



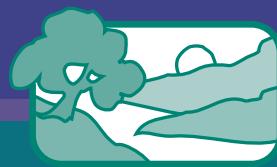
[www.islandstrust.bc.ca](http://www.islandstrust.bc.ca)

Islands Trust, 200-1627 Fort Street, Victoria, BC V8R 1H8  
Phone: 250-405-5151



Islands Trust

# Sharing Our Shorelines



Islands Trust

A close-up photograph of a Great Blue Heron standing in a field of tall, golden-brown grass. The heron's long neck is extended upwards and slightly to the right, its head turned to look towards the horizon. Its feathers are a mix of blue-grey on top and white/tan below. The background is a soft-focus view of a body of water under a clear sky.

We play an important role in the protection and preservation of the local environment. We share this place with thousands of marine animals.

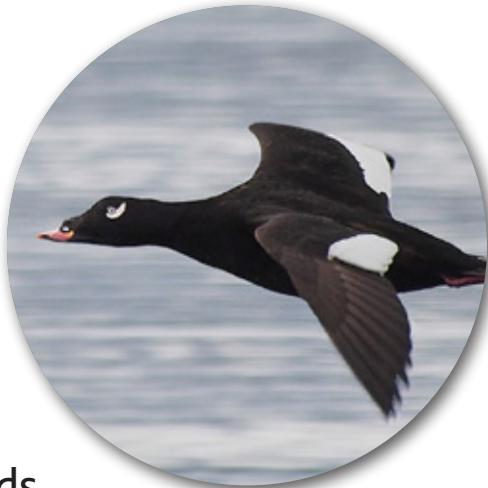
Our choices and stewardship actions can benefit the environment enriching our enjoyment from going fishing, beach combing or watching killer whales.

## Values and Views Island Trust Communities

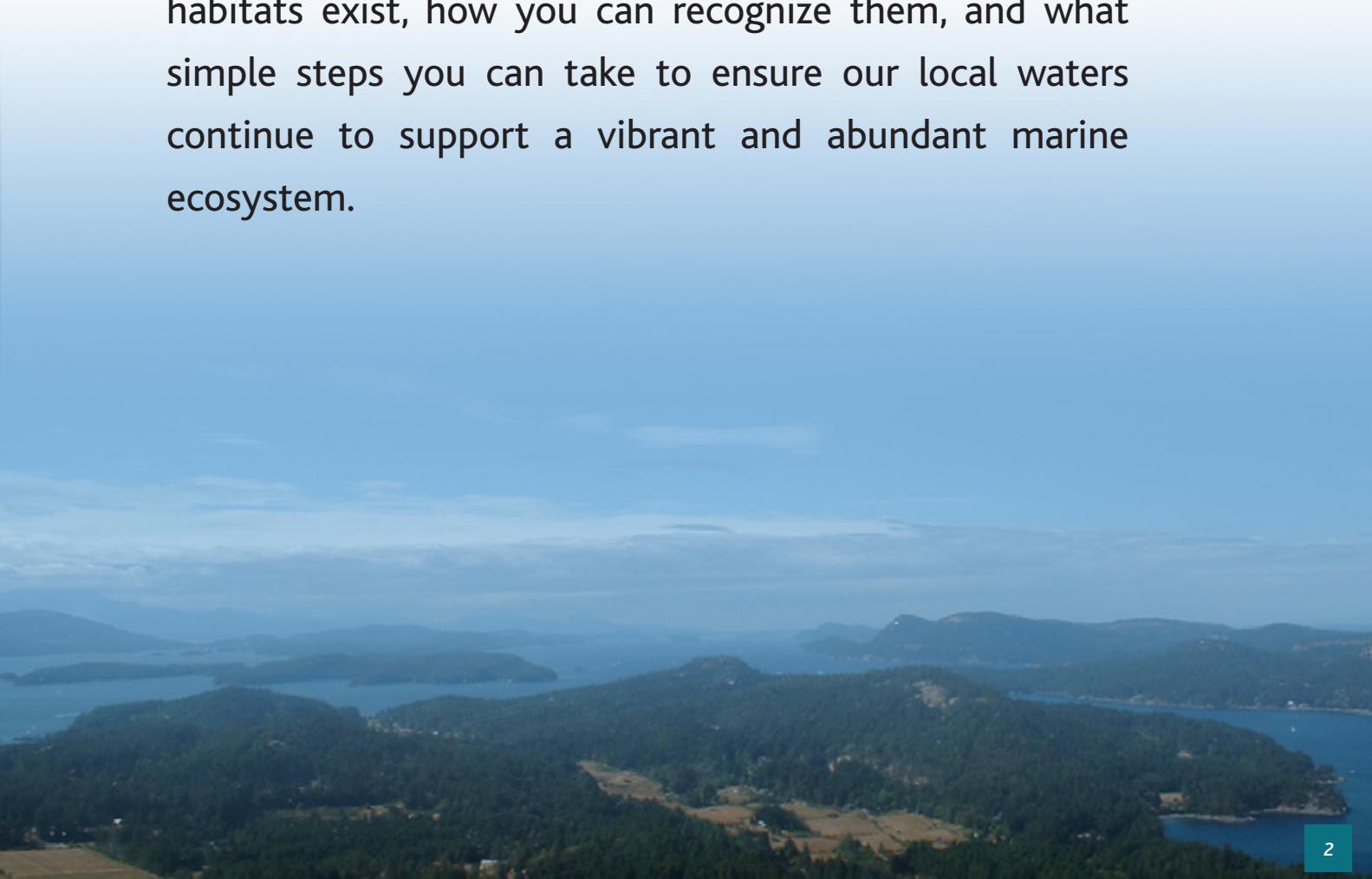
# Marine By Nature

The Islands within the Salish Sea have been shaped by ancient glaciers and modern oceanic forces. Whether you visit the islands seasonally or live here year round, Islanders treasure the marine environment.

The North Pender Local Trust Committee has developed this brochure to introduce you to where sensitive marine habitats exist, how you can recognize them, and what simple steps you can take to ensure our local waters continue to support a vibrant and abundant marine ecosystem.



*Above:*  
White Winged  
Scoter in flight





## Big Issues, Big Impacts

# Clean Water

As long as water moves downhill, the oceans will be the final receiver of pollution.

Untreated storm-water pollution, oil and gas from cars and boats, and sewage decreases water quality and harms wildlife. Landscaping and land clearing deposits sediment into the ocean, clogging fish gills and reducing marine vegetation growth. Docks and marinas block sunlight necessary for marine life survival.

Excessive nutrient loading from fertilizers and sewage stimulates growth of bacterial mats coating the sea bed and algae that smothers eelgrass. In summer, warm surface waters combined with nutrient loading can decrease oxygen available for fish.

*Actions we take now  
can safeguard marine life  
for next generations.*



Top Left:  
Rockfish in  
eelgrass

Middle Left: Shrimp in  
eelgrass

Top Right: Dungeness Crab

Bottom Right: Kayaker

Bottom: View from  
Medicine Beach



### Shoreline Stewardship Principles

- Use eco-friendly cleaners
- Maintain shoreline vegetative buffers
- Use gravel for driveways to reduce storm-water run off
- Stop oil/fuel leaks from cars and boats
- Keep lawn trimmings off the beach
- Eliminate or reduce pesticide and fertilizer use
- Use bilge pads and retire 2-stroke boat engines
- Maintain septic systems and use pump-out stations for boat sewage
- Support the use of neighbour-shared docks or community docks
- Use mooring devices located away from sensitive habitats
- Reduce dock impacts by using light-penetrating panels or open grating



## Big Issues, Big Impacts

# Shoreline Erosion

Shorelines are constantly changing. Sediment erosion and transport from the land and rivers create the very beaches we cherish.

Removing shoreline vegetation and fighting shoreline erosion by armouring beaches disrupts natural shoreline processes and harms marine ecosystems. Seawalls can increase beach erosion rates and block sediment transport to the beach. Deflected waves scour away fine sediment and reflected energy creates more waves potentially causing seawalls to fail.

Over time, beaches become too steep or coarse for people to enjoy. Armouring and shoreline vegetation removal degrades habitats for fish spawning, eelgrass beds and shellfish beds.

Nature is the ultimate shoreline engineer. Shoreline protection measures mimicking nature are a better option than hard armouring. Soft-shore engineering methods rebuild high-tide beaches using nature's design.

Natural materials such as gravel and sand, logs, and root masses absorb wave energy, protecting spawning beaches, eelgrass beds, and real estate values. If you must use hard armouring, set these structures back from the high water mark. Consider predicted sea level rise estimates when designing shoreline protection measures in your community.



Above:Seawall Below: Natural shoreline



### *Shoreline Stewardship Principles – Use Nature’s Erosion Controls*

- Maintain shoreline vegetative buffers to control erosion
- Trees are your defence against erosion. Trim or limb trees to stabilize bank and slope soils and improve your view
- Think twice about seawalls. Use soft-shore erosion protection methods that work with nature to protect your waterfront

### *Decrease Your Footprint*

- Locate piers, docks and mooring devices away from sensitive habitats
- Protect sensitive marine habitats when modifying your waterfront
- Take action on climate change issues
- See [www.ecy.wa.gov/puget\\_sound/index.html](http://www.ecy.wa.gov/puget_sound/index.html) and [www.greenshores.ca](http://www.greenshores.ca) for information about protecting your property.

# Coastal Bluffs and Shoreline Beaches

## Ice Age Legacy



### What are Coastal Bluffs and Shoreline Beaches?

Coastal bluffs and shoreline beaches are dynamic habitats where erosion is the rule. Bluffs are the product of ice-age sediment movement, entrapment and recent exposure and erosion. Glacial sediment from feeder bluffs, streams and creeks form pebble/sand beaches.



Erosion of coastal lands and watersheds provide the very sediment that make up the beaches we treasure for our views and coastal access.

*Above:*  
Naturally eroding  
bluff

*Below:*  
Pebble/sand  
shoreline



### Where are bluffs and beaches located?

Feeder bluffs and shoreline beaches are frequently encountered along our island shores.



### Why are bluffs and beaches important?

Erosion is a natural process supplying gravel/sand sediments that create shoreline beaches. These beaches provide people with numerous recreational activities and habitats important to the marine food web.

Along high beach lines, these pebble/sand nurseries are spawning habitats for beach spawning forage fish. These small feeder fish are critical to the survival of fisheries and thousands of fish, bird, and marine mammal predators. Pebble/sand beaches are important areas for burrowing worms and clams, early life stages of some marine invertebrates and migratory bird feeding areas.

### Protecting bluffs and shoreline beaches

Bluffs erode and slump because of build-up of water in the soil usually due to development. Hard armouring at the base can actually increase erosion of these land forms. Trapping sediment behind seawalls and piers can cause beaches to degrade over time.

- Set back – Keep buildings back from the bluff or shoreline edge
- Maintain vegetation and manage drainage of waste/storm water
- Use gravels instead of paving driveways
- Use soft-shore erosion protection methods (not hard seawalls) to protect your waterfront.



## Shorelines Connect – Linking The Land And The Sea

# Marine Riparian Vegetation



### What is Marine Riparian Vegetation?

The term “marine riparian” vegetation refers to grasses, shrubs, trees and logs lining marine shorelines. Marine riparian zones link the land and the sea through the exchange of water, sediments and nutrients.



### Where is Marine Riparian Vegetation located?

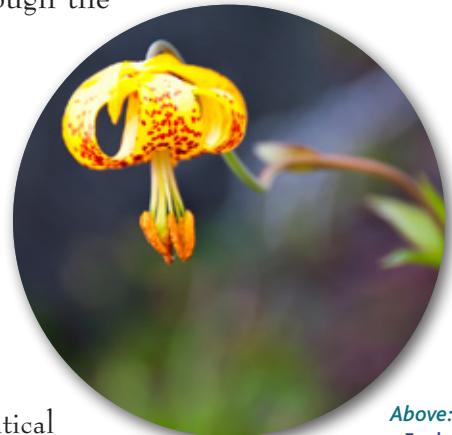
Vegetation above the high water mark, within “backshore” areas such as private shoreline properties, on bluff tops and slopes form the marine riparian zone.



### Why is Marine Riparian Vegetation important?

Insects captured by the winds as “wind fall” from shoreline vegetation are critical for young salmon growth. Removing overhanging shoreline vegetation from summer surf smelt spawning beaches causes embryos to die. Vegetation removal reduces key prey for juvenile salmon and can reduce surf smelt populations. Fish losses affect the entire food web. Vegetated buffer zones are a wildlife migratory corridor and leaf litter provides nutrients to stimulate marine plankton growth.

Maintaining shoreline vegetation is a net benefit to property owners as a free “ecosystem service” limiting erosion and stabilizing slope soils. Trees and shrubs absorb large volumes of rain water and filter pollutants. Vegetation removal may cause large sediment loads to enter the ocean limiting light for eelgrass growth and clogging fish gills.



**Above:**  
Eagle  
Bluffs Flower

**Below:**  
Roots stabilize  
slopes



### Protecting Marine Riparian Vegetation Functions

- Provide for marine riparian buffer zones (setbacks) from the high water mark
- Trim or limb trees to stabilize bank and slope soils and improve your view
- Maintain native plant species and minimize lawns

# Land Sea Connections

## Intertidal Habitats

### Q What are Intertidal Habitats?

Marine shoreline areas exposed by the tides create a unique environment. Rocky shores, sandy/pebble beaches, estuaries, mud and sand flats are constantly molded by ocean waves and currents. Intertidal habitats are biodiversity hotspots making our Pender shorelines home to one of the richest biological systems in the Salish Sea.



Above:  
Black  
Oyster Catcher

Below Left 1:  
Seastars

Below:  
Giant Green  
Anemone

### Q Where are Intertidal Habitats Located?

Uncovered by the tides twice a day, intertidal zones occur along marine shorelines. Living by the sea, our neighbours are marine creatures like crabs, barnacles and seastars.

### Q Why are Intertidal Habitats important?

Home to hundreds of marine species, intertidal habitats connect foodwebs from the land to the ocean abyss. Year-round residents include your favourite tide pool anemones and hermit crabs. Black oyster catchers feed and nest along rocky shorelines. Great Blue Herons and eagles stalk their prey along the water's edge. Sandy/pebble beaches provide spawning areas for forage fish.



Burrowed within the sand grains, Pacific sand lance, clams, worms, and amphipods attract many predators. Salt-tolerant grasses line vibrant estuary shores, essential nurseries for salmon and countless bird and fish species.

Following ancient flyways, shorebirds gorge on prey hiding beneath the sandy surface then begin marathon migrations to nesting grounds. When the tide is in, massive Grey whales feast on animals living within mudflat sediments. Juvenile salmon feed along these shores before undertaking their oceanic journey. The intertidal zone supports wildlife and our wild fisheries.

### Fragile by nature: Protecting Intertidal Habitats

- Tread lightly and carefully explore tidepools and under rocks
- Be aware of bird nesting times and locations
- Participate in local shoreline clean ups or monitor intertidal diversity with your local Straitkeepers team
- Consider a conservation covenant for your property
- Follow shoreline stewardship principles
- Follow a “greenshores” approach to protect property
- Ensure dock structures are elevated and are planned to reduce negative impacts on the environment





# Marine Shorelines are Critical Fish Habitats

## Beach Spawning Forage Fish

When we think of spawning habitat for fish, we generally think of salmon spawning on gravel beds in rivers. Have you ever seen surf smelt leaping at high tide?

On the very pebble-sand shorelines we like to walk along, surf smelt and Pacific sand lance deposit spawn near the log line. Herring eggs can also be found from mid-intertidal to deeper waters.

Forage fish species like surf smelt, Pacific sand lance (needle fish) and herring form the cornerstone of marine food webs. These small feeder fish are critical to the survival of fisheries and thousands of predators from fish, birds and marine mammals.

### From sand grains to salmon, it's all connected!

A healthy spawning beach has an intact marine riparian buffer zone, overhanging shade vegetation, a supply of pebble and sand and clean water. These spawning areas are in a zone highly vulnerable to human activities.

Shade from overhanging marine riparian vegetation keeps summer surf smelt eggs moist. Removing shoreline vegetation increases temperatures within the spawning gravel. On hot summer days, these eggs can't survive.

Hardening and altering shorelines degrades and destroys spawning habitat. Seawalls block sediments from reaching the beach and wave scouring removes pebbles and sand. Boat ramps and breakwaters interrupt sediment flow along beaches until these areas become starved of fine sediments.

### DID YOU KNOW?

The diets of salmon and rockfish are comprised mainly of these feeder fish, with sand lance making up at least 50% of the diet of adult Chinook. Chinook are a critical food source for resident orca populations. From little fish, big fish grow!

### Protecting Critical Fish Habitats

- Maintain shoreline vegetation
- Use soft-shore alternatives to protect waterfronts
- Set erosion protection back from the high water mark
- Manage storm-water runoff
- Join a local forage fish monitoring program
- Take action on climate change issues



Above:  
Surf  
smelt and Pacific  
sand lance

Below:  
PICA Forage Fish  
Monitoring Volunteers

Bottom Right:  
Spawning  
Surf Smelt



## Vital Marine Nurseries

# Eelgrass Habitats



### What is eelgrass?

Eelgrass, *Zostera marina*, is a true flowering plant, not a seaweed, and needs clean water and ample light. Eelgrass meadows generate food and provide habitat for an astonishing diversity of marine life.



Above:

Eelgrass bed

Bottom Left:

Juvenile Copper

Rockfish

Bottom:

Eelgrass bed



### Where is eelgrass located?

Eelgrass grows along protected shorelines of bays, inlets and estuaries. Within just meters of the shoreline, look for the long emerald green blades draping the ocean surface at lower tides. Eelgrass grows close to the low tide line to depths of 15-20 meters and blades can be up to 2 meters in length.



### Why are Eelgrass Habitats Important?

Eelgrass beds support hundreds of marine species using this habitat as a nursery and rearing ground, including crabs, salmon and rockfish. In spring, eelgrass blades are heavy with herring eggs. Other marine animals are unique to eelgrass beds such as the bay pipefish and eelgrass nudibranch. Canada and Brandt geese consume eelgrass blades while the Great Blue Heron stalks prey hiding within the meadow. Eelgrass habitat supports numerous BC fisheries.

Decomposing eelgrass and seaweeds are an ocean fertilizer, recycling nutrients to refuel marine food webs from the intertidal to the deep sea. Eelgrass protects shorelines by buffering waves and stabilizing sea floor sediments. Marine vegetation like eelgrass is an efficient carbon sink, protecting our entire planet.



### Protecting Eelgrass Habitats

Shading and physical disturbance damages eelgrass. Excessive nutrients, polluted water and rising ocean temperatures are detrimental to eelgrass health.

- Reduce the size and number of docks and locate them away from eelgrass beds
- Use light-penetrating panels or open grates in dock construction
- Anchor outside eelgrass beds and use mooring cans and public docks
- Use oil-absorbing bilge pads and pump-out vessel sewage.
- Manage upland water quality

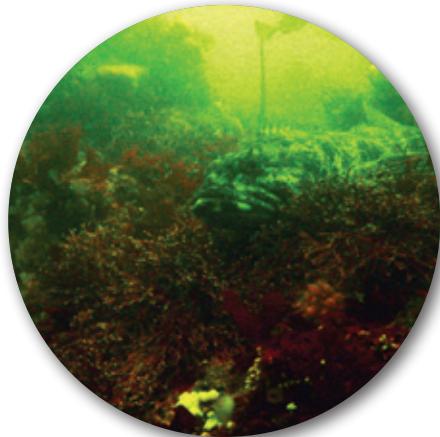
## Ocean Oasis

# Kelp Forests and Rocky Reefs



### What are Kelp Forests?

Kelp forests are canopy-forming seaweed communities attached to rocky shores extending from the sea floor to the water surface. Lesser Giant Kelp and Bull Kelp form the canopy at the ocean surface with their lush, thick blades. Below the canopy, more seaweed species add to the kelp forest community. As brown seaweeds, or “macroalgae”, kelps contribute to the base of the food web. Kelps are among the fastest growing organisms in the sea.



Above:  
Lingcod on reef

Below:  
Purple sea urchin

Below:  
Bulk kelp



### What are Rocky Reefs?

On the seafloor, rocky reefs provide habitat where giant octopus, rockfish and wolf eels set up house for their entire lives. Here lingcod tend egg masses and hunt prey under the watchful eye of hungry marine mammals. Rocky reefs provide essential attachment sites for kelp forests.



### Where are Kelp Forests and Rocky Reefs located?

Kelp forests are located along rocky shorelines in the subtidal zone throughout BC's marine waters. Bull Kelp is more tolerant to wave exposed areas while Lesser Giant Kelp thrives in more protected waters. Attached to boulders and rocky reefs, these giant kelps grow to at least 10-20 m from the sea floor to the water's surface.



# Ocean Oasis



## Why are Kelp Forests and Rocky Reefs important?

Kelp forests support a complex food web and provide a safe habitat for marine wildlife. Biodiversity treasure troves, kelp forests teem with life.

The survival of the endangered sea otter is directly linked to kelp beds as they sleep and hunt among the Lesser Giant Kelp canopy. Grey whales feed on tiny mysids hiding on the kelp forest floor. Sea lions and killer whales patrol the reef/kelp forest boundaries for their prey. An ocean oasis, kelp forests and rocky reefs help to colonize the ocean as animals transit the rich kelp habitat. Many rockfish species are "homers" living their entire lives on a particular reef habitat.

Kelp forest and rocky reef productivity support fisheries and tourism-based economies. Kelp is a rich source of food, pharmaceutical and health products. Kelp beds protect shoreline beaches and water-front properties from wave-induced erosion.



Above:  
*Tiger Rockfish*

Right:  
*Kelp forest canopy*

Below:  
*Opalescent nudibranch*

## Protecting Kelp Forests and Rocky Reefs

Kelp forests need clean water and light to survive. Keeping our ocean waters clean and limiting damaging human activities is important. Climate change is drastically affecting ocean habitats.

- Protect water quality by managing uplands waste water systems.
- Avoid kelp forests when boating
- Use oil-absorbing bilge pads
- Locate docks and mooring devices away from kelp and reefs.
- Avoid anchoring in these sensitive areas
- Respect rockfish conservation areas.
- Take action on climate change issues



# Marine Shorelines as Critical Fish Habitats

## Salmon Circle – Linking the Land and the Sea

Salmon are iconic symbols of British Columbia and an example of the interconnectedness of the land and the sea.

Starting their lives in freshwater rivers bounded by forests, migrating to estuaries and growing at sea – protecting the salmon circle of life depends on public will. The very waterfront property that you have worked so hard to own feeds salmon. Shorelines are a salmon migratory highway, providing a key habitat linking the land and the sea.

We aren't the only ones who enjoy a picnic at the beach. Tree-dwelling insects transported by winds to the ocean surface link coastal forest, marine riparian vegetation and marine food webs. At high tide, juvenile salmon can be found dining on tasty insects and other prey beneath bent hemlock, arbutus, and alder branches lining the salmon highway.

Marine riparian buffer zones help salmon by keeping water filtered of pollutants and high in oxygen. Stable backshore soils control erosion rates keeping water sun-lit, high in oxygen and free of gill-fouling silts.

### Healthy Shorelines are Critical Salmon Habitats

Salmon, especially Chinook, are heavily dependent on smelts, sand lance and herring. These forage fish spawn within metres of the high-tide line. Without these critical forage fishes, thousands of predator species would suffer, from salmon to killer whales.

### Fewer little fish mean fewer big fish!

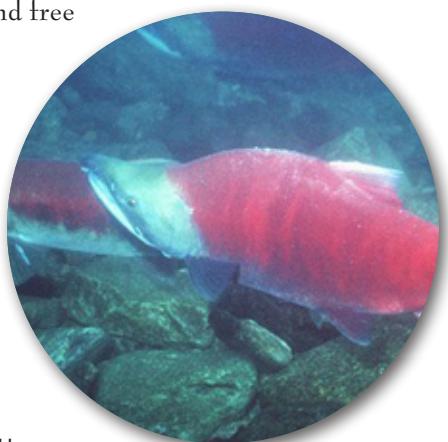
Kelp forests are home to rockfish, abalone and, among others, the charismatic sea otter. Kelp forests provide salmon with rich food resources and a hiding place from predators.



Above:  
*Juvenile salmon smolts*

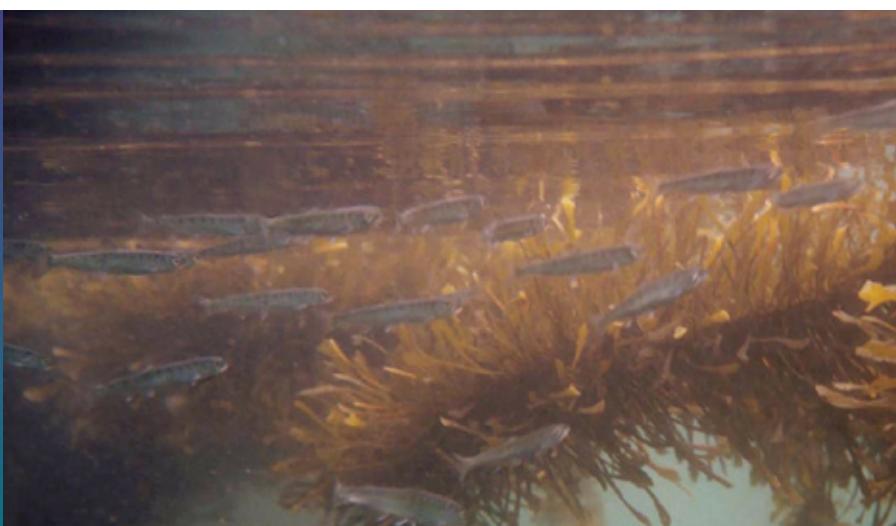
Below:  
*Spawning salmon*

Bottom:  
*Juvenile salmon smolts feeding at high tide*



#### DID YOU KNOW?

*Tree-dwelling insects, or windfall prey, transported to the ocean surface by winds make up to 50% of the diet of juvenile Chinook. Chinook are critical prey for resident killer whales.*





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Photo Credits: Front and Back Cover: Islands Trust Fund (Medicine Beach), Ramona de Graaf (seastar) Page 2: North Pender (A. Neudorf), • Page 3: Rockfish in eelgrass (Sharon Jeffery), Shrimp in eelgrass (S. Jeffery), Dungeness Crab (Rick Harbo), Kayaker (R. de Graaf), Medicine Beach (R. de Graaf) • Page 4: Seawall and North Pender Beach (R. de Graaf) • Page 5: Eroding bluff and Pebble/sand shoreline (R. de Graaf) Page 6: Roots stabilize slopes and vegetated shoreline (R. de Graaf) • Page 7: Black oyster catcher (Siobhan Gray), Seastars (R. de Graaf), Giant green anemone (S. Gray) • Page 8: Rocky intertidal seaweeds (R. de Graaf) • Page 9: Surf smelt and Pacific sand lance (Kurt Perry), Pender Island Conservancy Association Volunteers (Davy Rippner), Spawning Surf Smelt (K. Perry) • Page 10: Eelgrass bed underwater (Tom Lightfoot), Juvenile copper rockfish (S. Jeffery), Eelgrass beach (R. de Graaf) • Page 11: Lingcod on reef, Purple sea urchin, Bull Kelp (S. Gray) • Page 12: Tiger rockfish, nudibranch, Opalescent nudibranch (S. Gray) • Page 13: Juvenile salmon smolts (A. Shaffer), Spawning salmon, Juvenile salmon smolts in seaweed • Page 14: Bull Kelp (S. Gray)