

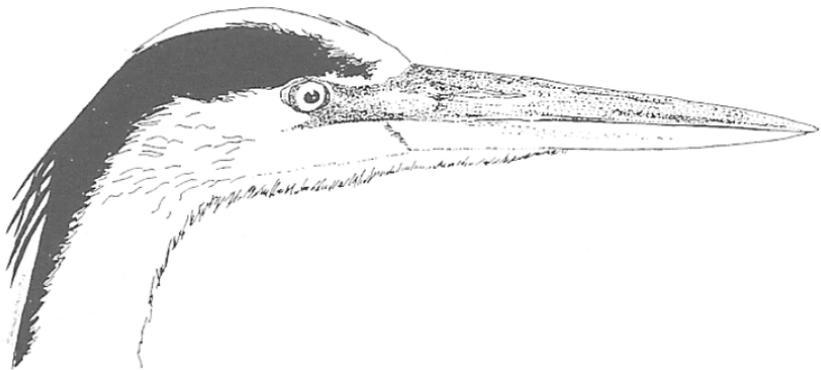
The Yaquina Estuary & Its Inhabitants

HATFIELD MARINE SCIENCE CENTER



“**I**n the end, we will conserve only what we love, we will love only what we understand, and we will understand only what we are taught.”

—Baba Dioum, Senegalese philosopher



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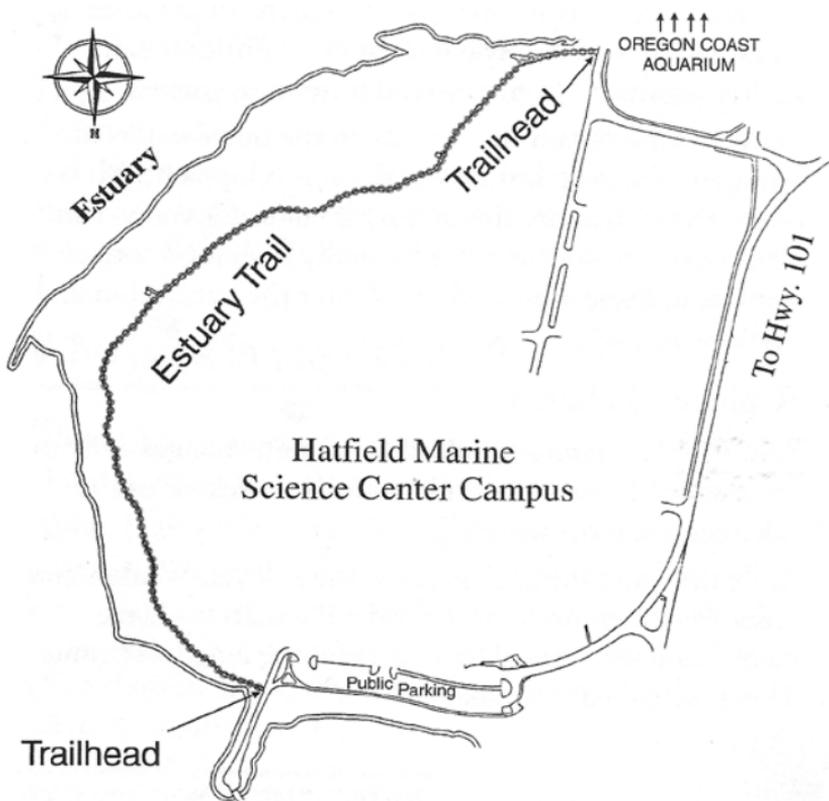
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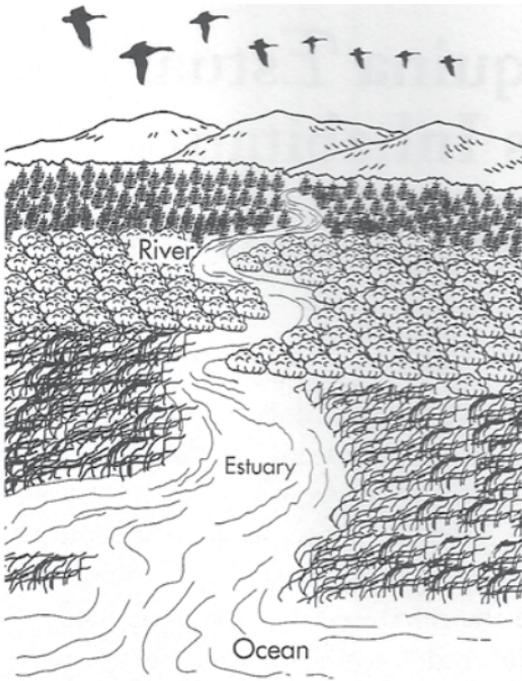
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The Yaquina Estuary and Its Inhabitants

A Trail Guide

The Hatfield Marine Science Center (HMSC) invites you to take a one-mile walk along our nature trail. This trail follows the bay side of the Marine Science Center along the Yaquina Estuary and ends near the Oregon Coast Aquarium. The trailhead is located in the northeast corner of the HMSC public parking lot.





What is an estuary?

A place where freshwater and saltwater meet

Here in Yaquina Bay, high tide brings saltwater from the ocean to mix with freshwater flowing down the Yaquina River.

A place that provides shelter

A haven from ocean waves and turbulent river currents, an estuary is a relatively calm environment that can shelter organisms from powerful water movements.

Many marine organisms depend on the quiet waters of estuaries at some point during their development. Most often, these areas are the nursery grounds for young fish. The young benefit from the naturally high food concentrations in these areas and the shelter the vegetation and shallows provide.

A place of change

Salinity, the amount of salt in the water, changes daily in the estuary. During high tide, salinity increases; as the tide recedes, it decreases.

Daily tides also bring changes in water level. While some areas are always under water, tidal fluctuations leave many habitats exposed to air for varying lengths of time. These are called intertidal areas.

A place that provides food

The estuary is inhabited by trillions of single-celled, microscopic plants and animals. These tiny creatures are referred to as “plankton” and are the basis of the food chain and for all life in the oceans.

As these plankton grow, they become food for larger organisms, especially shrimplike copepods, which, in turn, become food themselves for even larger grazing and filter-feeding animals, such as oysters and fish.

Another nutritious food source is detritus. Detritus is formed when vegetation in the estuary dies and bacteria breaks down the decaying matter into smaller bits and pieces which get carried around by tides and currents. Detritus also comes from the Yaquina River. As the river flows into the estuary, it slows and deposits its load of decaying plant and animal matter. The detritus is eaten by fish, clams, and worms, which are then eaten by larger fish, seals, or birds in a complex food web that also includes humans.

How productive is the estuary?

The combination of a large supply of nutrients from the river and the ocean, an abundance of detritus, and the constant mixing that occurs due to tides and currents contributes to estuaries being among the most biologically productive places on earth.

Who lives in the estuary?

Shorebirds, waterfowl, clams, shrimp, and fish are some of the many animals that live in the Yaquina estuary.

Animals and plants that live in the estuary are uniquely adapted, or suited, to life in an environment where water level and salinity change with every tide. Some fish adapt by leaving the upper estuary when salinity is low. Clams close their shells tightly at low tide, protecting themselves from drying out.

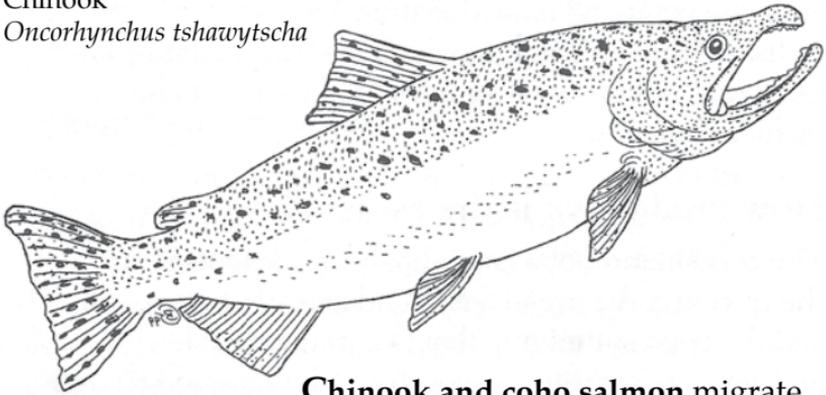
How many different habitats are found in the estuary?

Within an estuary, there are four habitats: open water, eelgrass beds, tideflats, and salt marshes. A fifth habitat, the uplands, is the land adjacent to the estuary.

OPEN-WATER HABITAT

Never exposed by the tides, the open water is a deep water habitat. Fish, seals, sea lions, and occasionally whales move into this habitat from the ocean, seeking food and shelter from predators.

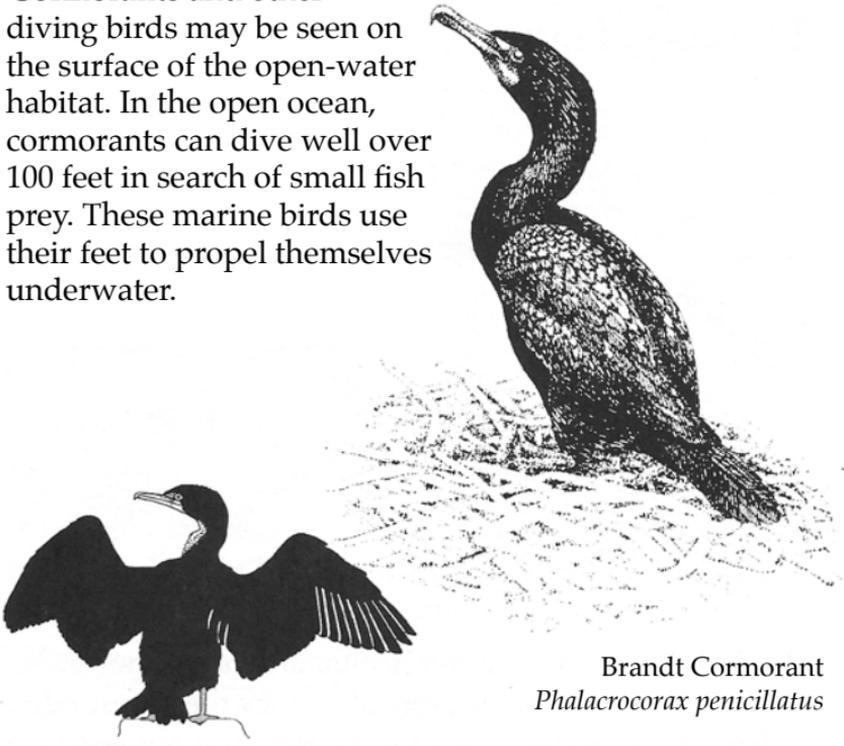
Chinook
Oncorhynchus tshawytscha



Chinook and coho salmon migrate through the open-water habitat and into the Yaquina River and its tributaries to spawn. Juveniles return through the open-water habitat to salt marsh channels in the estuary where they feed and seek shelter from predators. Young salmon may spend up to a few months in the estuary before moving to the ocean.

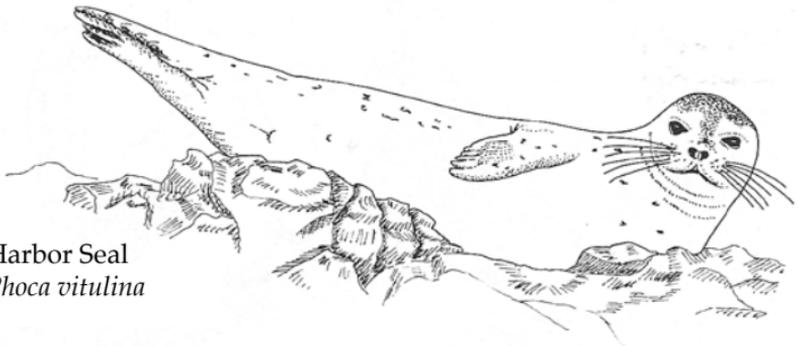


Cormorants and other diving birds may be seen on the surface of the open-water habitat. In the open ocean, cormorants can dive well over 100 feet in search of small fish prey. These marine birds use their feet to propel themselves underwater.



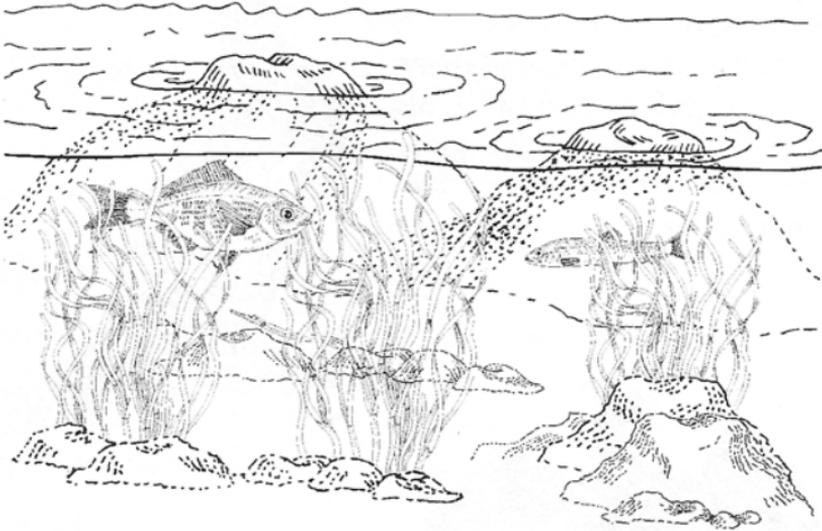
Brandt Cormorant
Phalacrocorax penicillatus

Harbor seals are often seen in estuaries, either resting along the shore or feeding in the open-water habitat. Food for this marine mammal can include fish, crustaceans, mollusks, and cephalopods.



Harbor Seal
Phoca vitulina

EELGRASS HABITAT

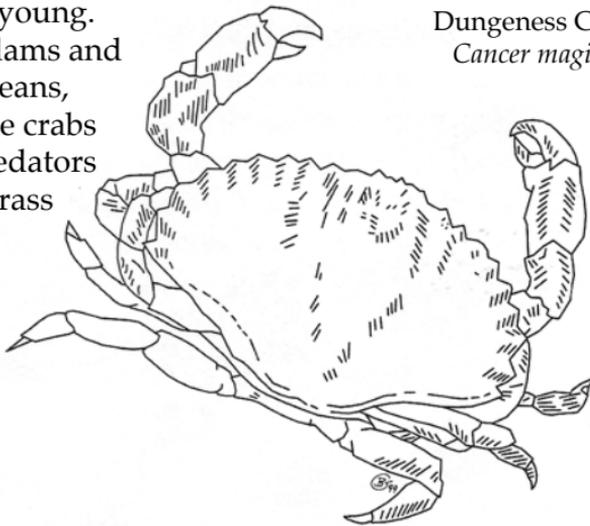


Adjacent to the open-water habitat are the eelgrass beds, a wetland habitat that is exposed only by the lowest tides. Eelgrass forms dense, underwater meadows—nurseries that provide shelter and food to many juvenile fish and shellfish.

Who lives in the eelgrass beds?

Dungeness crabs hatch in the ocean and move to shallow water and estuaries when they are still very young. Feeding on clams and small crustaceans, many juvenile crabs hide from predators in dense eelgrass beds.

Dungeness Crab
Cancer magister

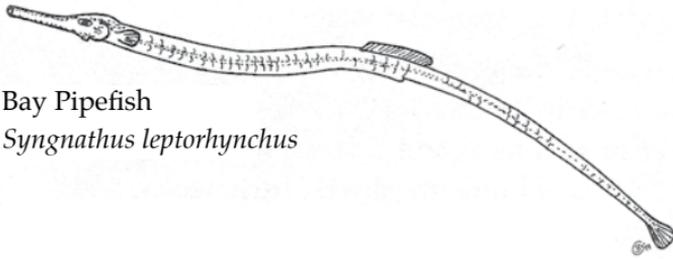


Pacific herring enter the Yaquina estuary in February to spawn. Females produce up to 30,000 sticky eggs that adhere to eelgrass, seaweed, and rocks. The eggs hatch in 10 days and the estuary becomes a nursery for the young herring that remain there through the fall.

Pacific Herring
Clupea pallasii



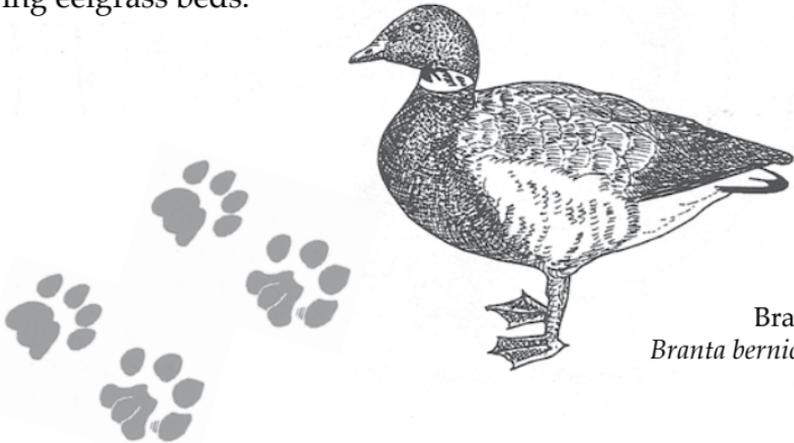
Bay pipefish are well camouflaged in eelgrass beds, where they spend much of their lives. The breeding season for pipefish begins in February, and it is the male that carries the eggs in a brood pouch on his underside.



Bay Pipefish
Syngnathus leptorhynchus

The **brant** is a small goose that winters in the Yaquina estuary. Eelgrass constitutes about 80 percent of the diet of these birds. Dredging and other human activities have reduced the amount of eelgrass in west coast estuaries.

Healthy brant populations depend on preserving remaining eelgrass beds.



Brant
Branta bernicla

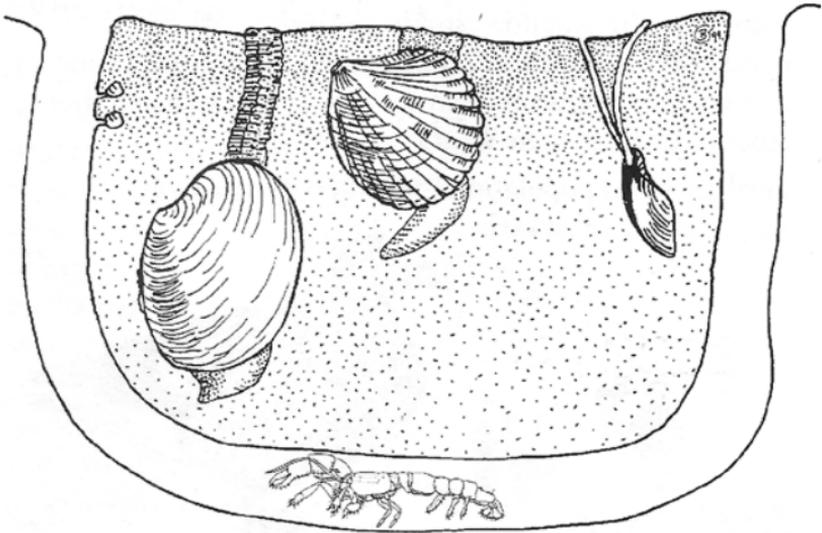
TIDEFLAT HABITAT

At low tide you will see the tideflats. Although tideflats appear barren from a distance, a close view reveals the myriad organisms that make a home in this wetland habitat.

Who lives in the tideflat?

The **ghost shrimp** lives in a burrow it digs in the sediment. The ghost shrimp is a deposit feeder; it swallows sediments and digests the thick coat of bacteria living on mud particles. **Worms, pea crabs, and clams** take advantage of the shrimp's hard work and also live in the burrow. The freeloaders feed on the shrimp's leftovers or filter plankton and detritus from the water.

Many of Oregon's **clam** species live in the estuary. Extending their fleshy siphons to the surface, most clams feed by filtering plankton and detritus when the tide is high. The tideflat is home to **gapers, littlenecks, and soft-shell clams**, among others.

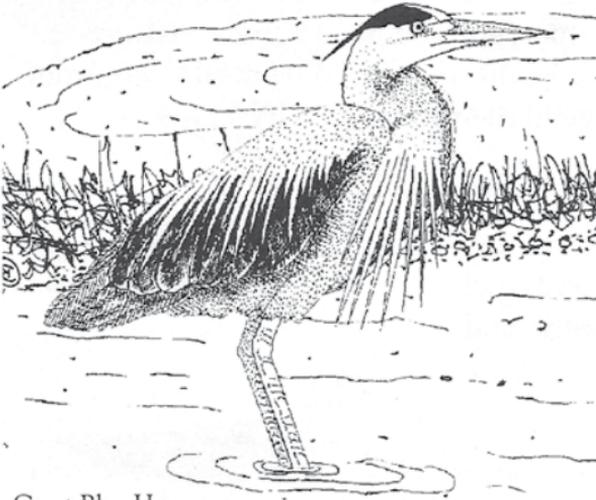


Underwater Burrow with a Ghost Shrimp, Clams, and a Pea Crab

While clams come in many sizes, we can determine the age of some by counting growth rings on the shell, much the same as counting rings on a tree.

Fish and Birds

When the tide is high, fish such as **starry flounder** and **sanddabs** migrate over the tideflats from nearby habitats to feed. The opportunity for dinner is not lost on **great blue herons**, large birds that can be seen wading on the tideflats in search of fish. The heron's long, crooked neck



Great Blue Heron
Ardea herodias

allows it to strike quickly at passing fish to grab them with its strong bills.

In the past, vast areas of mudflat habitat were covered by the material from dredging activities. The remaining mudflats

are under pressure by encroaching development in many estuaries around the globe.





BIRDS OF THE OPEN WATER, EELGRASS BEDS, AND TIDEFLAT HABITATS

Millions of birds migrate annually along the Pacific Coast, flying from Arctic breeding grounds to wintering areas in the south. Calm, protected estuaries and other wetlands provide vital rest stops, and the highly productive estuaries supply many birds with the food they need to continue their journey or spend the winter.

Shorebirds

At low tide, look over the tideflats for shorebirds such as **sandpipers**, **dunlins**, and **whimbrels**.



Whimbrel
Nemienias phaeopus



Dunlin
Erolla alpina

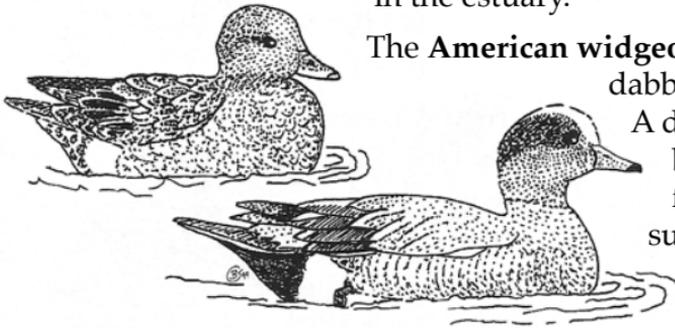


Western Sandpiper
Ereunetes mauri

Sandpipers use their bills to collect animals on or just below the surface. Even the whimbrel, with its long bill, also gathers its food from the surface or just below, feeding on crabs, marine worms, and even berries at times of the year.

Waterfowl

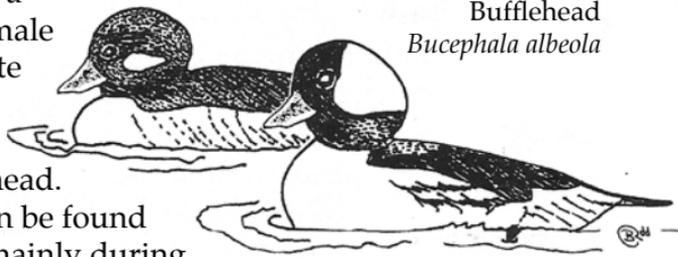
While swans are rare in the Yaquina estuary, **ducks** and **geese** are common here from September through May and can be seen on the surface of any submerged habitat in the estuary.



American Widgeon
Mareca americana

The **American widgeon** is a dabbling duck. A dabbler feeds by tipping forward and submerging its head and neck to reach for underwater food, generally plants and small invertebrates.

The **bufflehead** is one of the smallest ducks, with a large, puffy head and a short bill. The male has a great white patch from its eye around to the back of its head. These ducks can be found in the estuary mainly during the winter. They eat small crustaceans, mollusks, snails, insects, and some aquatic vegetation. When feeding in small groups, one sentry usually stays on the surface, while the others dive.



Bufflehead
Bucephala albeola

UPLAND HABITAT

The habitat next to the estuary, the uplands, begins where the highest high tide of the year stops.

Most of the HMSC trail passes through upland habitat. While spring and summer are the best times to see flowers along the estuary, many of the perennial plants are easily identified throughout the year.



Foxglove
Digitalis purpurea

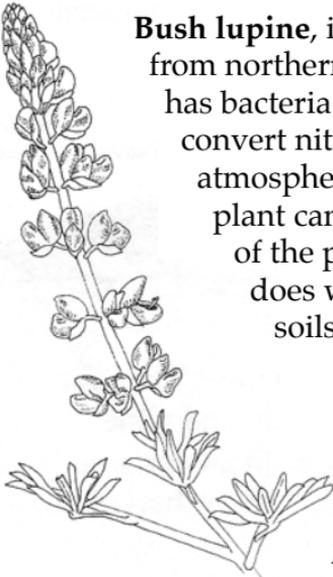
Yarrow can be seen blooming from June through September.

Native Americans used this aromatic plant as a tea and used strong solutions of yarrow medicinally.



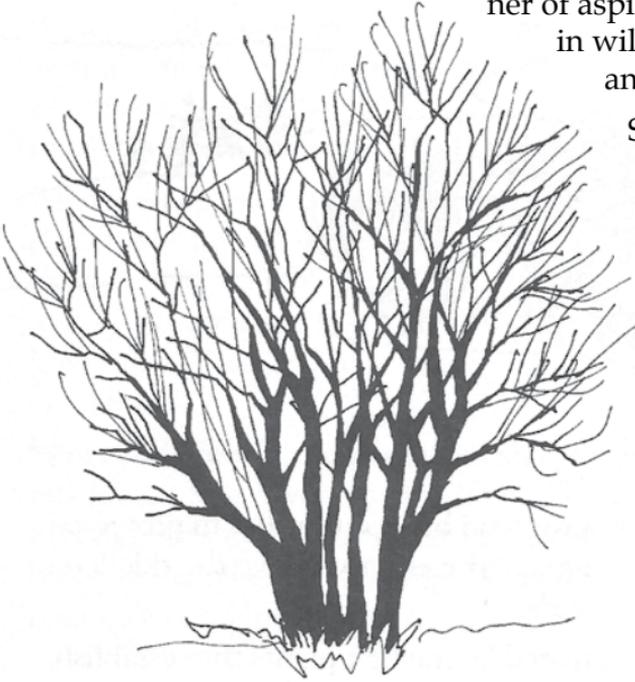
Yarrow
Achillea millefolium

Bush lupine, introduced from northern California, has bacteria in its roots that convert nitrogen from the atmosphere to a form the plant can use. A member of the pea family, lupine does well in the low-nitrogen soils of the Pacific Northwest.



Bush Lupine
Lupinus arboreus

Like most upland plants, **willow** cannot tolerate soil that is high in salt. The bark of this tree was chewed by Native Americans to relieve headaches. Salicylic acid, a forerunner of aspirin, is found in willow leaves and bark.



Willow
Salix hecheriana

Some of the plants here are native, having arrived before the first Euro-Americans, yet many are not.

Introductions such as **European beach grass** were planted to stabilize dunes or shifting sand. Others, like **Scotch broom**, were planted as ornamentals.

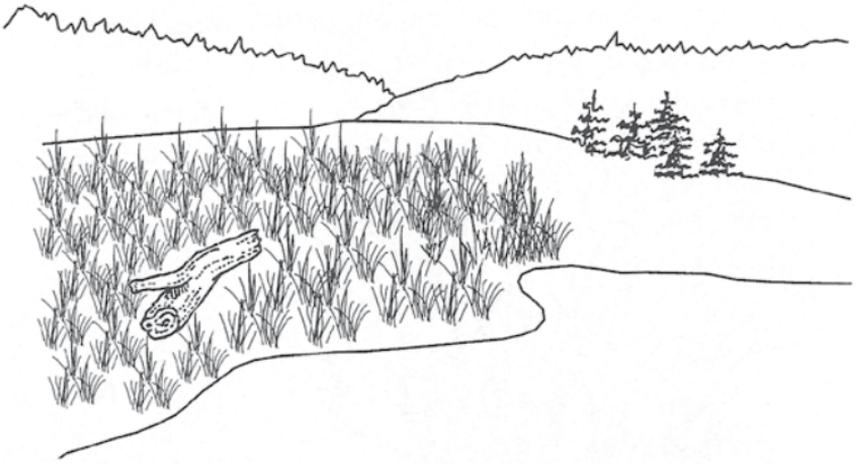
Nonnative plants often out-compete and displace the native ones in an area, a process that can eventually lead to a local decrease in species diversity.



Scotch Broom
Cytisus scoparius



SALT MARSH HABITAT



The salt marsh is a wetland habitat that lies in protected areas along the fringes of the estuary, above the tideflats and below the uplands.

Salt marshes are created by the first plants that establish themselves on high points on the tideflat. The first to take hold are **pickleweed**, **salt grass**, and **arrowgrass**. As these colonizers begin to grow, they slow down currents and trap sediment, building the marsh up and out toward the bay.



Arrowgrass
Triglochin maritimum

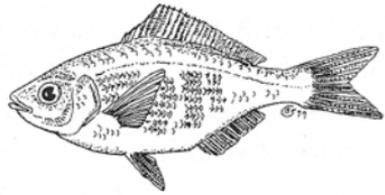


Who lives in the salt marsh?

Fish do.

Because daily tides expose the salt marsh to air, aquatic animals are not common. Those that do occur usually migrate in and out with the tides.

Pacific staghorn sculpin, **shiner perch**, and juvenile **salmon** swim up into salt marsh channels and pools at high tide to feed and hide from predators.



Shiner Perch
Cymatogaster aggregata

Shorebirds rest in the salt marsh and the grassy shore when high tide covers the mudflats. They feed on invertebrates in the low marsh. **Kingfishers** are diving birds that can be seen feeding on small fish in salt marsh channels at high tide.

Marsh plant adaptations

Salt water is toxic to most flowering plants, causing freshwater to move out of their cells and dissolved salts to move in. Those plants that survive in the salt marsh do so only with special adaptations.



Pickleweed
Salicornia virginica

One common adaptation is succulence, which allows a plant to manage high salinity by dilution. A bite into the fleshy stem of the **pickleweed** will reveal its unique adaptation. This plant actually stores salty water in its stems.

The estuary

Estuaries are fascinating and beautiful ecosystems, distinct from all other places. Estuarine environments are among the most productive on earth, creating more organic matter each year than an equivalent amount of agricultural land. The productivity and variety of estuarine habitats foster a wonderful abundance and diversity of wildlife.

Much of our estuary habitat, however, is being destroyed and damaged. Waters entering the estuaries bring silt and sediments eroded from the land, as well as sewage, animal wastes, pesticides, chemical fertilizers, and industrial discard. As estuary habitat is lost, it cripples an estuary's ability to support life.

Fortunately, people are acting to save these vital, productive and important environments. The National Estuarine Research Reserve System, under the auspices of the National Oceanic and Atmospheric Administration, exists to safeguard our estuarine resources and provide educational and research facilities to protect these critical habitats. The Clean Water Act of 1987 established a National Estuary Program, administered by the Environmental Protection Agency, that has identified 11 of the nation's major estuaries and is working to improve their quality. Restore America's Estuaries consists of community-based organizations whose goal is to reclaim one million acres of estuary habitat.

These and other organizations have established frameworks and put legislative tools at our disposal to begin to reverse some of the processes that have deteriorated the quality of the nation's most valuable waterways.

Tracks

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Which of these animal tracks
might you find along the estuary trail?

Which of these animals
might live near the estuary?

.....

Beaver



Cougar

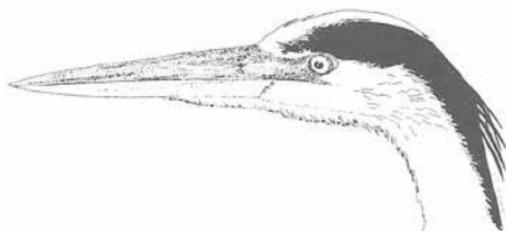


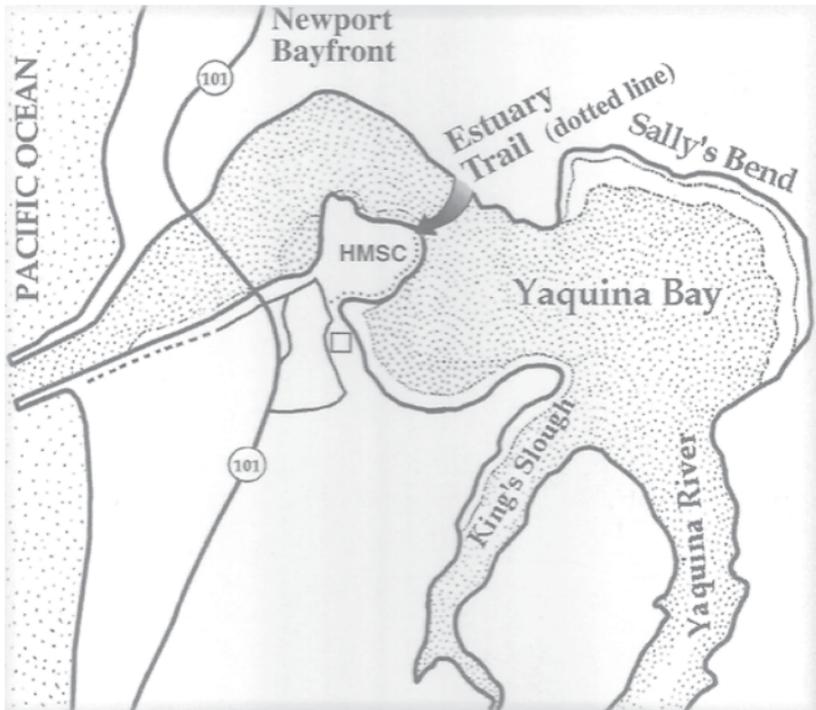
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Deer



Raccoon





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