Marine Shoreline Armoring and Puget Sound

Overview

Shorelines are the unique area where our land and marine ecosystems meet. Everything passing to or from these two worlds goes through our shorelines including water, plants and woody debris, dirt, rocks and soil, chemical pollutants, and people.

More than 25 percent of Puget Sound's 2,500 miles of shorelines are already armored to protect public and private property, ports and marinas, roads and railways, and other uses. However, there is broad scientific consensus that bulkheads and other armoring alter our marine ecosystems and associated habitats for diverse plant and animal species.

In the past, shoreline erosion was seen as a "problem" and armoring the method to control it. We now know "erosion" is really Puget Sound's way of replenishing and maintaining our beaches.

Since the Shoreline Management Act was passed by voters in 1972, we have learned to develop our shorelines in less harmful ways – but we still have a long way to go. More than 4.4 million people live in the 12 counties bordering Puget Sound. As the region continues to grow, the pressure to armor shorelines will grow, too.

We need to find ways to manage growth and protect and preserve the environmental health of Puget Sound. Restoring and safekeeping our shorelines is a high priority for the Washington Department of Ecology (Ecology) and Puget Sound Partnership. The Partnership was formed to specifically develop and oversee an Action Agenda to help restore, protect and preserve the Sound by 2020, based on broad community and scientific input.

WHY IT MATTERS

More than 700 miles of Puget Sound's shoreline is armored – with approximately four miles added every two years.

Armoring can protect upland sites from short-term erosion, but can harm shoreline habitat and dramatically change beaches. Each change may be small, but the combined effect adds up.

What is shoreline armoring?

Shoreline armoring is the construction of bulkheads, seawalls, riprap or any other structure used to harden a shoreline against erosion.

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Special accommodations

To ask about the availability of this document in a version for the visually impaired, call the Shorelands and Environmental Assistance Program at 360-407-7291.

Persons with hearing loss, call 711 for Washington Relay Service. Persons with a speech disability, call 877-833-6341.

Q: Why are shorelines important?

A: Shorelines define our sense of place in the Puget Sound region. While most of us may not live on a shoreline, it is where we harvest clams, take a dip on a hot August day, and ship our goods to the world.

The unique and precious qualities of Puget Sound – the nation's second largest marine estuary – make it a special place to live and work. Puget Sound shorelines help drive the Northwest's economy through its industrial, maritime, rail, fishing shellfish industries, boating and other recreational opportunities, scenic beauty and vibrant tourism. For example:

- There are 68 state parks and eight national parks, forests, wildlife refuges, and other recreational areas that border Puget Sound. These areas help attract 390,000 people to Puget Sound waters and beaches at least once a year.

- The combined value of recreational and commercial shellfish harvesting, crabbing, and fishing in Puget Sound is estimated to be $150 million. Healthy Puget Sound shorelines help make Washington State the national leader in farmed shellfish production.

- Together, the ports of Seattle and Tacoma make Puget Sound the second largest U.S. harbor for container traffic. Water-based activities at the Port of Seattle support 34,000 jobs and generate $2.1 billion annual income.

For more information on the importance of Puget Sound shorelines:

Department of Ecology: www.ecy.wa.gov/puget_sound/index.html
Puget Sound economic facts: http://www.ecy.wa.gov/pubs/0601006.pdf
Puget Sound Partnership Action Agenda: http://psp.wa.gov/aa_action_agenda.php
2009 State of the Sound Report: http://www.psp.wa.gov/sos2009.php

Q: What is shoreline armoring?

A: Shoreline armoring is the construction of bulkheads, seawalls, riprap "revetments" such as sandbags or cement, and any other structure to harden a shoreline against erosion.

Bulkheads can be made from many different types of materials. Left, a concrete bulkhead.

Q: How much of Puget Sound's 2,500 miles of shoreline are currently armored?

A: Scientists estimate about 700 miles of Puget Sound shorelines are armored. More than four miles of new bulkheads were added between 2005 and 2007 alone. The amount varies depending on the location, type of shoreline, and level of development. There are more armored shorelines in urban than rural areas. For example, more than 90 percent of the shoreline between Everett and Tacoma is armored while only five percent of the shorelines in San Juan County are armored.

Q: What are the problems with armoring shorelines?

A: The broad scientific consensus is that armoring alters marine ecosystems and associated habitats, plants and animals – negatively impacting the important environment functions of our shorelines. Armoring isolates the land from the water, disturbs natural processes that replenish our shorelines including the movement of sediment and water, and disrupts the food web.

More than 4.4 million people live in the Puget Sound region. By 2040, more than a million more will call the region home. As our population grows, so does the pressure to modify Puget Sound shorelines.

By armoring our areas where upland and marine vegetation meet, the negative impacts can be extensive. Bulkheads can:

- Reduce the natural delivery of sand and gravel to our shorelines. This causes the beaches in front of bulkheads to erode slowly, leading to gradual lowering or even disappearance of the beach. This also can have negative impacts by depleting adjacent beaches of sediment, further degrading the shoreline environment.

- Bury the upper beach and reduce the amount of large woody debris deposited on the beach, which results in habitat loss.

- Isolate once interconnected land and aquatic habitats, resulting in habitat loss and altering the abundance and density of associated invertebrates, a major food source for fish, birds and other wildlife species.

Building bulkheads is often accompanied by development which may result in the loss of riparian vegetation, increased use of pesticides and fertilizers, and placement of impervious surfaces, septic systems, and drain fields close to shorelines.

The Puget Sound Nearshore Ecosystem Restoration Project has conducted a number of scientific studies about shoreline armoring. For more information, go to:
http://www.pugetsoundnearshore.org

Q: What state laws govern shoreline armoring in Puget Sound?

A: The Shoreline Management Act and the state Hydraulics Code are the two main state laws governing shoreline armoring.

The state Shoreline Management Act, through the related policies and regulations of each local shoreline master program (see next question), governs if and where armoring can be used to protect development or provide private access. The location and design of a bulkhead must conform to local and state shoreline regulations. A local permit may be required for bulkheads and other armoring, depending on site specific conditions.

The state Hydraulics Code is administered by the state Department of Fish and Wildlife through Hydraulic Project Approvals (HPA). An HPA regulates when and where armoring can be used so critical fish and shellfish habitats are protected.

Other laws, rules and court cases may also apply to shoreline armoring. For more information:

Contact your local town, city or county planning department.

Shoreline stabilization: http://www.ecy.wa.gov/programs/sea/sma/laws_rules/173-26/231_modifications.html

Laws, rules, and court cases related to the Shoreline Management Act: http://www.ecy.wa.gov/programs/sea/sma/laws_rules/index.html

Permits and enforcement under the Shoreline Management Act: http://www.ecy.wa.gov/programs/sea/sma/st_guide/administration/index.html

Q: What local regulations govern armoring in Puget Sound?

A: State law requires local governments to have **shoreline master programs** that govern bulkheads and other shoreline activities. These programs are a mix of policies and regulations tailored to specific needs of the local community. While local shoreline regulations must be consistent with the minimum requirements of state law, towns, cities and counties may go further in restricting shoreline armoring.

Loc
al policies and regulations affecting armoring and other shoreline activities are being updated throughout Puget Sound. Revised shoreline master programs will be adopted jointly by each local government and the Washington Department of Ecology to ensure that local shoreline master programs are based on modern scientific understanding of common problems with piecemeal shoreline development, including those associated with armoring.

The public is strongly encouraged to participate in helping shape their local shoreline program. Contact your city or county planning office to get involved.

For more information on local regulations:

City or county planning offices: see your local phone book or city/county website.

Shoreline master program update schedule:
http://www.ecy.wa.gov/programs/sea/sma/laws_rules/90-58/schedule.html

Public participation in the shoreline master program:
http://www.ecy.wa.gov/programs/sea/sma/st_guide/SMP/docs/Chapter6_SMPHandbook.pdf

Permits and enforcement under the Shoreline Management Act:
http://www.ecy.wa.gov/programs/sea/sma/st_guide/administration/index.html

Q: What if "erosion" causes my existing bulkhead or armoring to fail? Will I be able to replace it?

A: Begin by talking to a representative in your local city or county planning office. Each circumstance will be unique and depends on an array of different factors such as:

- Why the armoring failed.
- If a house or other primary structure is at risk.
- Local laws and regulations.
- Whether salmon or other wildlife habitat would be affected.
- Armoring design.

Many buildings along Puget Sound have not been set back far enough from the shoreline to allow for the natural rate of erosion. Armoring was installed in an attempt to slow erosion and/or to create filled areas for desired shoreline uses. Erosion was typically seen as a "problem" to be solved. We now know that naturally eroding bluffs supply sand and other materials needed to replenish and nourish beaches. Placing armoring structures on bluff-backed beaches can block this supply and may not be the best long-term solution for protecting property.

Q: Is shoreline armoring at odds with the state's requirement to achieve "no net loss of ecological functions?"

A: State laws and rules specify that shoreline modifications such as dikes, breakwaters, dredging, filling, clearing and grading, and vegetation removal should be allowed only in those limited instances when shoreline preferred uses require protection. New shoreline modifications "individually and cumulatively" should not result in a net loss of ecological functions. Towns, cities and counties have flexibility in how they achieve "no net loss" through their shoreline regulations. They can require that the impacts of armoring be avoided all-together, or mitigated through actions such as restoration.

Q: How does shoreline armoring affect shellfish?

A: Armoring affects shellfish in several ways. Historically, armoring has been built directly in shellfish habitat which has destroyed many shellfish growing areas and critical habitat such as eelgrass beds. When armoring is built or removed, dirt may be suspended in the water which can interfere with clams and other bivalves' ability to feed. Armoring can also change the flow of natural currents, keeping shellfish larvae from reaching growing areas.

For more information:

"Native Shellfish in Nearshore Ecosystems of Washington State" – Puget Sound Nearshore Ecosystem Restoration Project, Technical Report 2006-04
http://www.pugetsoundnearshore.org/technical_reports.htm

Q: How does shoreline armoring affect forage fish such as herring, smelt and sand lance?

A: If armoring is placed directly over, in front of or behind a spawning area, it can prevent fish from using the upper beach, an important spawning area for surf smelt and sand lance. The armoring changes the beach to coarser sediment due to increased wave action. Armoring can also dramatically increase the sediment temperature while decreasing the amount of decaying vegetation on the upper beach. One study found that temperature changes alone cut the survival rate of surf smelt embryos in half.

For more information:

"Marine Forage Fishes in Puget Sound" – Puget Sound Nearshore Ecosystem Restoration Project, Technical Report 2007-03 http://www.pugetsoundnearshore.org/technical_reports.htm

Q: Are bulkheads and other shoreline armoring really a problem for salmon?

A: Yes. Endangered Chinook salmon and other salmon species rely on Puget Sound shorelines for food and shelter. Young salmon spend time in Puget Sound before entering the Pacific Ocean. They need clean, abundant insects and other food, and shelter from predators. Plants that overhang the shoreline are an important source of insects and shelter. These plants are often removed when a shoreline is armored.

For more information:

Puget Sound Shorelines
http://www.ecy.wa.gov/programs/sea/pugetsound/species/salmon.html

Q: My bulkhead is only 100 feet long – does that really affect Puget Sound?

A: Puget Sound is an ecosystem in trouble. Some have likened the challenges facing the Sound as "death by a thousand cuts." Considering more than 25 percent of Puget Sound shorelines are already armored and every year another new mile of bulkheads is built along our shorelines, the cumulative, negative environmental effects on water quality, critical fish and wildlife habitat, and our shorelines has been dramatic. While one small bulkhead may not seem like much, hundreds of miles of uninterrupted stretches of armored shoreline consisting entirely of end-to-end small bulkheads have a major impact.

The Puget Sound Nearshore Ecosystem Restoration Project has conducted a number of scientific studies about shoreline armoring. For more information, go to:
http://www.pugetsoundnearshore.org

Q: Are there alternatives to armoring? Where can I go for assistance?

A: In many cases, shoreline properties can be developed without the need for a seawall or bulkhead. Setting structures further back from the water's edge and managing vegetation and site drainage can greatly reduce the risk of future problems. Stairs and beach access can be designed to minimize shoreline intrusion and associated problems. Alternatives to armoring may provide protection without as many adverse effects. Options include using large wood or gravel berms to provide wave protection, and using vegetation and improved drainage to stabilize slopes.

For more information:

Talk with your local government planning office to learn about local requirements and alternatives to armoring your shoreline.

"Alternative Bank Protection Methods for Puget Sound Shorelines"
http://www.ecy.wa.gov/biblio/0006012a.html

"Green Shorelines: Bulkhead Alternatives for a healthier Lake Washington" – City of Seattle. Contact: Dave LaClergue, 206-733-9668, dave.laclergue@seattle.gov
http://www.seattle.gov/dpd/Planning/Green_Shorelines/Overview/

Puget Sound Shorelines http://www.ecy.wa.gov/programs/sea/pugetsound/index.html

Technical studies and information on restoring nearshore ecosystems in Puget Sound.
http://www.pugetsoundnearshore.org/

Q: I hear that the sea level may rise in the coming decades. Where can I learn more?

A: A significant consequence of global climate change is rising sea levels. How sea level rise will affect specific stretches of our marine and coastal shorelines is difficult to predict. However, we know it will have a profound impact on coastal shoreline ecosystems and associated development.

For more information:

The Response of the Salish Sea to Rising Sea Level: A Geomorphic Perspective – Presentation at the Puget Sound Georgia Basin Research Conference, February 11, 2009 by Hugh Shipman, Coastal Geologist, Washington Department of Ecology.
http://depts.washington.edu/uwconf/psgb/proceedings/papers/6a_shipm.pdf

"Beaches and Bluffs of Puget Sound and Northern Straits" (pages 17-19) – Puget Sound Nearshore Ecosystem Restoration Project, Technical Report 2007-04
http://www.pugetsoundnearshore.org/technical_papers/beaches_bluffs.pdf

"Sea Level Rise in the Coastal Waters of Washington State" – A technical report produced by University of Washington Climate Impacts Group and the Washington Department of Ecology, January 2008 http://cses.washington.edu/db/pdf/moteetalslr579.pdf

Climate Change – Washington Department of Ecology
http://www.ecy.wa.gov/climatechange/index.htm

Photos taken by Hugh Shipman, Washington Department of Ecology