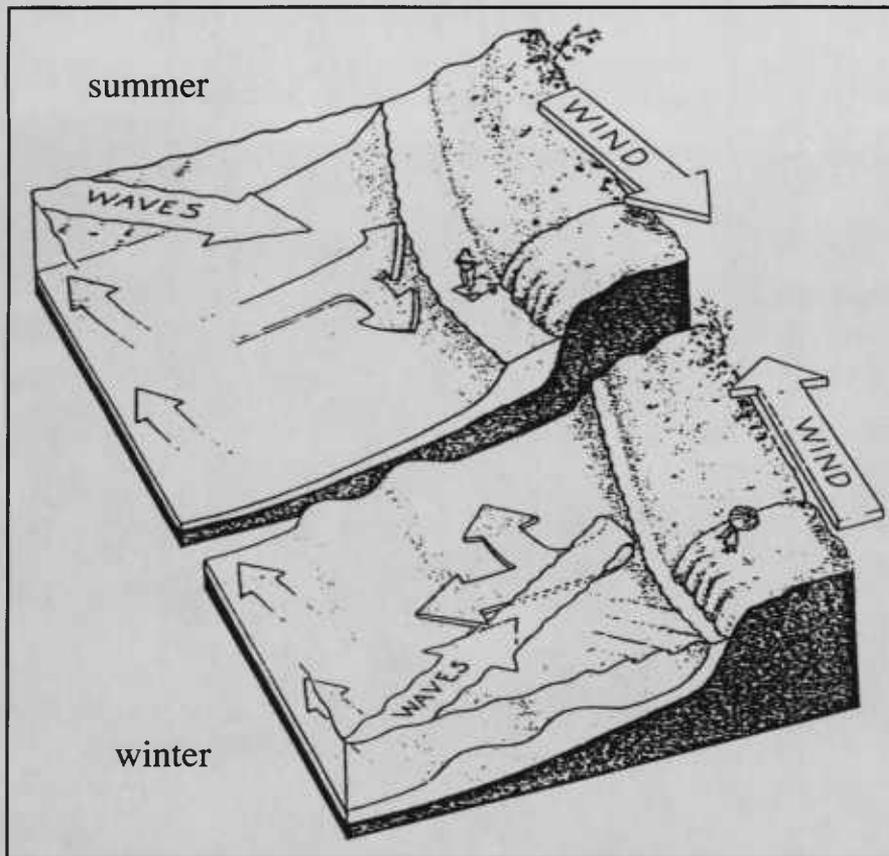


Figure 3.—Beaches change hour to hour, day to day, and season to season. Long waves strike beaches in summer, moving submerged offshore materials back onto the beach. Steeper, shorter length waves of winter scour materials off the beach, depositing them offshore. Thus, the profile of a beach changes appreciably between summer and winter (from Chesser and Peterson, 1987).

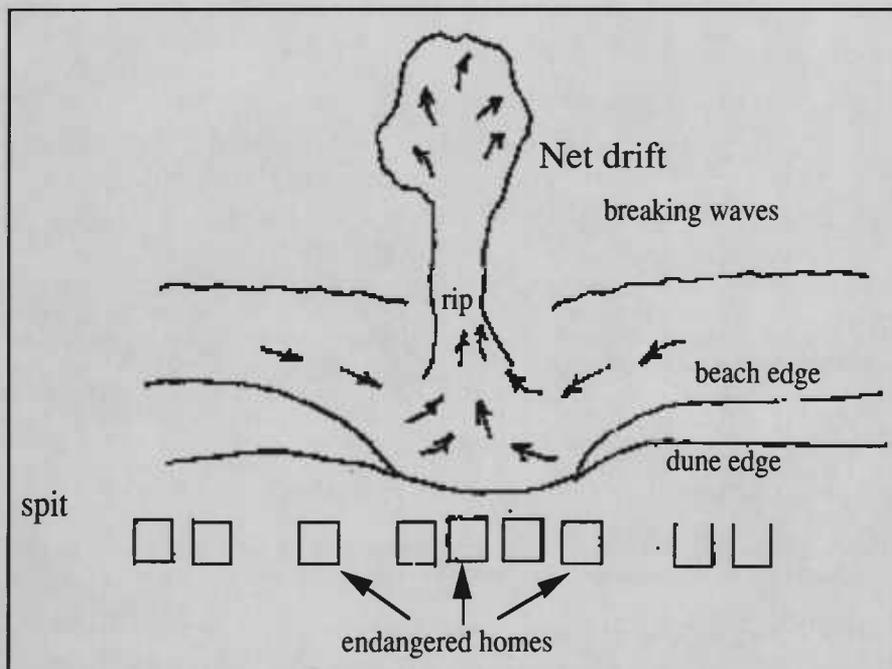


Figure 4.—A rip current flowing outward across the beach, hollowing out an embayment into the beach and eventually into the foredunes, causing property losses.

They usually flow as temporary, concentrated offshore currents, and they can scour sand from the beach and deposit it offshore.

Rip currents may also hollow out depressions along the beach, allowing storm waves to cause greater erosion damage to the land above the beach. With the sand stripped away by these currents, the large storm waves can travel further up the beach, causing localized shoreline erosion (see figure 4).

Rip currents are caused by the presence of sand bars just beyond the surf. They can be created or destroyed as the sand is constantly moved about. Predicting the location of rip currents from season to season is not realistic.

What can happen

We have had several bitter lessons about coastal erosion on the Oregon Coast. A housing development on the Siletz spit (a sand spit on Siletz Bay) suffered greatly from coastal erosion. Before 1972, a number of homes were built on the spit (figure 5). The lots were placed just above the vegetation line, facing the ocean.

During a 3-week period in the winter of 1972-73, large storm waves combined with high tides produced wave action that reached farther inland than usual.

A powerful rip current was also at work in front of the spit during most of that winter, hollowing out a section of beach and allowing storm waves to attack still further up the slope.

One partially built house was destroyed, and rip-rap was quickly placed in front of three houses in the affected area to save them. (Rip-rap is a protective mound of rocks

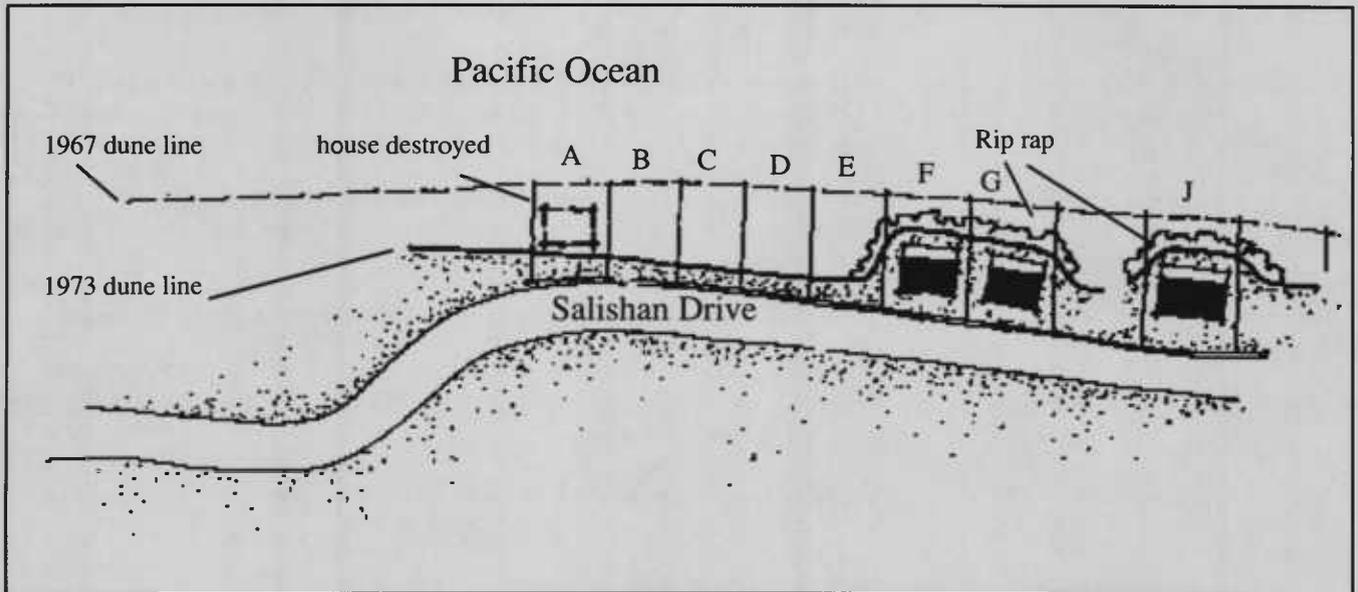


Figure 5.—In 1971-1973, Siletz Spit eroded considerably. In 1972 homes were built or being built on lots A, F, G, and J. The dashed line shows the approximate location of the foredune in 1967. Storms during the winter of 1972-73 moved

the foredune line eastward, tumbled the home on lot A into the ocean, and scoured away sand where lots B, C, D, and E had been laid out. The homes on lots F, G, and J were saved at least temporarily, by rip-rapping the retreating foredune.

that helps reduce the force of waves and currents by absorbing and weakening the wave energy.)

The unprotected lots lost 30 meters (about 90 feet) of land in 3 weeks.

Working with nature

Suppose you want to build a home near the beach. You wish to enjoy the beautiful views of the ocean and smell salt air from your lot.

But be aware that you'll have to deal with events such as high winds, storms, eroding beaches and bluffs and frequent battles over what to do about the eroding beach and how to pay for repairs. There's much to think about and evaluate before you buy a lot or home near the ocean.

Tsunami

Infrequent occurrences such as tsunamis can have devastating effects on coastal property. Tsunamis are large, destructive waves created by earthquakes. The 1964 earthquake in Alaska generated a large tsunami wave that destroyed much of the coastal town of Crescent City, California.

Eleven people were killed and several blocks of downtown Crescent City were leveled. Low-lying developments, especially those on sand spits, can be totally destroyed by unpredictable but rare tsunamis.

Global warming and sea level rise

The long-term outlook for ocean property owners should include the predicted sea level rise caused by the warming of the oceans.

The expansion of water because of warmer temperatures and melting of ice caps is predicted to cause sea levels to rise. Even a small

increase—say, a fraction of a foot—can cause problems.

The temporary sea level rise associated with the El Nino of 1986 caused erosion along the California coast, and erosion problems along some areas of Oregon.

Consider all these factors carefully before you invest in waterfront property on any coast. If you have any doubt, consult with a soils engineer, geologist, or coastal processes specialist before you invest.

Checklist

Use the checklist (page 5) to evaluate a site along the coast. These aren't firm guidelines, but they certainly include items that you should consider before you invest in a home near the beach.

Coastal property checklist

Bluffs

How high is the cliff?

The higher the cliff, the better the protection from waves—but it's difficult to protect with sea walls as the area above the sea wall will continue to erode from wind and rain.

What material is the bluff made of?

Solid rock is best. If the rock rings when you hit it with a hammer, it's solid. If you can scrape the bluff away with a shovel or pick, it will erode away easily.

Does your bluff have visible rock layers?

If the layers dip *seaward*, water seeping through the bluff during a winter rain may cause a slide. If the layers dip *toward the land*, a slide may have occurred, indicating instability.

Does the bluff have cavities?

Small caves may be enlarged by storms or groundwater, and the caves will contribute to bluff failure.

Is there evidence of previous bluff failure?

Is there a jumble of landslide material at the base of the cliff? Have slides occurred before? Ask around.

Are there signs of excess water seepage from lawn watering or septic tanks above?

Springs and clumps of green vegetation indicate seepage. This can lubricate bluff slumping.

Sand transport

Is the lot on a sandy, nonbluffed river mouth or spit?

How close is the river mouth or inlet? Keep at least ½ mile away since the mouth tends to migrate. Homes on Oregon spits have been threatened when channels move.

Dig a deep ditch. Are there drift logs covered by sand?

If so, this would indicate a shifting, changing environment.

Is the lot open, bare sand?

Shifting sands can bury driveways and foundations.

What is the beach below like?

Summer's broad, sandy beaches are sometimes stripped bare by winter waves, exposing the base of the cliff to the waves. Rip currents can also transport sand offshore and expose the shore to winter storms. Rip currents are formed by sand bars that form and dissipate along sandy beaches.

The Extension Sea Grant Program, a component of the OSU Extension Service, provides education, training, and technical assistance to people with ocean-related needs and interests.

The photo in figure 1 is by James W. Good, Extension resource management specialist, Oregon State University.

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