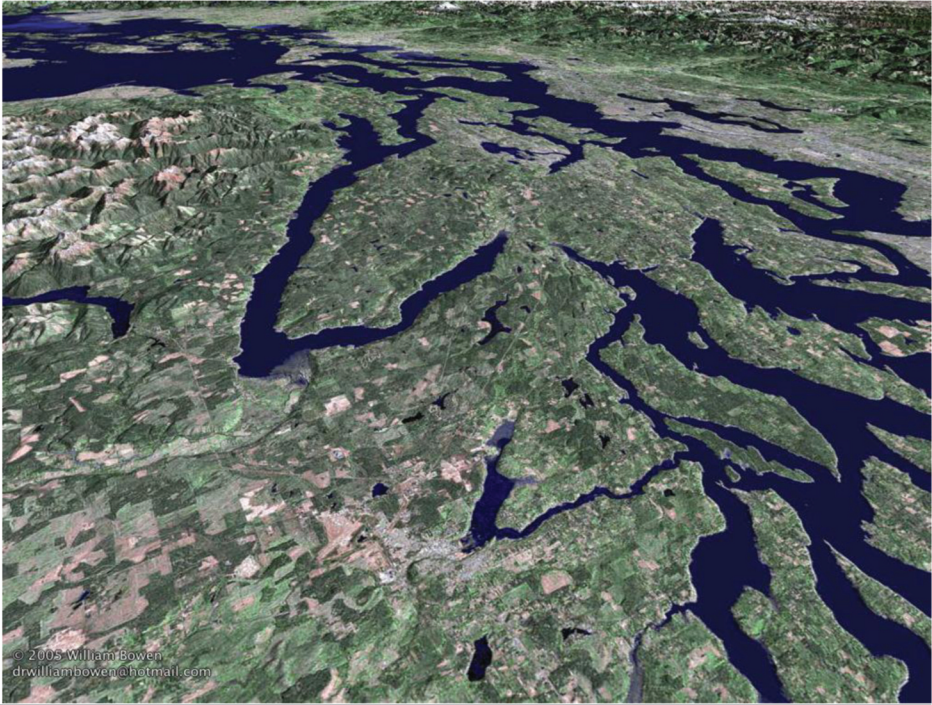


GUIDE FOR SHORELINE LIVING

SHORE STEWARDS



SHORE STEWARDS BOOKLET

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Shoreline areas are unique and spectacular places to call home. They offer beautiful scenery, opportunities for recreation and wonderful fish and shellfish. It is important to take care of the land and water to protect these qualities as well as provide the habitat for fish and wildlife.

Do you call the shores of Hood Canal, Pickering Passage, or one of many other miles of marine shoreline home? Perhaps the freshwaters of Mason, Spencer, Isabella, or one of the many Tahuya Peninsula lakes are where you live. Or home may be along the banks of the Skokomish or Satsop rivers, or one of the many creeks and streams in Mason County.

We hope that your commitment to living respectfully along the shoreline includes following the Shore Steward guidelines set out in this booklet, along with the other resources suggested.

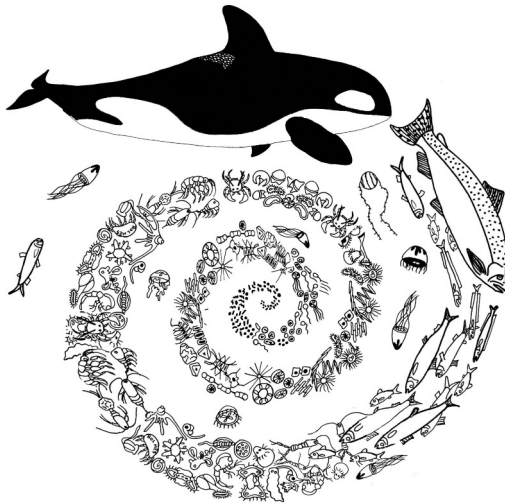


ILLUSTRATION: RESIDENTS OF NEIGHBORHOOD/MINI FOOD WEB
Courtesy of Jan Holmes

GUIDELINE 1

USE WATER WISELY

WATER IS A LIMITED RESOURCE

The water that we pump from wells is recharged (or re-filled) solely by the rain or snow that falls on the soil and slowly works its way down into water-bearing zones. These zones are called aquifers. *For more information on the interaction between rainfall and our geology, refer to Guideline #4, Manage Your Groundwater.*

Conserving water is a good idea for several reasons. When you conserve water you ensure that as much water as possible can stay in the natural environment which keeps our streams flowing during our dry periods and helps to keep stream temperatures cool. This benefits many organisms including salmon.

Conserving water can also help keep a septic system functioning properly since too much water can overload the system. Using less water in your home also means a lower water or electric bill.

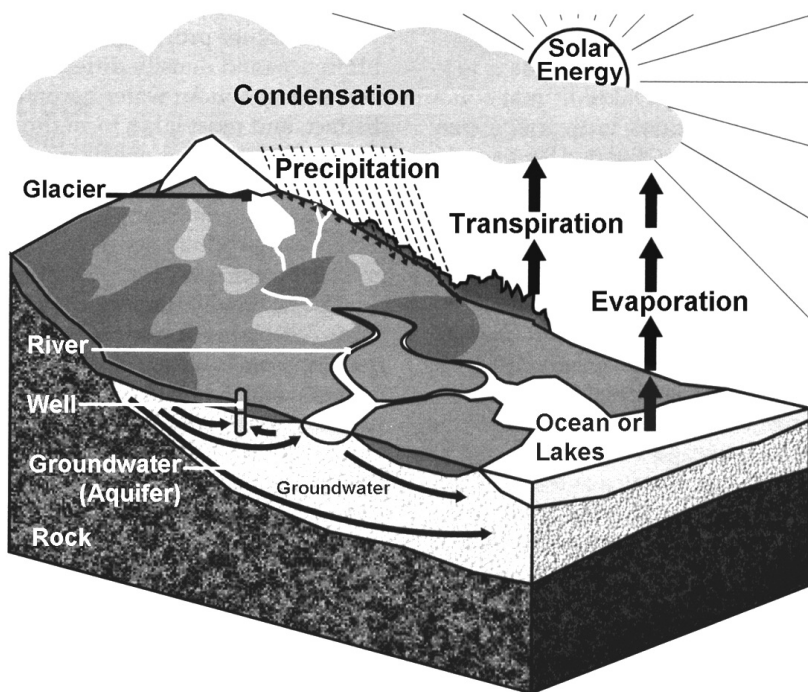


ILLUSTRATION: THE HYDROLOGIC CYCLE Source: Washington Lakes Protection Association

WAYS TO CONSERVE WATER

There are many things you can do, both inside and outside your home, to conserve water.

IN YOUR HOME:

- Use a high efficiency washer, which typically use 24 gallons of water per load, compared to the 40 gallons used by a standard machine.
- Use dishwashers and washing machines only with full loads.
- Check toilet for leaks by placing two or three drops of food coloring in the toilet reservoir and checking the bowl (without flushing) for the appearance of color.
- Install a low-flow or ultra-low flow toilet which use 1.6 gallons per flush, compared to 3.6 gallons per flush, saving 14,000 gallons per year for a family of four. Or place a half-gallon plastic bottle filled with pebbles in the tank. Be sure the bottle doesn't interfere with the flushing mechanism. Do not use a brick in the tank as bricks may break down and pieces can get caught in the mechanical parts of the toilet.
- Fix leaky faucets. Even a small drip can easily waste 20 gallons of water each day.
- Install a water-efficient showerhead and take shorter showers.
- Turn off the water while brushing your teeth.
- Use a broom to clean walks and driveways, not a hose.
- Install a water meter if you don't have one, and keep track of your water usage.

TIP: A high efficiency washing machine uses 30-50% less water, which is equivalent to about 5,000 gallons per year, 50-60% less energy and 1/3 less detergent.

IN YOUR YARD AND GARDEN:

- Consider using water-conserving plants that require little or no watering; retain native soils and vegetation as much as possible; use native plants that typically require less care and water.
- Use rain collection techniques for water needs. Water during the early morning or evening and avoid watering when it's windy to decrease water loss from evaporation.
- Use a soaker hose or drip irrigation system for garden beds.
- Water less frequently and for a longer duration. Light watering tends to encourage shallow root growth that makes plants more susceptible to droughts.
- Lawns west of the Cascades only need about one inch of water per week during hot, dry weather. Apply no more than 1/2 inch of water per hour depending on type of soil and its absorption rate.
- Weekly watering should be sufficient for most plants during the summer.
- Place 2-4" inches of mulch around plants and trees to reduce evaporation and minimize watering requirements.
- Monitor your watering to prevent runoff from occurring. Arrange sprinklers so that they don't water the street, the driveway or sidewalks.
- Use only hoses with a shutoff nozzle.

TYPICAL WATER CONSUMPTION

In this country, the in-home use of water averages about 70-100 gallons per day, per person. That's 25,500 to 36,000 gallons per year per person. This does not include lawn, garden and other outdoor uses of water. So where does all this water go?

| Activity | Gallons Used |
|------------------------------------------|---------------------|
| Flushing conventional toilet (per flush) | 3.6 |
| Showering (per shower) | 17.2 |
| Bathing (per bath) | 24 |
| Brushing teeth (per person) | 1 |
| Washing dishes by hand (per load) | 30 |
| Dishwasher (per load) | 9.3 |
| Washing machine (per load) | 40 |
| Cooking meal (per person) | 3 |
| Washing car (per car) | 20 |
| Watering lawn/garden for 30 min. | 240 |

DID YOU KNOW? A conventional toilet is perhaps the single biggest water guzzler, accounting for 27% of the water used in the average home.

SEAWATER INTRUSION (SALT WATER INTRUSION)

As the population increases, the demands placed on our groundwater resources also increase. As a result, certain areas around Puget Sound have significant saltwater intrusion problems and other areas are at risk. Some wells are at risk of becoming unusable.

Seawater intrusion is the underground flow of salt water into wells and aquifers. It occurs near a coastline when fresh water is withdrawn faster than it is replenished. Seawater intrusion can increase the salt content of the well water to unsafe levels for human consumption.

HELPFUL RESOURCES FOR USING WATER WISELY

Water conservation

H2OUSE – Water Saver Home
H2Ouse.org

WSU Extension Drought Alert website
drought.wsu.edu

Ecology – Be Water Smart, Not Water Short
www.ecy.wa.gov/programs/wr/ws/wtrcnsv.html

Rainwater Collection
www.ecy.wa.gov/programs/wr/hq/rwh.html

WATER AVAILABILITY

WRIA 14 – Kennedy/Goldsborough Watershed
<https://fortress.wa.gov/ecy/publications/publications/1111019.pdf>

WRIA 15 – Kitsap Watershed
<https://fortress.wa.gov/ecy/publications/publications/1111020.pdf>

WRIA 16 – Skokomish/Dosewallips Watershed
<https://fortress.wa.gov/ecy/publications/publications/1111021.pdf>

WRIA 22 - Lower Chehalis Watershed
<https://fortress.wa.gov/ecy/publications/publications/1111027.pdf>

GUIDELINE 2

PROPERLY CARE FOR YOUR SEPTIC SYSTEM

HOW A SEPTIC SYSTEM WORKS

Household wastewater flows into the septic tank, where heavy solids settle to the bottom forming a sludge layer, while grease and lighter solids float to the top forming a scum layer. As additional wastewater enters the tank, the wastewater between the scum layer and sludge layer is pushed through other components of the tank and eventually flows or is pumped out to the drainfield for final treatment and disposal in the soil.

The scum and sludge layers accumulate and remain in the tank, where bacteria work to break them down to some degree. These solids cannot be fully digested so they will eventually fill up the tank and need to be pumped out so they don't get into the drainfield.

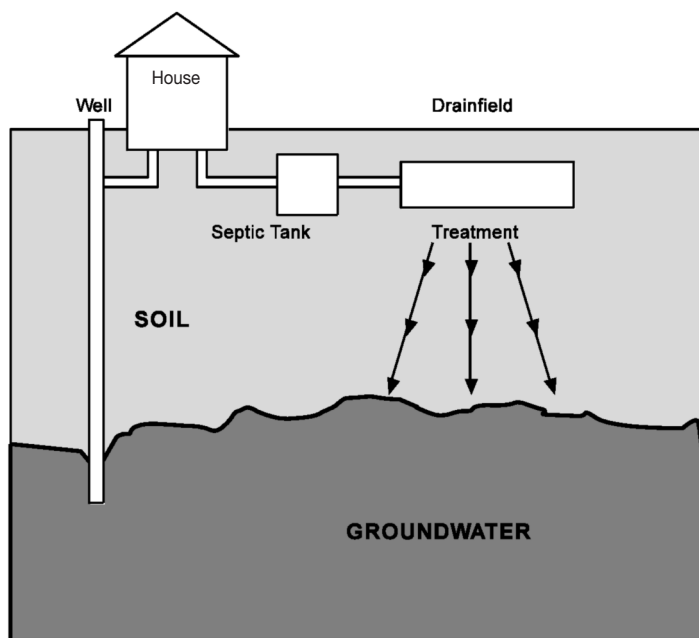


ILLUSTRATION: THE SEPTIC TANK AND DRAINFIELD

Source: Island County Health Department

MAINTENANCE AND REPAIR KEEPS US HEALTHY; PROTECTS OUR WATERS

There are approximately 26,000 on-site septic systems in Mason County and many of them are located within 1000 feet of our shorelines. Poorly maintained or failing septic systems can lead to contamination of our beaches and waterways. Keeping your system in good repair not only saves you money in the long run, but prevents pollution that causes closure of shellfish beds and swimming beaches, an increase in harmful aquatic plants, and other public health and environmental concerns.

MAINTAINING YOUR SYSTEM

Inspect the scum and sludge layer levels inside the tank once a year to monitor when it should be pumped and to see if it is functioning properly. Pumping should be done whenever the bottom of the scum layer is within 3 inches of the bottom of the crossover baffle or the top of the sludge layer is within 12 inches of the bottom of the crossover baffle. Family size and use of the

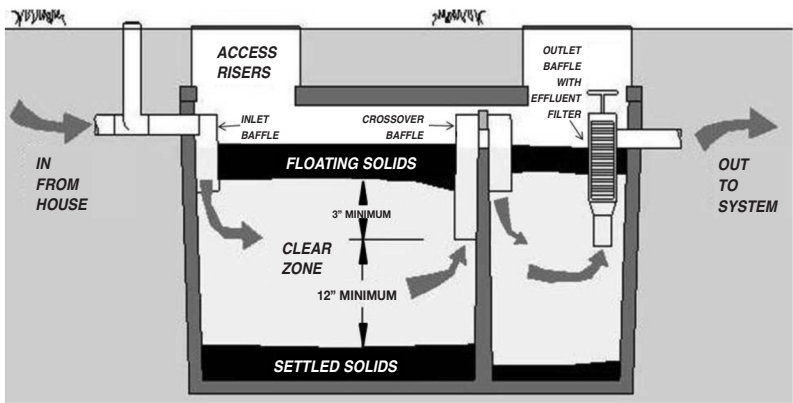


ILLUSTRATION: A SEPTIC SYSTEM Source: Mason County Public Health

system may require the pumping frequency to be more or less often. Keep records of inspections and pumping.

TANK AND DRAINFIELD LOCATION

The location of your tank and drainfield are important. It is recommended that you keep a sketch of where your septic tank and drainfield are located for quick reference in the future. If you don't know where your septic system is, contact the county health department to request a copy of your records. They should have a copy of your system plan on file.

Water runoff from your roof gutters, downspouts, patios and driveways should be diverted away from your septic tank drainfield areas as the excess water floods the soil treatment area. When excess water flows into drainfields, either through the septic system or across the ground surface, it reduces the ability of the soils to adequately remove contaminants from wastewater. If you have a water softening system, you should also avoid discharging the system into the septic tank or onto the drainfield area.

OTHER DRAINFIELD AND RESERVE AREA POINTERS:

- Do not build any structures, such as sheds or greenhouses, on your drainfield.
- Do not pave the area over your drainfield, or place non-permeable materials (like plastic) over it.
- Avoid driving over or parking on your drainfield or reserve area. Unnecessary weight compacts the soil or can break pipes, harming the effectiveness of your drainfield. It can be expensive to repair or replace a drainfield.
- Plant shallow-rooted native plants or grasses. Don't water or fertilize plantings over a drainfield.

- Trees should not be planted any closer to the system than twice the branch reach of the mature tree as the roots can break the pipes and possibly enter the septic tank. Shrubs and hedges should be avoided for the same reason. Planting vegetables (especially root vegetables) over the septic tank and drainfield is not recommended.
- Do not burn brush piles on your drainfield.

SEPTIC SYSTEM FAILURE

So much of the septic system action takes place underground that it's hard to tell if your system is doing its job. A failed septic system can contaminate the streams, lakes and bays with bacteria (fecal coliform), pathogens, and other pollutants. The runoff makes shellfish inedible and nearby waters unhealthy for wading or swimming. Here are some indicators of a potentially failing system:

- Water pooling in your yard or accumulating elsewhere downhill from your septic tank or pump chamber.
- Moist or mushy areas in your drainfield area.
- Foul odors.
- Dark grey or black stains in soil of the drainfield or surroundings.
- Poorly flushing or backed-up toilets and sinks.
- Algae growth on subsurface drainage pipe outlet, bulkhead or as visible, seeps on the beach.

If you notice any of these signs, you need to find out why they are occurring. Contact the health department or a septic system professional for advice. There are special loan programs for septic repairs.

WHAT SHOULD GO INTO YOUR SEPTIC SYSTEM

Only three things should go into your septic system on a regular basis—human waste, toilet paper and water from everyday bathing and washing activities. Reading product labels is critical in knowing whether something can be safely flushed or washed down into your septic system.

Non-toxic household cleaners, dish washing products, laundry soaps, etc. are widely available and are not harmful to your system when used in moderation. Products with a “danger” or “poison” warning should not be used. Instead try using different cleaning methods. For recipes for non-toxic household cleaners, see “Back to Basics” available for free download through Washington State University’s website. Liquid laundry and dishwasher soaps should be used whenever possible to avoid clogging baffles and pipes.

TIP: If you are using your washing machine, try to do only one load a day. It’s wise to limit the amount of water put into a septic system and spread it out through the day and week. Typical water use is approximately 70-100 gallons per person per day. More than that can overload your system. For more pointers on water conservation, refer to Guideline #1, Use Water Wisely.

WHAT SHOULD NOT GO INTO YOUR SEPTIC SYSTEM

Toilet tissue is meant to go into your septic tank. There are other items you might use that will not break down easily, and should be thrown in the garbage instead of flushed. If not disposed of properly, they will fill up the tank or harm the beneficial bacteria that keep your septic system functioning properly.

PRODUCTS THAT CAUSE PROBLEMS IN SEPTIC TANKS:

| | |
|--------------------------------------------------------------------|-----------------------------|
| Disposable cleaning wipes (even those that say they are flushable) | |
| Facial tissues | Cooking oils |
| Paper towels | Newspapers |
| Disposable diapers | Cigarette butts |
| Baby wipes | Matches |
| Rags | Sanitary napkins |
| Cat litter (even the flushable kind) | Tampons and/or applicators |
| Plastic | Dental floss |
| Coffee grounds | Hair from hairbrushes, etc. |
| Grease | Water softener discharges |

DANGEROUS CHEMICAL PRODUCTS THAT CAN KILL YOUR SEPTIC TANK AND DRAINFIELD BACTERIA:

| | |
|----------------------------------|-------------------------|
| Gasoline | Lye-based drain openers |
| Motor oil | Fertilizers |
| Paint (both latex and oil based) | Pesticides |
| Paint thinner | Pharmaceuticals |
| Solvents | |

GARBAGE DISPOSALS, DRAIN OPENERS AND PAINT

A garbage disposal grinds food and deposits it in your septic tank filling it more quickly, and forcing you to have it pumped more often. Ground food also contains nutrients which can contribute to algae growth in Puget Sound and lakes. It is important to note that most septic systems do not remove nutrients very effectively.

If your pipes or toilet get clogged, do not use lye based drain openers. These kill the beneficial bacteria in your tank. Try using a half cup of vinegar and a half cup of baking soda down slow drains. Wait a half hour then rinse the mixture down with a kettle

of boiling water. If this doesn't work, a "snake" is the best way to clean your pipes. If you use a micromesh screen available at local hardware stores, you will eliminate much of the material going down your drain that causes clogs.

Do not clean paintbrushes in your sink. Thinners and solvents can be re-used and then recycled at the transfer station/dump. Paintbrushes can be wrapped in plastic and frozen in between use. If you used latex paint, wash your paintbrush out over your lawn but make sure to do this as far from the water's edge as possible. If you have a larger amount of paint to rinse out, rinse paintbrushes out over a bucket then take the diluted paint to a hazardous waste facility (contact the Counties' solid waste department for hazardous waste facility locations).

SEPTIC TANK ADDITIVES

Do not waste your money. There are chemical additives on the market that claim to improve the "health" of your system so you won't need to pump as frequently. These chemicals are costly and unnecessary. Although they will probably not hurt your system, they won't help it. In fact, proof of effectiveness is not required for marketing in Washington State. The enzymes and bacteria present in human waste are the only additives necessary to keep your system functioning properly.

HELPFUL RESOURCES FOR MAINTAINING YOUR SEPTIC SYSTEM

Mason County Environmental Health

- Shelton 360-427-9670
- Belfair 360-275-4467
- Elma 360-482-5269

www.co.mason.wa.us/health/environmental/

Septic System User's Manual

www.co.mason.wa.us/forms/Env_Health/septic_user_manual.pdf

Onsite Sewage Operation and Maintenance

http://www.co.mason.wa.us/health/environmental/onsite/oss_maintenance.php

Washington Sea Grant Program

Septic Sense website

www.wsg.washington.edu/mas/pdfs/SepticSense.pdf

WSU Extension Publication *Creative Cleaning: Back to Basics*

Available for free download at:

<https://pubs.wsu.edu/> and search for publication EB1758

Or by calling 800-723-1763

Septic Maintenance

For a range of septic system resources from the Dept. of Health, Washington Sea Grant and WSU see:

county.wsu.edu/mason/nrs/water

GUIDELINE 3

SAFE AND RESPONSIBLE PEST CONTROL

USE PESTICIDES OR HERBICIDES? USE COMMON SENSE!

Most pesticides and herbicides are synthetic chemicals that may have harmful effects on non-target plants and animals, including pets, humans and some beneficial insects that are desirable for pest control. Even some of the 'safer' alternatives can be harmful to the environment. Many are slow to break down and may end up contaminating our water supply. You can eliminate or reduce the use of dangerous chemicals and still control unwanted plants or pests by using the following methods.

TIPS TO LIMIT PESTICIDE USE

- Incorporate northwest native plants into your Landscape: Native plants create beautiful, beneficial & low maintenance gardens. They seldom need pesticide or fertilizer and many require little or no extra watering once established.
- Encourage habitat for beneficials: Native plants create a welcoming environment to beneficial insects and animals. These insects provide safe pest control and are not bothersome to humans.
- Healthy soil, healthy garden: According to Washington State University, healthy plants that are attacked by pests produce chemicals that attract beneficial insects. Keep your plants healthy by giving them compost and mulch. Composts will boost soil health and microorganism populations which will help create a vibrant soil ecosystem and healthy plants in your garden.
- Try to tolerate some pests: Plants can bear some pest damage. Insecticides can often harm the soil microorganisms needed for healthy soils and the beneficial insects that are predators to garden pests. For almost every pest there is

another organism that preys on it. By using some “broad spectrum” pesticides you may be killing the natural predators of the pest.

- Use safe and effective alternatives: Horticultural oils, insecticidal soaps and the bacteria *Bacillus thuringiensis* (Bt) are sometimes referred to as “soft pesticides.” They do less damage to beneficial insects.
- Always follow instructions: When using any pesticide product, follow the directions carefully and use them only when they are appropriate. Even then, use them sparingly.

For more information on the benefits of native plants, please refer to Guideline #5, Encourage Native Plants and Trees.

WEED CONTROL

- Mulch garden paths and flower beds. Mulch controls weeds, conserves water and adds organic material to the soil over time. Wood chip mulch and compost are a good combination.
- Hand-weed vegetable beds. A stirrup or scuffle hoe is an effective and efficient tool for weeding between vegetables. Remove all weeds before they go to seed.
- In areas that are vulnerable to weeds, out-compete the weeds by planting native trees, shrubs and groundcovers. You will eliminate the weeds and beautify your landscape. Contact the WSU Extension Office for a list of native plants.
- Do not expect to eradicate weeds completely. Do keep a watchful eye for noxious weeds such as knotweed. Knotweed can take over your shorelines. Contact WSU Extension for more information or if you think you may have knotweed on your property.

SLUG CONTROL

- Make your own slug trap by burying a bowl of beer so that the rim is level with the ground. Watch the slugs crawl right in!
- Hand-pick slugs at night when they are active.
- Keep the garden free of debris of any kind including leaf and grass clippings (home to slug eggs).
- Keep grass near and around the garden trimmed.
- Avoid heavy ground covers near susceptible plants.
- Use iron phosphate instead of metaldehyde, which is harmful to dogs and cats.

DISPOSING OF PESTICIDES

When you switch to safer pesticide alternatives and discover unused pesticides around the house or garage, remember all pesticides are considered hazardous waste and must be disposed of at a hazardous waste site. In Washington it is illegal to dump them in the trash or down the drain. For more information on hazardous waste disposal in Mason County, contact Mason County Solid Waste Department.

LAWNS

Many of us have a love affair with vast green lawns. But our lawns have become huge consumers of water, fertilizers and pesticides and a significant source of water pollution from runoff. One solution is to reduce the size of your lawn by replacing grass with native plants that require less water than lawns. It is especially beneficial to create a buffer of native plants along your shoreline, not only to reduce erosion but to reduce pollutant runoff as well.

There are a number of things you can do to minimize fertilizer and water use, thus reducing the cost and amount of labor involved in maintaining your lawn. Healthy lawns start with healthy soils. Use a mulching mower, compost, aerate soils, and leave grass clippings on the grass to build soil nutrient reserves and biodiversity.

SMART FERTILIZING

The methods above should go a long way in making your lawn beautiful and could eliminate the need for fertilizers altogether. If you find that the previous methods of lawn care are insufficient then apply organic or time-released fertilizer sparingly, making several applications over a period of time instead of a single large application. Also be sure to fertilize more than 24 hours before forecasted rain. These measures ensure that fertilizers stay on your lawn instead of washing into the water. September is the best month to fertilize.

DANGERS OF OVER-FERTILIZING

Using too much fertilizer may pollute surface and groundwater as rain (or over-watering) washes the soluble fertilizer off the lawn. Overuse of fertilizers causes thatch build-up (a naturally maintained lawn rarely has a thatch problem) and the reduction of earthworms and soil microorganisms. On the shoreline, over-fertilization may also contribute to algae blooms and adversely affect important nearshore plants such as eelgrass because it adds excess nutrients to the ecosystem. For more information on the role of eelgrass in a healthy nearshore ecosystem, please refer to Guideline #10, Preserve Eelgrass Beds and Forage Fish Spawning Habitat.

DID YOU KNOW? Non-point pollution comes from many small, widespread sources such as excess pesticides and fertilizers or failed septic systems. Nitrates from fertilizers, manures and some pesticides leach through the soil and may contaminate groundwater. For more information on non-point pollution and water quality, please refer to Guideline #4, Manage Upland Water Runoff.

HERE ARE SOME HELPFUL RESOURCES FOR LIMITING USE AND PROPERLY DISPOSING OF UNWANTED PESTICIDES, HERBICIDES AND FERTILIZERS.

SAFE DISPOSAL OF PESTICIDES AND HERBICIDES:

Mason County Utilities and Waste Management
360-427-7771

www.co.mason.wa.us/utilities_waste/solid_waste

ALTERNATIVES TO CHEMICALS:

Washington State University Extension - Hortsense
pep.wsu.edu/hortsense/

National Pesticide Information Network
1.800.858.7378
npic.orst.edu

Grow Smart, Grow Safe Guide
www.lhwmp.org/home/gsgs

NOXIOUS WEEDS

Mason Noxious Weed Control Program
county.wsu.edu/mason/nrs/noxious

GUIDELINE 4

MANAGE WATER RUNOFF

A GROUNDWATER AND SURFACE WATER PRIMER

Surface water is water that flows across or “ponds” on the ground’s surface. It can result from rainfall or irrigation practices. Groundwater is rainfall or surface water that has infiltrated, or soaked into, the soil.

Surface water volumes and flows can be large, especially after heavy rainfall. At such a time, you may notice a thin layer of water running over smooth areas such as parking lots, roofs, driveways and large expanses of lawn. This surface water runoff is known as stormwater. When groundwater and surface water are not properly managed, a number of problems can result.

- The more hard surfaces we have (impervious areas), the more rainfall runs off our land instead of soaking in (infiltration). This can result in reduced drinking water supplies, smaller wetlands, increased runoff, and lower stream flows during dry periods.
- Increased runoff means more stormwater leaves our property at a faster speed, and that can lead to flooding, erosion, excessive sediment deposits, property damage and stream habitat destruction.
- Stormwater can pick up pollutants as it runs across our lawns, driveways and other impervious areas. These pollutants can reduce and impair water quality in our lakes, streams, rivers, wetlands and marine waters.
- While infiltration is usually desirable, infiltrating in the wrong place can create on-site septic system problems, flooded crawlspaces, and unstable slopes.

The good news is there are many simple ways to properly manage water on our property to minimize water pollution, flooding and erosion problems. Be sure to check with the Mason County Departments of Community Development or Public Works to see what is required for new development, or for help with solving existing concerns. Local resources for help with existing problems include Mason Conservation District and WSU Mason County Extension.

LOW IMPACT DEVELOPMENT

Low Impact Development (LID) is one approach to managing stormwater that can help efficiently and effectively manage stormwater and protect water resources. The goal is to mimic natural processes, thereby preserving or restoring the natural hydrology of watersheds. Key LID strategies include conserving existing vegetation, preserving soil that drains well, avoiding building in areas that don't drain well, minimizing impervious surfaces, and using LID practices if practicable.

LOW IMPACT DEVELOPMENT PRACTICES FOR YOUR PROPERTY:

Low impact development can attractively and efficiently offset some of the problems of stormwater runoff. If you decide that you would like to implement low impact development on your property, be sure to first have your site assessed to see how stormwater is moving through the site, and evaluate other site characteristics such as topography, soils, vegetation, and critical areas.

Contact the County Public Works or Community Development Departments to determine if any County codes apply, and who may help you with a site assessment. Once a site assessment has

been completed, the best LID practices for your site can be determined. Following is a list of common LID practices. **Please note that not all practices are advised, or are practical, for every site.**

ENVISIONING LID PRACTICES ON YOUR PROPERTY

Conservation - Maybe your home has a smaller footprint, or shares a driveway with your neighbor, and much of the native vegetation has been preserved.

Rain Gardens - Sometimes an LID technique can be as subtle as a swath of vegetation in a small depression that captures and filters stormwater runoff from your roof, driveway or patio.

Pervious Pavement - Perhaps your sidewalk doesn't look quite like a typical concrete sidewalk. Or you may park on a driveway that isn't asphalt. Instead of impervious materials, the surfaces are permeable pavement, which allows water to infiltrate to the ground beneath.

Amending soil with compost - Soil amending is an important function of LID. Add compost to soils disturbed during construction to restore the soil's health and its ability to infiltrate rainwater. If you have poor soils at your existing home, consider amending them to store and infiltrate water.

Vegetated roofs (also known as green roofs or eco-roofs) - Your garden shed can be designed with a green roof instead of shingles to help reduce pollutants and slow down roof runoff.

Minimal excavation foundations - Another LID technique uses alternative building foundations composed of driven piles and a connector at or above grade. This practice eliminates the need for extensive excavation and reduces soil compaction.

Rooftop rainwater harvesting - Maybe you use a rain barrel next to your home acting as a rooftop rainwater catchment system.

When you use this water in your garden, you are conserving water as well!

Dispersion - Take care to not collect and concentrate stormwater, but manage it in small catchment areas where it can more readily infiltrate.

A word of caution: If you live on a shoreline bluff, great care should be taken when collecting and redirecting runoff. Saturation of soils can lead to landslides and slope failures. Seek professional advice regarding drainage methods. For more information on stormwater and bluffs, see the web address below for the Department of Ecology's "Managing Drainage on a Bluff" website.

WHEN TO AVOID LOW IMPACT DEVELOPMENT PRACTICES

Low impact development practices that infiltrate surface water into the ground (rain gardens, dispersion, and pervious pavement) are not advised in some situations, for example where soils have low permeability, near bluffs, or in close proximity to on-sites septic systems.

In the case of areas near bluffs, unstable or eroding slopes and shoreline areas, move water by way of tightlines rather than infiltrating. A tightline is a continuous length of pipe used to transport water down a slope that is steep or susceptible to erosion. Tightlines are likely to require a permit and should not be used unless there is an existing or potential drainage-related problem on a slope. We highly advise that you seek professional advice to determine the need, as well as for design and construction.

TIGHTLINES TO THE BEACH

If your groundwater and/or surface waters are tightlined to your beach, it is very important that these lines are properly designed, constructed and maintained. It is important to make sure that pollutants do not enter the tightline as they will be flushed directly into the water. The tightline pipe material has to be sufficiently strong to withstand the elements, anchored securely to the bluff, and not perforated. Water from a tightline should never be discharged at the top or middle of a slope as severe erosion can occur.

It is also very important to carefully consider the discharge point location. High tides can create pressure and delay the release of flow from a tightline if there is little difference in elevation (low-bank properties). A dispersion device or method should be used at the discharge point to reduce energy and prevent beach erosion. Finally, you should be able to inspect the line to ensure that it remains securely fastened and that there are no leaks. If you find a maintenance problem, be sure to fix it immediately to ensure bank stability is protected.

Again, consult the County regarding current regulations and resources that can help with site assessment, design and construction.

TIP: Inspect your tightline and its discharge frequently, especially after a major storm or earthquake. If there is a failure, severe erosion can occur over a very short period of time.

STORM WATER AND WATER QUALITY

Stormwater can pick up a nasty assortment of pollutants as it flows across the land and into our lakes, streams, rivers, wetlands and marine waters. This is called non-point pollution. Stormwater **transports a mixture of pollutants** such as petroleum products, heavy metals, animal waste and sediments with the following results:

- Pollution carried by stormwater has contaminated virtually all urban creeks, streams and rivers in Washington State. **Mason County has many locations where our lakes, streams, rivers and marine waters do not meet state water quality standards.**
- Stormwater is the **leading contributor to water quality pollution.** In Mason County, the primary pollutants of concern transported by stormwater are fecal coliform, nutrients, sediments, and in some locations heavy metals and petroleum products.
- Two species of salmon and bull trout are threatened with extinction under the federal Endangered Species Act. **Loss of habitat** due to stormwater and development is a cause.
- Shellfish harvest at some beaches is restricted or prohibited due to pollution. Stormwater runoff is often one of the causes. **Mason County is world-renowned for its shellfish and has experienced numerous cycles of harvest restrictions, prohibitions, and upgrades. Consider the implications of these closures on our local economy.**

We all play an important part in managing non-point pollution. Many of the LID approaches and techniques already listed help to prevent polluted runoff. Here are some other ways you can help.

TO PREVENT POLLUTED RUNOFF:

- **Maintain your car or truck.** Never dump anything down a storm drain – it does not go to a treatment plant! Storm drains and ditches will eventually drain to a stream, wetland, beach or aquifer (your drinking water). Always recycle used oil, antifreeze and other fluids. Fix oil leaks in your vehicles.
- Avoid storing machinery, equipment or substances outside or in areas where pollutants can leak into the ground and surface waters.
- **If you wash your car or boat at home, wash it on your lawn** using a mild, phosphate-free soap, (NOT over the septic system or drainfield and NOT on pavement or boat ramps). The best thing to do is to wash your car at a commercial car wash.
- **Drive less.** Leave your car at home at least one day each week and take a bus, carpool or bike to work. Combine errands when you drive. Get vehicle emissions checked and repaired. Buy a low emission vehicle. Fewer vehicles on the road means less emissions and contaminants in runoff.
- **Cut down on fertilizers, pesticides and herbicides.** If you use these chemicals, follow directions and use them sparingly. Don't fertilize before a rainstorm. Consider using organic or slow-release fertilizers. Let your lawn go golden brown in the summer months; it will rebound in the fall. Compost or mulch lawn clippings. Preserve existing trees or plant new ones. Trees hold rainfall and help manage stormwater.
- **Remove part or all of your lawn.** Lawns require a lot of watering, mowing and caring. Replace part of your lawn with native and drought-tolerant plants. Add compost to planting soil and dress it with mulch to improve plant growth and reduce stormwater runoff.

- **If you are on a septic system, maintain the system.** Septic systems require regular inspections, maintenance and pumping, or they will fail, costing a lot of money to fix and creating a public health hazard. Inspect your system regularly and have it pumped out when needed.
- **Pick up after your pets and keep animals out of streams.** Scoop your dog's poop and properly dispose of it by putting it in the garbage. Also, make sure fences and other structures are keeping cows, horses and other animals out of streams. Compost manure in a designated covered area so that it doesn't wash off into nearby waterways.
- **Reduce impervious surfaces at home and increase the vegetated land cover** of your property. Impervious surfaces include your roof, driveway, patios and lawn. Reduce rooftop runoff by directing your downspouts to vegetated areas, and not to your driveway or the street. For your driveway and patios, consider putting in permeable paving or patterns of cement and brick that allow water to filter through it.
- **Support your local storm or surface water program.** Programs to maintain a community's stormwater system, prevent flooding and protect natural resources may cost money in the short term but save money for damages to public and private property in the long term. Take advantage of opportunities to educate yourself and your family about your local watershed. Consider volunteering for stream restoration or other local volunteer projects.

CONCERNS ABOUT EXCESS GROUNDWATER AND SURFACE WATER

Prevention or reduction of surface water runoff is often the least expensive approach to reducing drainage problems. However, it's important to remember that drainage issues are site specific. If

you have concerns about excess groundwater or surface water on your property, contact the Planning department at the numbers listed at the end. *For more information on site drainage issues on a bluff, please refer to Guideline #7, Develop on Bluffs with Care.*

LANDSLIDES ON YOUR PROPERTY

If your property is on a bluff, knowing the geology of the land is important to help you determine how best to manage the surface water and groundwater to prevent landslides. Vegetation is also a critical element that effects slope stability as fibrous roots can “knit” soils together at a bluff or on a bluff face. *For information on using native plants to control erosion on a bluff, please refer to Guideline #7, Develop on Bluffs with Care.*

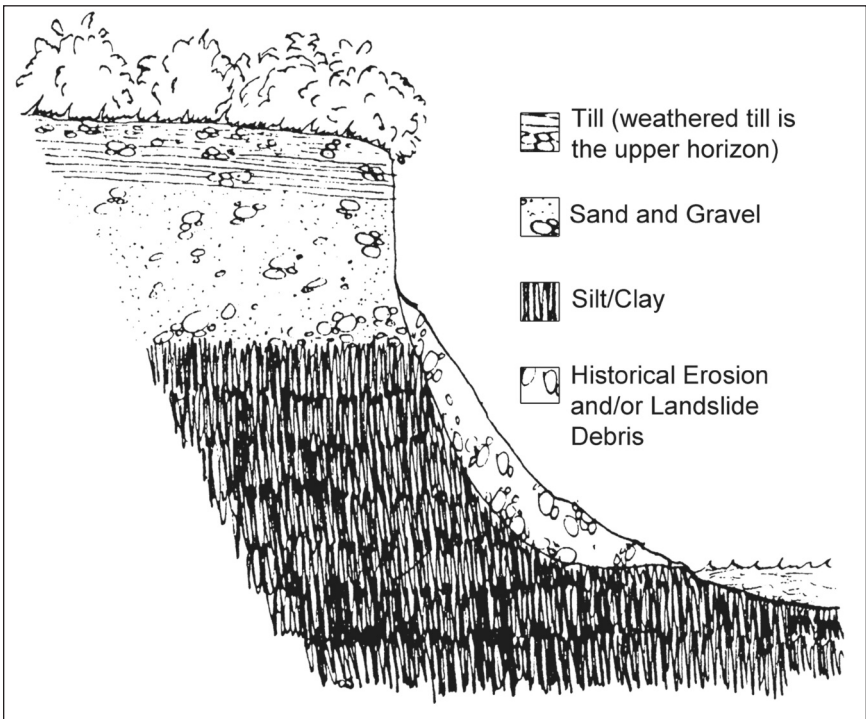
With development, changes can occur in the volume and location of surface water runoff that can significantly change the potential for landslides. Our region’s natural geology makes some areas especially prone to landslides. The resulting combination of increased water runoff from development and naturally unstable soils can be disastrous.

The Puget Sound basin’s geology has been heavily influenced by glaciation, which has left varying soil layers. These layers include a weathered zone (including topsoil), and thick deposits of sand, gravel and glacial till (hard pan). In addition to flowing over land during heavy rains, rainfall and surface water infiltrate the soil, becoming groundwater, which often accumulates or “perches” above the glacial till or less permeable clay layers. Water that accumulates above the impermeable layer may then flow laterally

(or in a side direction) until it “daylights” as seepage on the slope face. This water can act as a soil lubricant and can cause the upper layer to slide on top of the clay layer, resulting in landslides.

ILLUSTRATION: COMMON SOIL LAYER SEQUENCE ON COASTAL SLOPES

Source: Department of Ecology, Surface Water and Groundwater on Coastal Bluffs: A Guide for Puget Sound Property Owners



HELPFUL RESOURCES FOR MANAGING YOUR GROUNDWATER AND SURFACE WATER

Public Works

Mason County Public Works Department

- Shelton: 360-427-9670 ext. 450

- Belfair: 360-275-4467 ext. 450

www.co.mason.wa.us/public_works/

Mason Conservation District

- 360-427-9436

www.masoncd.org

Planning Department

Mason County Planning Department

- Shelton: 360-427-9670 ext. 352

- Belfair: 360-275-4467 ext. 352

www.co.mason.wa.us/community_dev/planning

Department of Ecology: Managing Drainage on a Coastal Bluff

www.ecy.wa.gov/programs/sea/pubs/95-107/intro.html

Rain Gardens

raingarden.wsu.edu

Blueprint for lake friendly landscape -

www.ecy.wa.gov/programs/wq/plants/lakes/landscaping.html

BMPs for lake shoreline residents -

www.ecy.wa.gov/programs/wq/plants/lakes/ShorelineMgt.html

Stormwater and Low Impact Development

www.psp.wa.gov/stormwater.php

GUIDELINE 5

ENCOURAGE NATIVE PLANTS AND TREES

THE ROLE OF NATIVE PLANTS

On shorelines, keeping one's property as "natural" as possible has many advantages. Maintaining trees, shrubs and groundcovers slows water runoff and traps pollutants. Plants capture large quantities of water during rainstorms, thereby helping reduce potentially damaging runoff and landslides. The root systems of plants, especially trees and shrubs, prevent erosion by binding layers of soil together. Mature vegetation provides shade to the beach below, enhancing habitat for salmon and other marine wildlife, and leaves and insects drop off trees into the water, providing food for young salmon. *For information on using native plants to control erosion on a bluff, please refer to Guideline #7, Develop on Bluffs with Care.*

ADVANTAGES OF USING NATIVE PLANTS IN YOUR LANDSCAPE

- Native plants are well adapted to our climate, our insect population and diseases. They don't require much maintenance once established.
- Native plants seldom require fertilizers or pesticides.
- Once established, native plants properly sited generally require no watering.
- Wildlife is adapted to native plants and depends on that vegetation for food, cover and breeding places.

OVERHANGING AND FALLEN TREES

Trees that overhang the beach or have fallen downward onto the beach protect embankments from wave action and thus help in soil retention, as well as provide vitally important shade, shelter and insect food for fish and other marine life. Some downed

nearshore trees may live for a number of years. Leave them alone if possible. Even dead trees are useful, serving as "sediment traps" to build beaches or provide more buffer at the water's edge. If you need to, prune fallen trees instead of removing them. *For more information on the importance of shade trees to forage fish, refer to Guideline #10, Preserve Eelgrass Beds and Forage Fish Spawning Habitat.*

PRUNE FOR VIEWS

Trees are vital to the good health of shoreline properties and should be cut only when they are a hazard. To make the most of your waterfront panorama, frame views by selectively pruning your trees rather than cutting them down.

RECOMMENDED PRUNING STRATEGIES

ILLUSTRATION: WINDOWING, THINNING, LIMBING UP Source: Department of Ecology, *Vegetation Management: A Guide for Puget Sound Bluff Property Owners*

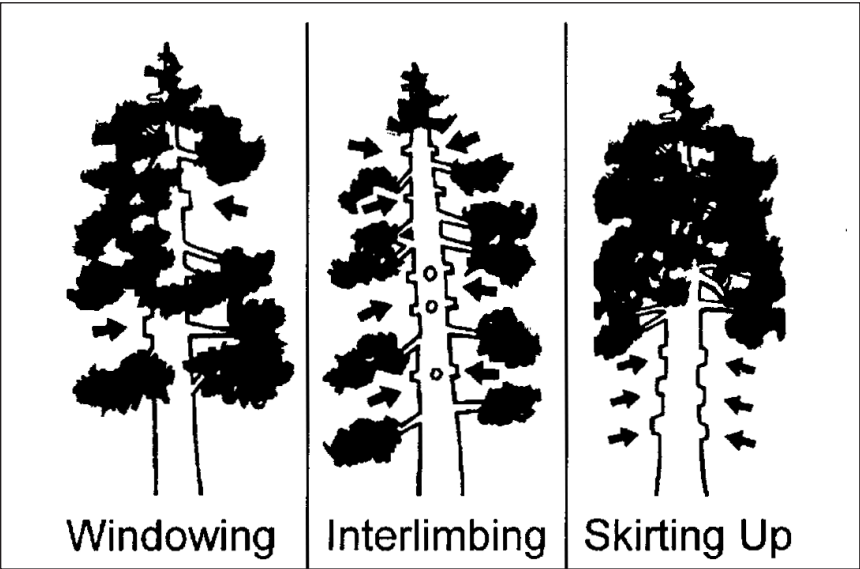
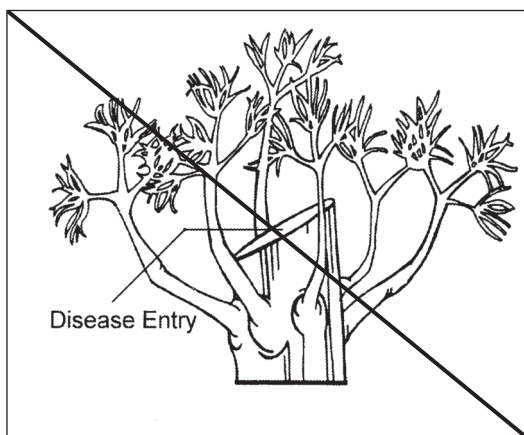


ILLUSTRATION: A "TOPPED" TREE Source: Department of Ecology,
Vegetation Management: A Guide for Puget Sound Bluff Property Owners



NEVER TOP A TREE!

Topping can lead to disease and death of the tree. It may also lead to re-growth of weak upper limbs, which are more likely to break and be a danger in heavy winds.

KEEP YARD WASTE OFF BLUFFS AND BEACHES

Yard waste on bluffs kills underlying vegetation, adds dead weight (usually wet and soggy) to the upper portion of a slope and can easily slide, possibly precipitating a larger slide or causing down-slope damage. The discarded plant material may be washed away by tidal action. Although out of sight, the breakdown of plant material uses up oxygen as it decomposes which can cause problems for aquatic life. Dumping yard waste on the beach can also spread noxious weeds in our region.

By definition under statewide Solid Waste Regulations, yard waste and grass clippings are considered solid waste and therefore must be handled and disposed of properly. It is unlawful to dispose of any type of solid waste by dumping it on the ground, into the water or burying it. Solid waste may be dumped and buried at a

permitted landfill or in some neighborhoods, collected by yard waste collection companies. Consider alternatives such as:

TWO ALTERNATIVES TO DUMPING:

1. **Compost yard waste.** To prevent composted material from entering the water, use an above-ground composter if possible and position it well away from the water's edge. Composted material is beneficial to gardens because it increases soil fertility and microorganisms, makes clay soils more workable, and reduces irrigation needs.
2. **Leave lawn clippings on the lawn.** Grass clippings help keep your lawn green by recycling nitrogen.

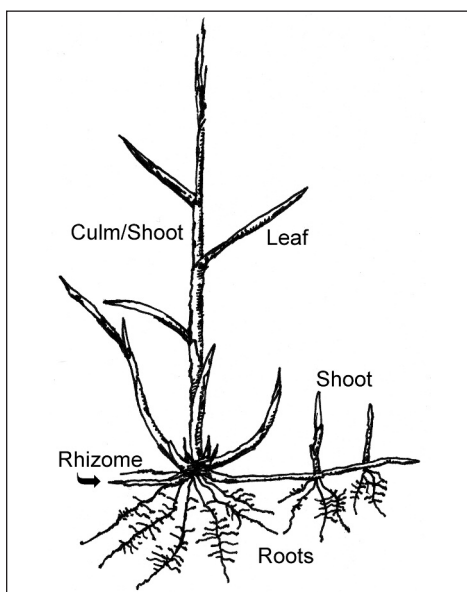


ILLUSTRATION OF A *SPARTINA* PLANT

***SPARTINA* IS A NASTY NOXIOUS WEED**

At first glance, *Spartina* appears to be just grass growing in or along the water. But look closer and you'll see that it severely disrupts the native saltwater ecosystem, alters fish, shellfish and bird habitat, and increases the threat of floods. *Spartina* colonizes in areas that would normally be mudflats, changing the *natural* regime of soil erosion and deposition by trapping soil with its roots.

This is a non-native, invasive weed that can rapidly 'take over' whole beach areas just like weeds can take over our yards and gardens.

Early control of an infestation is essential. Care must be taken to remove not only the visible plant but all roots or rhizomes. Those removed must then be disposed of far from the shore, preferably in a landfill to prevent re-sprouting. Do not compost *Spartina*! When established, *Spartina* is far more difficult to eradicate. All *Spartina* invasions should be reported to the local Noxious Weed Control Board. Before pulling out a suspected bed of *Spartina*, carefully clip a couple of small stalks, placing them in a plastic bag as you collect them on the beach for identification by your local weed board. There are many beach grasses that look alike.

HOW TO IDENTIFY SPARTINA

Spartina appears as individual plants, small clumps, or when established, as large circular masses of plants several feet tall in the intertidal zone. Its stems are round and hollow with leaves spreading out from the stem at nearly right angles. At the base of the leaves there is a row of fine hairs.

Sprouting in the spring, *Spartina* flowers and seeds from mid-summer to fall. The seed heads top the long stalks that grow straight up from the plant. *Spartina* turns brown in the fall and generally remains dormant until early spring.

KNOWN SPARTINA INFESTATIONS IN PUGET SOUND

The Washington Department of Agriculture (WSDA) estimates that in 2003, there were over 9,000 acres of *Spartina* in Washington State, mostly in Willapa Bay. In 2010, WSDA estimates a total of 27 acres of *Spartina* in Washington. *Spartina* has been found in many Puget Sound counties including: Island, Snohomish and Skagit counties and smaller amounts in Clallam, Jefferson, Kitsap, King, San Juan, Pierce and Whatcom Counties. While significant

progress has been made in eradicating *Spartina*, eradicating the last few acres will be the most challenging as it represents many individual plants and small clumps spread along thousands of miles of Washington's shoreline. You can help by watching for *Spartina* when you're at the beach and reporting sightings to your local noxious weed board.

HELPFUL RESOURCES FOR ENCOURAGING NATIVE PLANTS AND TREES

Gardening with native plants:

WSU Master Gardener Stewardship Gardening Website:
gardening.wsu.edu/stewardship/

Blueprint for lake friendly landscape -

<http://www.ecy.wa.gov/programs/wq/plants/lakes/landscaping.html>

BMPs for lake shoreline residents -

<http://www.ecy.wa.gov/programs/wq/plants/lakes/ShorelineMgt.html>

Grow Your Own Native Landscape: A Guide to Identifying, Propagating & Landscaping with Western Washington Native Plants. WSU Publication Misc 0273

gardening.wsu.edu/text/nwnative

Native plant sales:

Mason Conservation District Annual Native Plant Sale (usually January- February)

www.masoncd.org/

Washington Native Plant Society

888-288-8022

www.wnps.org

Pacific Northwest Native Wildlife Gardening
www.tardigrade.org/natives/nurseries.html

Native Plant Salvage Foundation (Thurston Co.)
360-867-2166
www.nativeplantsalvage.org

To dispose of yard waste:

Mason County Garbage and Recycling
360-426-8729 or 360-275-4590
www.masoncountygabage.com

To report illegal dumping:

Mason County Public Health
www.co.mason.wa.us/health/environmental/solid_waste/illegal_dumping.php
360-427-9670 ext. 584

To report *Spartina* invasions and other noxious weeds:

Mason Noxious Weed Control Board
360-427-9670 ext. 592
county.wsu.edu/mason/nrs/noxious/Pages/default.aspx

Related Links

Managing Vegetation on Coastal Slopes, Department of Ecology.
Vegetation management during site development to reduce the hazard of erosion and landslides.
www.ecy.wa.gov/programs/sea/pubs/93-31/intro.html

Slope Stabilization and Erosion Control Using Vegetation,
Department of Ecology. An online guide to controlling erosion on
slopes and bluffs using vegetation.

<http://www.ecy.wa.gov/programs/sea/pubs/93-30/index.html>

Spartina Identification

www.spartina.org/species.htm

GUIDELINE 6

KNOW THE PERMIT PROCEDURES FOR SHORELINE DEVELOPMENT

WHY YOU NEED A PERMIT TO DEVELOP YOUR SHORELINE

Shoreline resources are finite and must be effectively managed if their many values are to be preserved. Planning under Washington State's Growth Management Act provides a unique opportunity to consider shorelines and their relationship to the community as a whole and its overall development strategy.

THE SHORELINE MANAGEMENT ACT (SMA)

In 1971, the Washington State Legislature passed the Shoreline Management Act. This act was validated by voters in the November, 1972 election.

OBJECTIVES OF SMA

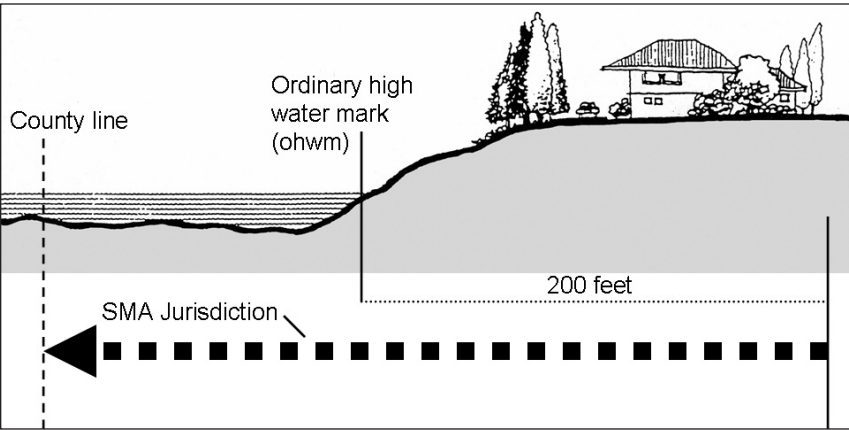
- To protect and preserve shoreline resources.
- To provide for reasonable use of the state's shorelines.
- To preserve the public's right to access the shorelines.

The Shoreline Management Act covers more than 20,000 miles of Washington State saltwater, river and lake shorelines. This includes more than 2,600 miles of saltwater shoreline. Approximately one-third of Puget Sound's shoreline is currently lined by bulkheads or other hard structures.

Mason County has 701 miles of fresh and marine shorelines. Bulkheads and rip rap along shorelines, called shoreline armoring, is especially disruptive of natural geologic and ecosystem processes. From 2005 to 2010, Mason County had the highest

percent increase of new shoreline armoring of all the Puget Sound counties. The total length of new armoring in the county represented almost 20 percent of the armoring constructed in the Puget Sound. Shoreline armoring that was replaced in the county represented almost 11 percent of the replacement armoring in the Puget Sound. In contrast, Mason County only represents 1.5 percent of total number of people that live in the Puget Sound region (as of 2010, Mason County's population is 60,699 compared to 4.1 million in the 12 Puget Sound Counties). Mason County only represents 8.8 percent of total linear marine miles in the Puget Sound (217 miles of shoreline in Mason County compared to 2,468 in all of Puget Sound).

ILLUSTRATION: SMA COVERAGE Source: Department of Ecology,



The Shoreline Management Act along marine shorelines applies to the area from 200 feet landward of the “ordinary high water mark” extending offshore to the county line.

DID YOU KNOW? Anchor buoys in the middle of a bay are covered by SMA permitting processes. Why? Because the SMA jurisdiction includes the water to the middle of the Puget Sound, Hood Canal, or wherever the county across the water intersects.

SHORELINE MASTER PROGRAMS (SMP)

The provisions of the Shoreline Management Act established a planning and regulatory program, which is initiated at the local level under state guidance. This cooperative effort balances local and statewide interests in the management and development of shoreline areas by requiring local governments to plan (via Shoreline Master Programs) and regulate (via permits) shoreline development.

In Mason County, our planning department is charged with ensuring compliance with the SMP. Each county works with Dept. of Ecology to coordinate with the State Departments of Fish & Wildlife, Dept. of Natural Resources and the US Army Corps of Engineers. The Department of Natural Resources is a participant where state-owned tidelands and bedlands are involved.

THE SHORELINE PERMIT PROCESS

All permits for development on your shoreline property originate at the local level. Substantial development permits for work such as clearing, grading and construction are approved locally. Some conditional use permits and variances are locally approved and then sent to the Department of Ecology for their approval. Appeals to denied permits are made through the local hearing examiner and the state shorelines hearing board.

Some minor types of shoreline development may be “exempt” from permit requirements. They must still be reviewed by your local Planning Department for consistency with the Shoreline Master Program and the Shoreline Management Act.

DEVELOPMENT REQUIRING A PERMIT

Major saltwater activities requiring a permit include:

- Bulkheads
- Filling
- Boat launches
- Piers
- Dry docks
- Artificial reefs
- Dock floats
- Marinas
- Placement of utility lines
- Pile driving
- Dredging
- Tree removal

The above are only examples of major types of activities. Any construction activity below the ordinary high water line requires a permit, even if the activity is outside the water at the time it is undertaken.

In some cases, a Department of Fish and Wildlife Area Habitat Biologist will visit the project site. They will work with you to help achieve your objective while protecting fish, shellfish and their habitat.

COMPLIANCE WITH SHORELINE REGULATIONS

You play a vital role in shoreline administration through peer education and bringing shoreline issues to the attention of state and local personnel. With ever-increasing workloads and reduced funding of staff positions, local and state agencies must rely more and more on citizen help in protecting and preserving our shoreline resources and letting local officials know how they feel about shoreline issues.

HELPFUL RESOURCES FOR UNDERSTANDING THE PERMIT PROCEDURES FOR SHORELINE DEVELOPMENT

Planning Department

Mason County Planning Department

- Shelton: 360-427-9670 ext. 352

- Belfair: 360-274-4467 ext. 352

- Elma: 360-482-5269 ext. 352

www.co.mason.wa.us/community_dev/planning

Department of Ecology

Ecology maintains oversight of the Mason County Shoreline Master Programs and the shoreline permit processes. They also maintain a large and informative website.

- Puget Sound - www.ecy.wa.gov/programs/sea/pugetsound

- Shoreline aerial photos -

<https://fortress.wa.gov/ecy/coastalatlas/tools/ShorePhotos.aspx>

- Landslides - www.ecy.wa.gov/programs/sea/landslides

- Citizen Guide: Shoreline Master Program Updates -

www.ecy.wa.gov/programs/sea/shorelines/smp/citizen.html

Permit Assistance Center

www.ecy.wa.gov/permit.html

360-407-7037

GUIDLINE 7

DEVELOP ON BLUFFS WITH CARE

THE IMPORTANCE OF BLUFFS

The coastal bluffs of our region result from thousands of years of erosion and are an important natural feature of the Puget Sound's shoreline.

Many of our local bluffs and beaches "feed" sediments to adjacent beaches and nearby "accretion" beaches, which are typically either low spits of land that jut into the intertidal zone or coves between headlands. When seawalls or bulkheads are placed on beaches with feeder bluffs, the natural process is halted. Without continual replenishment, beaches and accretion beaches erode, threatening homes and wildlife populations. Bulkheading of bluffs to protect property actually leads to the loss of adjacent beaches and increased erosion of neighboring bluffs.

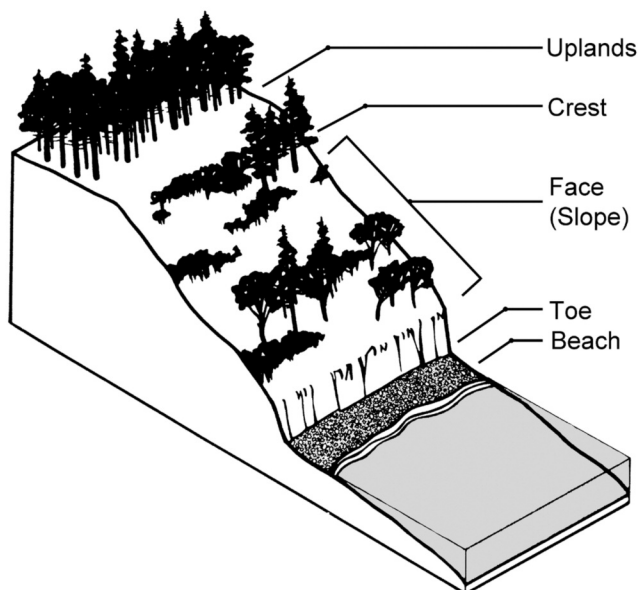


ILLUSTRATION: ANATOMY OF A BLUFF Source: Department of Ecology, *Vegetation Management: A Guide for Puget Sound Bluff Property Owners*

YOUR ACTIONS IMPACT BLUFF EROSION

Property owners often unknowingly increase bluff erosion. Clearing vegetation, disturbing the soils, poor site drainage and modifications to the bluff for access can all lead to landslides and accelerated erosion. Improper clearing of vegetation can also lead to increased danger from tree falls and wind damage.

DID YOU KNOW? Bluff erosion is often characterized by decades of gradual change, punctuated by sudden landslides. Slides can undermine structures at the top of the bluff or bury structures at the bottom.

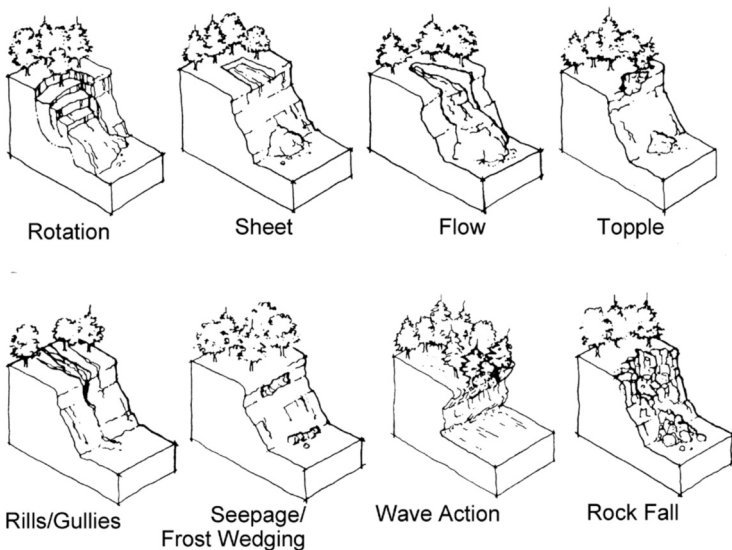


ILLUSTRATION: TYPES OF BLUFF EROSION Source: Department of Ecology, Vegetation Management: *A Guide for Puget Sound Bluff Property Owners*

LEAVE STUMPS IN PLACE

Please keep in mind that it is best to save all stumps near a shoreline bluff or slope. Their roots alone will help stabilize soil. When removing invasive plants such as Himalayan blackberry or Scotch broom from unstable shore property, have an immediate revegetation plan.

NATIVE PLANTS HELP CONTROL EROSION

Bluff shoreline property owners have special considerations. Excessive erosion must be contained. If not, the particles slipping down onto the beaches and into the water can cover and smother many marine plants and animals. Hence, "buffer zones" of trees, shrubs and plants along bluffs are imperative. If you choose to plant trees on a slope then you should plant bareroot stock. This allows you to minimize the amount of soil that you disturb in order to plant and in the long term bareroot stock will be more successful. You should also mulch heavily around the planting to help retain moisture and prevent erosion.

DID YOU KNOW? English ivy is not a good erosion control option. It is invasive and will smother native plants. It is considered a noxious weed by the state and should not be planted. It is also not an effective soil holder and will just hide the signs of slope instability.

GOOD CHOICES FOR STABILIZING THE SOIL AND EROSION CONTROL:

Trees:

Douglas fir
Bigleaf maple
Madrone
Red cedar
Willow

Shrubs:

Ocean spray
Salal
Snowberry
Vine maple
Serviceberry

For more information on the role of native plants in shoreline landscapes, please refer to Guideline #5, Encourage Native Plants and Trees.

WAYS TO LIMIT BLUFF EROSION

- View local setback requirements as a minimum. For new construction, locate your home sufficiently far from the water or bluff so it is not susceptible to wave damage, erosion or landslides. Resist the urge to trade off safety for the sake of a slightly improved view. When developing your site, do so with a minimum of disturbance. Leave as much native vegetation as possible, including an undisturbed vegetation buffer along the top of the bluff.
- Where practical, replant bare areas. Use hardy, deep-rooted native species appropriate to the site. Avoid landscaping that requires watering. Instead of removing or topping trees, selectively thin or window them to improve views. This action also promotes root vigor. Refer to section #5, Encourage Native Plants and Trees, for an illustration of thinning and windowing trees.
- Divert runoff away from the bluff face. Excessive groundwater and surface water runoff are leading causes of landslides and bluff erosion. Coordinate with neighbors to avoid concentrating runoff if possible. For more information on this topic, please refer to section #4, Manage Your Upland Water Runoff.
- Plan beach access carefully for minimal soil and vegetation disturbance. Where possible, consider sharing access with neighbors to minimize disturbance and costs. Consider building a “hybrid” system (a combination of trail, ladder, winding paths and stairs) to limit disturbance on the bluff.

- Avoid building bulkheads or other erosion control structures. Increased wave activity in front of and to the sides of a bulkhead encourage unnecessary erosion, often to your neighbor's property. For more information on the effects of bulkheading, please refer to section #8, Minimize Bulkheads.
- Do not dump yard waste over the edge of your bluff. It sets the stage for future erosion because these piles of green waste smother native plants holding fragile slopes in place. Even small heaps of grass clippings can take years to break down.

HELPFUL RESOURCES FOR DEVELOPING ON BLUFFS WITH CARE

Planning Department

Mason County Planning Department

- Shelton: 360-427-9670 ext. 352

- Belfair: 360-275-4467 ext. 352

- Elma: 360-482-5269 ext. 352

www.co.mason.wa.us/community_dev/planning

Native Plants

Native Plant Salvage Project Guide:

gardening.wsu.edu/NWnative/

GUIDELINE 8

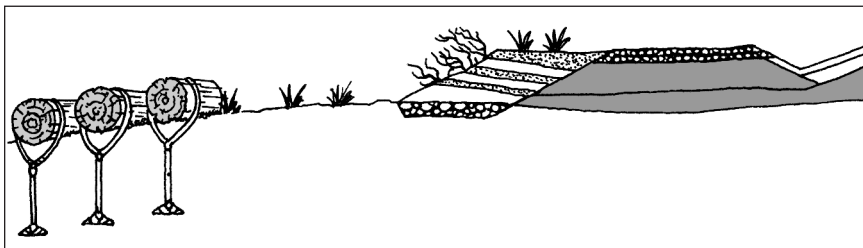
USE SOFT ARMORING TECHNIQUES WHEN APPROPRIATE

As discussed in Guideline #7, shoreline bluffs and beaches are dynamic environments where erosion and storms are the rule rather than the exception. It's important to understand beach processes and to make environmentally-sound choices about how we manage eroding shorelines. The shoreline actually depends on continuing erosion to maintain beaches and to support nearshore and intertidal habitats, yet we are often intolerant of even relatively gradual erosion. Some property owners go to great expense to engineer rock, wood and concrete structures to stabilize eroding property. This is called shoreline hardening, or bulkheading. There are other appropriate ways to protect your land while also letting the necessary movement of beaches to occur.

SOFT EROSION CONTROL

Soft-shore protection projects rebuild the high-tide beach to provide protection of property and homes and while preserving natural beach functions. These approaches use indigenous materials such as gravel, sand, logs and root masses to absorb wave energy and reduce erosion.

ILLUSTRATION: EXAMPLE OF A LOW-ENERGY ZONE SOFT-SHORE PROTECTION PROJECT Source: Department of Ecology, *Alternative Bank Protection Methods for Puget Sound Shorelines*



Anchoring logs on the beach helps dissipate wave energy and may help increase the deposition of sediment on the beach.

Here are some reasons to use soft erosion control to protect your property instead of hard armoring techniques (bulkheads).

THE IMPACT OF BULKHEADS

Bulkheads cut off the sediments supplied to the beach by erosion. This leads to sediment-starved conditions that can actually increase erosion and alter beach composition. The cumulative effect of numerous bulkheads along a reach of shoreline may be the long-term, irreversible loss of habitat and increased erosion on the property of others.

OTHER SIDE EFFECTS OF BULKHEADS:

- Hard structures, especially when vertical, reflect wave energy back onto the beach, modifying the energy regime on the beach and sometimes undermining the bulkhead.
- Increased wave energy and loss of sediment supplies can lead to coarsening of the beach as sand and small gravel are progressively winnowed from the beach. The result is a shift to coarser gravel and cobble beaches and more frequent exposure of underlying hardpan or bedrock.
- Installation of bulkheads often requires that upland vegetation be removed and can prevent mature native vegetation from becoming re-established.
- Bulkheads can decrease availability of spawning areas for forage fish.

DID YOU KNOW? It is natural for our beaches to erode and long-term erosion rates are generally quite slow. The rates vary from one site to the next but an average range is one foot per decade (0.1 foot/year), often reflecting the loss of several feet of bluff or bank in a landslide every twenty or thirty years.

WHAT CAN YOU DO?

There are a number of actions that you can take to help prevent erosion on your beach. Some actions require a minimum of money and effort while others may require more work and investment.

HAVE YOUR SITE PROFESSIONALLY ASSESSED FOR SOFT ARMORING SUITABILITY

Soft-shore protection designs are not suitable for all sites. The erosion rate, the type and causes of erosion and an evaluation of wave energy are critical for determining whether a soft-shore protection strategy will work on a particular beach. If you're interested, please contact the Planning Department for a list of coastal geologists who design soft-shore protection systems.

RETAIN DRIFTWOOD AND NATIVE VEGETATION

The presence of driftwood and other large woody debris helps to retain sediments and absorb wave energy. If you find them washed up on your beach, leave them in place. Also, intertidal plants, dune grass and other berm vegetation can greatly increase the resilience of beaches to storm waves. Native vegetation on shorelines and bluffs are your best first line of defense against erosion.

IF YOU MUST REPLACE OR BUILD A BULKHEAD

If it's necessary for you to have a bulkhead, build it to recognized standards. Construct it as far away from the water's edge as possible and build only as much structure as necessary. (A 200' bulkhead is not necessary to protect the base of a stairway.) Consult the Planning department for assistance with design and permits. Plant a wide native plant buffer along your bulkhead to provide food and habitat for wildlife and increase erosion protection.

HELPFUL RESOURCES FOR MINIMIZING BULKHEADS

Planning Department

Mason County Planning Department

- Shelton: 360-427-9670 ext. 352

- Belfair: 360-275-4467 ext. 352

- Elma: 360-482-5269 ext. 352

www.co.mason.wa.us/community_dev/planning

The Planning department can advise on geologists with soft-shore protection expertise.

GUIDELINE 9

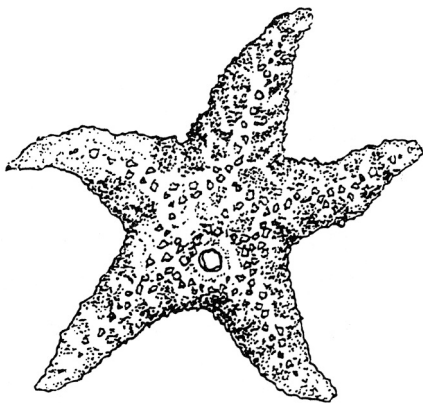
RESPECT INTERTIDAL LIFE WHILE ON THE BEACH AND BOATING

COMMON BEACH SENSE

Beach etiquette is an important issue. Investigate, learn, have fun and leave the beach cleaner than you found it while respecting the intertidal species that make their homes on the beach and rocky shore.

A FEW THINGS TO KEEP IN MIND AS YOU EXPLORE

- *Walk around tidepools and eelgrass beds.*
- *Tread lightly around barnacle covered rocks, protecting living barnacles as well as you're shoes or bare feet.*
- *Unless you're harvesting, observe sea life where it lives or by handling them lightly with wet hands.*
- *Look carefully under rocks and seaweed and replace the rocks exactly the way you find them.* Some organisms hide underneath rocks and seaweed to protect themselves from air, sun, and predators. Others are adapted to living on top of the rock. An overturned rock that is not replaced is doubly bad news for sea life.
- *Refill any holes you dig in the sand.* Leftover piles of sand may suffocate marine life.
- *Give birds and mammals that you see on the beach plenty of room to go about their business.* Mother seals will leave their young on the beach for periods of time while they forage. Other birds and animals are probably eating, and nobody wants to be disturbed at mealtime.



- *Leave all vegetation where you find it.* Plants prevent erosion, are food for animals and insects, and add variety and beauty to the beach.

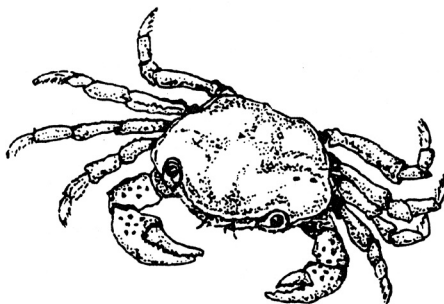
BEING A GREAT BOATER

Boating in any type of craft should be done in a safe and conscientious manner. Using common sense will limit harm to shoreline habitats and the salmon, forage fish and other sea life that rely on them. *For more information on these habitats, please refer to Guideline #10, Preserve Eelgrass Beds and Forage Fish Spawning Habitats.*

Speed restrictions are in place for boaters for certain conditions and areas (there are signs posted) usually in bays and inside harbors. When passing near marinas, fishing or swimming areas or a vessel at anchor, boats should reduce their speed. Some local jurisdictions have ordinances prohibiting a boat motoring at a speed greater than 6 knots within 100 feet of shore, docks, piers, floats or anchored or moored vessels, unless taking off or landing a water skier.

AVOIDING DAMAGE TO THE ENVIRONMENT WHILE BOATING

- Slow down when close to the shoreline to reduce or eliminate your wake. This prevents excessive erosion and protects forage fish and salmon habitat. Some bigger



power boats can produce wakes that will do much more damage to a shoreline than a speed boat, even if they are 500 ft off the beach. Likewise, a personal watercraft wake can cause as much damage as a regular speed boat. Use good judgment as to when to slow down.

- Inspect your boat's motor regularly and make sure that it isn't leaking fuel into the water. Consider purchasing a motor that meets or better EPA 2006 guidelines.
- When refueling, make sure hoses are tightly connected and that no gas spills into the water. Use an "oil absorb" pad to catch fueling drips and spills.
- For larger boats, do not pump any sewage or waste material into the water. Use only designated State pumpout locations (see below for contact info.)
- Avoid dragging your anchor. It may damage clam, oyster and eelgrass beds.
- Personal Watercrafts (PWC) disturb fragile intertidal areas when used irresponsibly. Their wakes can be as damaging to the shoreline as those of a speedboat. Do not operate PWCs in shallow water (less than 24 inches deep) and do not dock in reeds and grasses.
- Inspect, clean and dry your boat or PWC and gear to prevent the spread of invasive species and to keep your boat running efficiently and safely.
- Avoid anchoring or mooring in eelgrass or microalgae beds. These provide important habitat for many species and can be damaged by anchor or mooring lines.
- Be a whale wise boater. As of May 16, 2011, new federal rules

prohibit vessels from approaching any killer whale closer than 200 yards and forbid vessels from intercepting a whale or positioning their vessel in its path. The rules apply to all types of boats, including motorboats, sailboats and kayaks, in Washington.

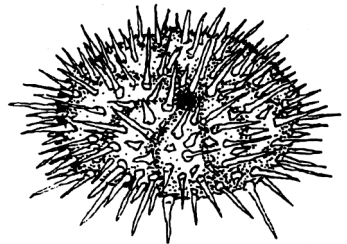
FIRES ON THE BEACH

Local regulations vary widely for beach fires. Please check with your fire department or local jurisdiction on beach fire restrictions, permits and burn bans.

Beach fires can be a great part of going to the beach. However, fires could ignite tree roots and dry grasses, and driftwood fires are a genuine concern to firefighters and local residents on neighboring uplands. Because of these dangers, beach fires should only be built under strictly controlled circumstances. Bring your own wood and do not burn driftwood off the beach, as this is part of the habitat structure. Fires should be made above the high water mark in order to minimize the damage to organisms that make their home on the beach.

GOOD CAMPFIRE OR BONFIRE PRACTICE CHECKLIST:

- The fire is at least 50 feet from any structure.
- The fire is less than 3 feet in diameter and 2 feet high.
- You have a shovel nearby.
- There is always somebody present to tend the fire.



- The surrounding area is free of flammable materials.
- You douse a fire completely with water prior to leaving the site.

MARINE MAMMALS ON THE BEACH

Marine mammals may occasionally use the beach for various reasons. Adult seals and sea lions often rest on the shoreline or go there to avoid visiting Orcas, but they will eventually return to the water.

Mother seals may leave their pups on the shore while they go find food. If you see a seal pup alone, it may not necessarily be abandoned. Should you find a seal pup that appears to be in distress, contact the National Marine Fisheries Services immediately at 800-853-1964.

As great as it is to let Fido run free on the beach and frolic in the water, make sure to keep your dog in your sight and under your control. A wandering dog's interaction with a seal pup could be bad news for both.

If whales, dolphins or otters appear to be stranded on the beach, it's imperative that you report it to the Marine Mammal Stranding Network. Never attempt to touch a marine mammal, especially one that is stranded. Wild animals in a stressed condition bite, and they often carry diseases that are harmful to humans and dogs.

TO REPORT A STRANDING

1. Note the condition of the animal (without getting too close) and the location.
2. Do not touch, disturb, feed or pour water on the animal.
3. Contact National Marine Fisheries Services immediately at 206-526-6733.

HELPFUL RESOURCES FOR RESPECTING INTERTIDAL LIFE

Adventures in Boating Washington Handbook

www.boat-ed.com/washington/handbook/index.html

U.S. Coast Guard - Boating safety:

800-368-5647

www.uscgboating.org/

National Marine Fisheries Service Enforcement Hotline

800-853-1964

www.nmfs.noaa.gov/ole/

Washington Department of Fish and Wildlife – Enforcement

877-933-9847 or to report poaching in progress, call 911

wdfw.wa.gov/enforcement/

Washington State Pump out locations:

State Parks Commission

360-902-8500

www.parks.wa.gov/boating/pumpout/

SWIMMING BEACH INFORMATION

<http://www.ecy.wa.gov/programs/eap/beach/>

BEACH CLOSURE INFORMATION

<http://www.doh.wa.gov/CommunityandEnvironment/Shellfish/BeachClosures.aspx>

BOOKS, CARDS, BLOGS AND LINKS FOR SEA LIFE AND SHORELINES

The resources for learning more about the Salish Sea's marine life and habitats are nearly as abundant, diverse, and inspiring as the organisms themselves. Below are several resources you may use as a gateway to the watery world of Salish Sea marine life.

At the Sea's Edge: An Introduction to Coastal Oceanography for the Amateur Naturalist, William T. Fox, Prentice Hall

The Beachcomber's Guide to Seashore Life in the Pacific Northwest (Revised Edition), J. Duane Sept, Harbour Publishing

Invertebrates, EZ-ID laminated cards,
beachwatchers.wsu.edu/ezidweb/ezid_cards/periwinkle.htm

Marine Life of the Pacific Northwest: A Photographic Encyclopedia of Invertebrates, Seaweeds And Selected Fishes, Andy Lamb (Author), Bernard Hanby (Author, Photographer), Harbour Publishing

The Natural History of Puget Sound Country, Arthur Kruckeberg, University of Washington Press

The Naturalist's Path: Beginning the Study of Nature, Cathy Johnson, Walker and Company

Puget Sound Sea Life, David Jamison,
www.pugetsoundsealife.com

Sea-life, Jeff Adams,
pugetsoundblogs.com/sea-life

Seashore Life of the Northern Pacific Coast,
Eugene N. Kozloff, University of Washington Press

Seashore of the Pacific Northwest, Ian Sheldon,
Lone Pine Publishing

Seaweeds and seagrasses, EZ-ID laminated cards,
beachwatchers.wsu.edu/ezydweb/ezyd_cards/periwinkle.htm

WSU Beach Watchers: EZ-ID Guides,
beachwatchers.wsu.edu/ezydweb/

GUIDELINE 10

PRESERVE EELGRASS BEDS AND FORAGE FISH SPAWING HABITATS

EELGRASS PROVIDES A DIVERSE HABITAT

Eelgrass is a flowering, perennial grass that grows in nearshore marine waters with silty/sandy bottom, propagating both by vegetative growth and by seed germination. Just like other plants, eelgrass needs adequate sunlight to grow. In the Northwest, water clarity allows eelgrass to grow to depths of about 60 feet (-60' MLLW) in locations like Hood Canal. In other areas, turbidity or overwater structures restrict the amount of light reaching the substrate, limiting or eliminating eelgrass growth. The Washington Department of Ecology estimates that 33% of the eelgrass beds in Washington have been lost.



ILLUSTRATION: THE EELGRASS MEADOW Source: Reproduction of Port Townsend Marine Science Center's Eelgrass interpretive display

EELGRASS FACTS:

- Softens the impact of waves and currents.
- Stabilizes the shoreline, providing a calm space where organic matter and sediments are deposited.
- Provides a diverse habitat for many species. Some animals and algae attach to the blades of eelgrass; others use the structure to hide or provide camouflage.
- Reduced currents, large surface area, abundant food and good hiding spots make eelgrass beds excellent “nursery areas” for young fish (including salmon) and a variety of invertebrates
- Shelters small animals and plants from extreme temperatures during low tides.
- Decomposes to form the base of an important food web for the nearshore marine and estuarine ecosystems.
- Grows in the spring and summer then decays in the fall and winter.
- Grows blades up to 3 feet in length
- Is often used for shelter by Dungeness crabs in spring when molting and as juveniles.
- Is a substrate for herring eggs and a hiding place for juveniles.
- Is a resting and feeding place for juvenile salmon during outmigration.
- Eelgrass is not directly consumed by most of its inhabitants, but is an important feeding ground for many species that consume organisms attracted or attached to eelgrass.
- Brandt consume eelgrass as a nearly exclusive part of the diet and will also eat herring eggs on the eelgrass.

FORAGE FISH ARE INDICATOR SPECIES

Mason County's shoreline supports spawning beds for important forage fish, including Pacific herring, surf smelt and Pacific sand lance (also erroneously known as candle fish). As the name implies, the significance of forage fish is related to the critical role they play as a food source for a large variety of other marine organisms. Historically occurring in large numbers and being high in fat and protein these fish form a critical link in Puget Sound Food Web between zooplankton and larger predators such as salmon, seabirds, crabs, seals and even whales rely on this food source for sustenance.

The spawning grounds of surf smelt and Pacific sand lance are along the shallow marine shoreline and therefore, vulnerable to shoreline development. Pacific Herring spawn on eelgrass, making protection of the beds critical to their survival.

The vitality of the total forage fish resources in Washington is a valuable indicator of the overall health and productivity of our marine environment.

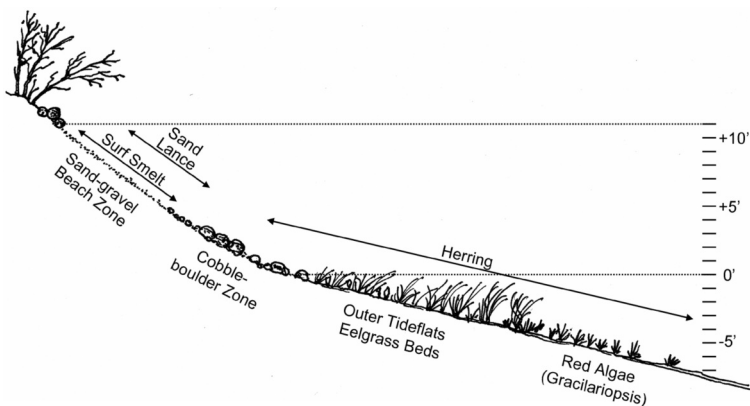


ILLUSTRATION: FORAGE FISH SPAWNING HABITAT ZONE OF SARATOGA PASSAGE and PORT SUSAN Source: Dan Penttila, Department of Fish and Wildlife

PACIFIC HERRING FACTS:

- Herring eggs may be deposited on eelgrass or seagrass between the upper limits of high tide to a depth of -40 feet, but most spawning takes place between 0 and -10 feet in tidal elevation in known locations.
- Herring spawn from late January through early April.
- Natural mortality for herring is quite high with approximately 50 to 70 percent of the adult herring from Washington falling to predation each year.
- Scoters (a marine duck) consume large amounts of herring eggs by stripping eelgrass of the attached eggs.

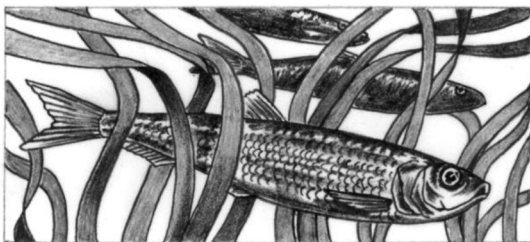


ILLUSTRATION: PACIFIC HERRING Courtesy: North Olympic Salmon Coalition and Deborah Cooper

SURF SMELT FACTS:

- Surf smelt spawn on the upper beaches with coarse sand and pea gravel.
- Surf smelt eggs are deposited and fertilized near the water's edge around the time of high slack water at a tidal elevation between +7.0 and mean high-high water line during spawning events.

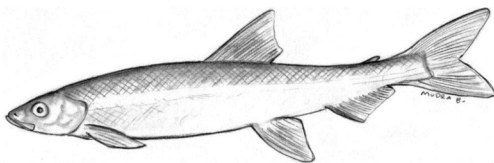


ILLUSTRATION: SURF SMELT Credit: North Olympic Salmon Coalition and Mudra Bergan.

DID YOU KNOW? Overhanging shade trees along the beach are vital to the survival of surf smelt eggs during the summer months. To encourage surf smelt spawning it is wise to preserve existing trees and/or re-forest sections of the shoreline where the marine forest has been removed during the course of development.

PACIFIC SAND LANCE (CANDLE FISH) FACTS:

- Up to 60% of a juvenile Chinook salmon's diet is sand lance.
- Sand lance deposit eggs on a rather broad range of beach substrates, from fine sand beaches to gravel beaches up to 3cm in diameter, but most frequently, they spawn on sandy beaches.
- Sand lance spawning occurs at tidal elevations ranging from +5 feet to about mean higher high water line.
- Sand lance feed in open water during the day and burrow into the sand at night to avoid predation.

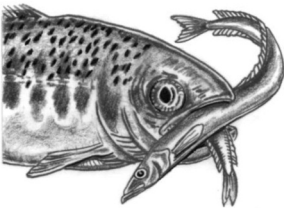


ILLUSTRATION: SALMON SMOLT EATING SAND LANCE Credit: North Olympic Salmon Coalition and Deborah Cooper

HELPFUL RESOURCES FOR PRESERVING EELGRASS BEDS AND FORAGE FISH SPAWNING HABITATS

Puget Sound Nearshore Ecosystem Restoration Restoration Project – Marine Forage Fishes in Puget Sound Technical Report.
www.pugetsoundnearshore.org/technical_papers/marine_fish.pdf

Washington Department of Ecology Eelgrass webpage
www.ecy.wa.gov/programs/sea/pugetsound/species/eelgrass.html

Washington Department of Natural Resources Eelgrass
Monitoring webpage
[www.dnr.wa.gov/ResearchScience/Topics/AquaticHabitats/Pages/
aqr_nrsh_eelgrass_monitoring.aspx](http://www.dnr.wa.gov/ResearchScience/Topics/AquaticHabitats/Pages/aqr_nrsh_eelgrass_monitoring.aspx)

If you would like to know if you have documented forage fish
spawning habitat, please contact the WSU Beach Watchers at
beachwatchers.wsu.edu or visit Washington Department of Fish
and Wildlife Salmonscape mapping website at
wdfw.wa.gov/mapping/salmonscape/index.html

Washington Department of Fish and Wildlife, *Protecting
Nearshore Habitat and Functions in Puget Sound: June 2010
Revised Edition*
wdfw.wa.gov/publications/00047/

Washington Department of Fish and Wildlife, *White Paper –
Overwater Structures: Marine Issues*
wdfw.wa.gov/publications/00051/

BIBLIOGRAPHY

1 – USE WATER WISELY

Water Conservation: Guidelines to Being Waterwise, available from Washington State Department of Health at 800-525-0127

California Urban Water Conservation Council: *H2Ouse.org*

2 – PROPERLY CARE FOR YOUR SEPTIC SYSTEM

Septic System Users Manual: Care and Feeding of your Onsite Sewage System. Mason County Public Health.

www.co.mason.wa.us/forms/Env_Health/septic_user_manual.pdf

3 – SAFE AND RESPONSIBLE PEST CONTROL

Washington State University Extension - Hortsense
pep.wsu.edu/hortsense/

National Pesticide Information Network

1.800.858.7378

npic.orst.edu

Grow Smart, Grow Safe Guide

www.lhwmp.org/home/gsgs/

4 – MANAGE WATER RUNOFF

Department of Ecology – Shorelands and Environmental Assistance

360-407-7472

<http://www.ecy.wa.gov/programs/sea/publications.htm> - to access the following publications:

- *At Home with Wetlands – A Landowners Guide*
- *Slope Stabilization and Erosion Control Using Vegetation*
- *Managing Drainage on Coastal Bluffs*
- *Managing Vegetation on Coastal Slopes*

5 – ENCOURAGE NATIVE PLANTS AND TREES

Gardening with Native Plants of the Pacific Northwest, Arthur Kruckeberg, University of Washington Press

Native Plants in the Coastal Garden, April Pettinger, Whitecap Books

Plants of the Pacific Northwest Coast, Jim Pojar and Andy McKinnon, Lone Pine Publishing

Landscaping for Wildlife in the Pacific Northwest, Russell Link, University of Washington Press

Spartina Eradication Program 2010 Progress Report, Washington State Department of Agriculture available at:
agr.wa.gov/PlantsInsects/Weeds/Spartina/docs/SpartinaReport2010.pdf

Managing Vegetation on Coastal Slopes, Department of Ecology. Vegetation management during site development to reduce the hazard of erosion and landslides.
www.ecy.wa.gov/programs/sea/pubs/93-31/intro.html

6 – KNOW THE PERMIT PROCEDURES FOR SHORELINE DEVELOPMENT

Puget Sound Shoreline Armoring: State of the Science Workshop
– available at:
pubs.usgs.gov/sir/2010/5254/pdf/sir20105254_intro.pdf

Below are valuable publications available to you from the Department of Ecology with their publication numbers. You may request copies online or by mail or phone.

Department of Ecology
Publication Distribution Center
360-407-7472
<https://fortress.wa.gov/ecy/publications/UIPages/Home.aspx>

Washington State Office of Regulatory Assistance, Environmental Permitting Services, #00-06-041

Frequently Asked Questions: Shoreline Master Programs, #09-06-029

Citizen Guide: Shoreline Master Programs, #12-06-003

Mason County Regulations:
<http://library.municode.com/index.aspx?clientId=16478>

7 – DEVELOP ON BLUFFS WITH CARE

Living with the Shore of Puget Sound and the Georgia Straight,
Thomas A. Terich, Duke University Press

The Coast of Puget Sound—Its Processes and Development,
John Downing, University of Washington Press

Below are valuable publications available to you from the Department of Ecology with their publication numbers. You may request copies online or by mail or phone.

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<https://fortress.wa.gov/ecy/publications/UIPages/Home.aspx>

Bluff Erosion Monitoring on Puget Sound: A Guide for Volunteers,
#98-122

Department of Ecology – Shorelands and Environmental
Assistance 360-407-7472

www.ecy.wa.gov/programs/sea/shorelan.html - Click on
“Publications” at the left of page to access the following
publications:

- *Slope Stabilization and Erosion Control Using Vegetation*
- *Managing Drainage on Coastal Bluffs*
- *Managing Vegetation on Coastal Slopes*

8 – USE SOFT ARMORING TECHNIQUES WHEN APPROPRIATE

Below is a DOE publication available to you with its publication number. You may request a copy online or by mail or phone.

Department of Ecology
Publication Distribution Center
360-407-7472

<https://fortress.wa.gov/ecy/publications/UIPages/Home.aspx>

Alternative Bank Protection Methods for Puget Sound Shorelines,
#00-06-012

9 – RESPECT INTERTIDAL LIFE WHILE ON THE BEACH AND BOATING

At the Sea's Edge: An Introduction to Coastal Oceanography for the Amateur Naturalist, William T. Fox, Prentice Hall

The Naturalist's Path: Beginning the Study of Nature, Cathy Johnson, Walker and Company

Seashore Life of the Northern Pacific Coast, Eugene N. Kozloff, University of Washington Press

The Natural History of Puget Sound Country, Arthur Kruckeberg, University of Washington Press

10 – PRESERVE EELGRASS BEDS AND FORAGE FISH SPAWNING HABITAT

Puget Sound Nearshore Ecosystem Restoration Restoration Project – Marine Forage Fishes in Puget Sound Technical Report.
www.pugetsoundnearshore.org/technical_papers/marine_fish.pdf

Washington Department of Ecology Eelgrass webpage
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Washington Department of Natural Resources Eelgrass Monitoring webpage
www.dnr.wa.gov/ResearchScience/Topics/AquaticHabitats/Pages/aqr_nrsh_eelgrass_monitoring.aspx

Washington Department of Fish and Wildlife, *Protecting Nearshore Habitat and Functions in Puget Sound: June 2010 Revised Edition*
wdfw.wa.gov/publications/00047/

OTHER RESOURCES

Puget Sound Partnership
360-464-1232
<http://www.psp.wa.gov/>

Washington Dept. of Fish and Wildlife:
360-902-2200
<http://www.wdfw.wa.gov>

Washington Department of Ecology
360-407-6000
<http://www.ecy.wa.gov>

Marine Biotoxin Hotline
800-562-5632
<http://www.doh.wa.gov/ehp/sf/biotoxin.htm>

Call 800-OILS-911 if you see a change in fish behavior, algae blooms, an oil spill or dead fish in or near Puget Sound.

SPONSORS

This booklet was produced through funding from the Puget Sound Partnership and Mason County.



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This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on the right side, suggesting it's resting on a surface.

For additional information on the Shore Stewards program, to get more booklets or to request a Shore Stewards presentation be made at an upcoming community event, please contact the WSU Mason County Extension office at 360-427-9670 ext. 680 or Cammy Mills, Shore Stewards coordinator, at cammymills@wsu.edu.

Additional Shore Stewards information available at:
<http://county.wsu.edu/mason/nrs/water/Pages/ShoreStewards.aspx>

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