Intertidal Salt Marshes of Oregon

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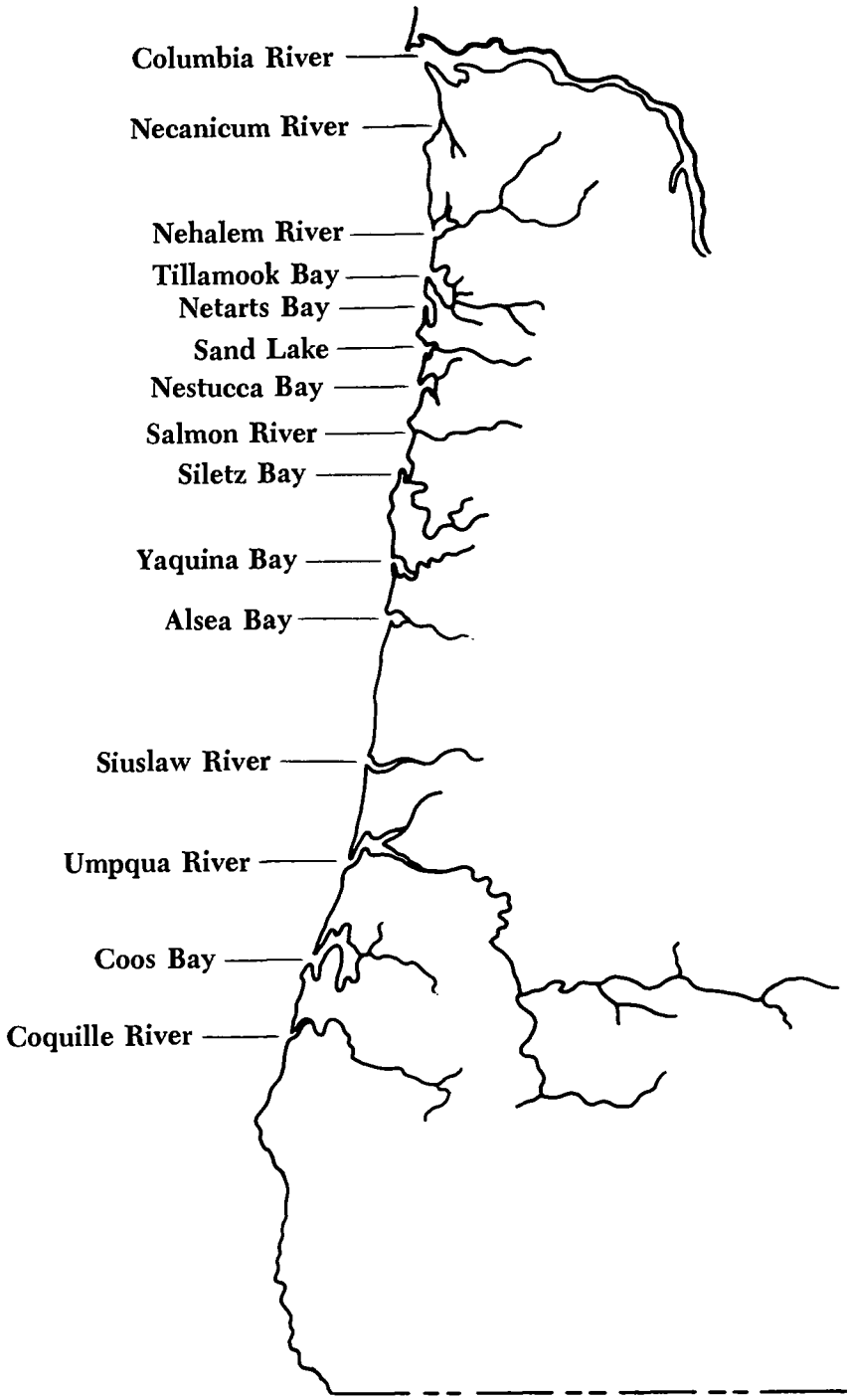

Figure 1.—*Estuaries and bays of Oregon. Note that south of the Coquille River, the Oregon coast is characterized by steep slopes. Southern Oregon coastal rivers, therefore, descend rapidly into the Pacific Ocean. These steep river gradients provide for small estuaries, tidal water that does not move very far inland, and minimal deposits of silt and clays. Consequently, intertidal salt marshes are not extensive along these rivers.*

Wetlands are parts of landscapes that merge from wet to dry: swamps, marshes, bogs, and similar areas. They lie between the sea and the land, at the mouth of a river, at the edge of a lake, or in low-lying fields. They are areas inundated or saturated by surface or ground water frequently enough, and for long enough periods each time, to support vegetation that is mostly adapted to saturated soil conditions.

Intertidal salt marshes are a type of wetland that is generally a feature of the earth's temperate regions. Intertidal salt marshes develop where river or marine sediments are available and where there is shelter from the direct attack of ocean waves: behind sand spits, behind barrier islands, or (as on the Oregon coast) within estuaries of large rivers and protected bays (figure 1).

Oregon's estuaries and bays are small compared with those on other North American shorelines, so the extent of intertidal marshlands has never been great on our coast.

Here are some key facts about Oregon intertidal marsh areas:

- Marsh vegetation is composed mainly of low-growing perennial species that are *rhizomotous,* which means they have underground stems (rhizomes).
- The lower or seaward edge of the marsh begins at a level subject to tidal flooding twice a day, and it extends landward to the extreme high-tide level, where tidal flooding is infrequent (figure 2).
- Toward the sea side of the marsh is mud or sand flat (usually mud mixed with sand). Landward, the marsh grades upward to shoreland.
- Intertidal marshes, therefore, occupy the transition zone between estuarine and terrestrial ecosystems.

Figure 3 (centerspread, pages 4-5) illustrates a model intertidal salt marsh and pinpoints the habitats of animals and plants that are discussed in this bulletin.

Tides play a vital role

Of all the environmental factors that influence the intertidal salt marsh, tides have the greatest effect on plant reproduction, growth, and survival within the marsh:

- The frequency and intensity of tidal movement may, among other effects, uproot young plants.
- The vertical range of the tide controls the vertical extent of the marsh.
- Tides affect the salinity (percentage of salt) of marsh water.
- The form of the tidal cycle regulates the number of times and the period of time the marsh is submerged or exposed to the atmosphere.
- Incoming tides transport nutrients and other materials vital for marsh plant growth.
- Outgoing tides export dead plant material used as food by bacteria and larger estuarine animals.

How salt marshes develop

Intertidal salt marshes begin to develop on mud or sand flats at an elevation near mean sea level (the average height of the surface of the sea for all stages of the tide, over a 19-year period).

Once the first plant species to arrive (the "colonizers") have established themselves, they begin to trap silt, clays, and floating organic matter. Their plant root growth also binds this material together. These two factors gradually elevate the marsh above the surrounding flat.

As the marsh elevation increases, plants are submerged less frequently. Other plant species now replace the colonizing species. At a certain elevation, there is an abrupt change in the time plants are exposed to the air.

Below this point, the marsh is submerged twice a day. Above it, submergence is less frequent, and exposure time increases. This results in changes, in both environment and vegetation, from the mudflat to upland or freshwater plant communities.

As the marsh is elevated above the flat, tidal drainage channels become

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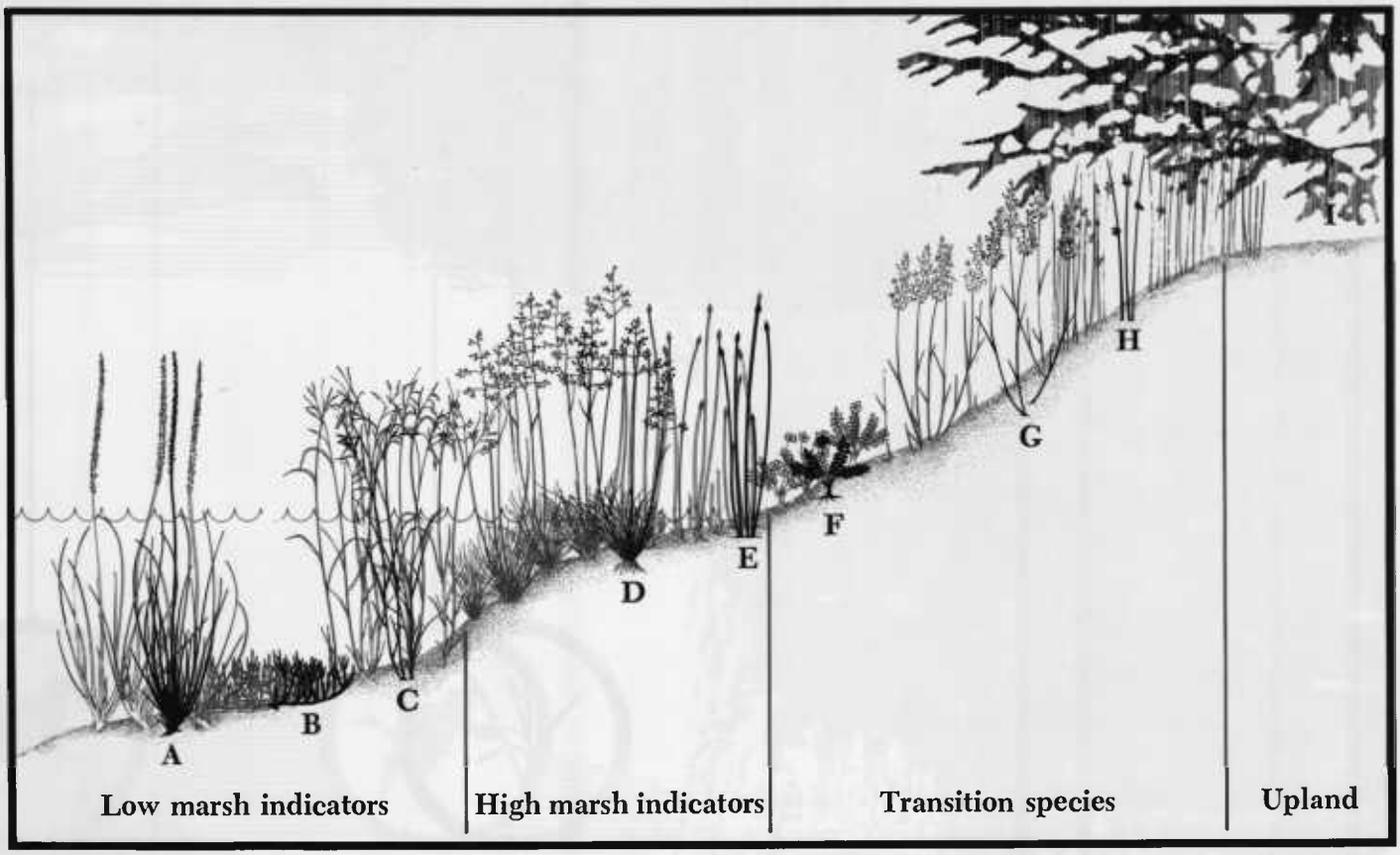


Figure 2.—*Generalized profile of an Oregon intertidal marsh. Although the plant species shown are prominent throughout their respective zones, they may also be found to some extent in the other marsh zones. Plants shown are: (a) arrow-grass, (b) pickleweed, (c) Lyngby's sedge, (d) tufted hairgrass, (e) common spike rush, (f) silverweed, (g) redtop, (h) Baltic rush, and (i) Sitka spruce.*

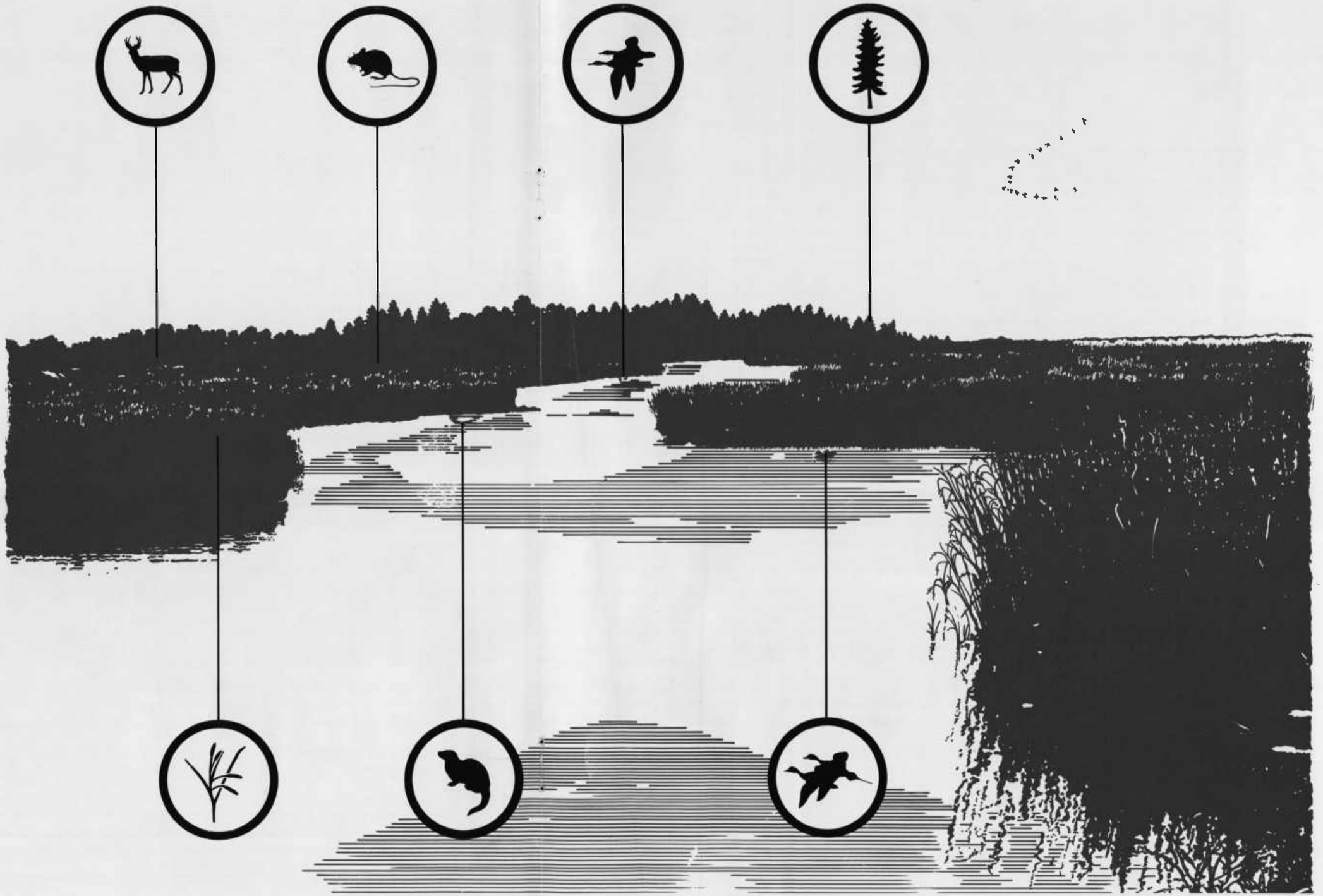


Figure 3.—*Generalized overall view of an Oregon intertidal salt marsh. Highlighted at the top are (left to right): white-tailed deer, Pacific jumping mouse, red-breasted mergansers, and Sitka spruce. At the bottom (left to right) are: Lyngby's sedge, river otter, and pintails.*

deeper and more sharply defined. These channels form a two-way network: they supply nutrients *to* the marsh, and they remove dead plant material *from* the marsh.

Salt pans are characteristic of intertidal salt marshes. These are barren or partially vegetated depressions within the marsh but without any outlet from the marsh. The salinity of the water in the pans may surpass that of seawater. During drying periods, the water evaporates, leaving surface cracks and salt deposits.

Intertidal salt marsh plants

Salt marshes are mainly composed of plant species adapted to living on land. The environment of the marsh imposes certain limits on the kinds of plants that can survive in it. For this reason, few species are found within the marsh. Salt marsh plants are called *halophytes,* plants that can tolerate high salinity.

There are three basic ways in which these plants respond to salinity:

- *Succulents,* such as pickleweed (*Salicornia virginica*) store salts in their fleshy succulent tissues.
- *Salt-secreting* species, such as saltgrass (*Distichlis spicata*) and saltwort (*Glaux maritima*) have special glands that remove excess salt.
- Species with *no special mechanism,* like the rushes (*Juncus* spp.), concentrate salt in their leaves. As the salt-tolerance level is exceeded, the leaves die and fall off.

Most salt species tolerate high salinity but are not confined to such an environment. Many of the marsh species may do well outside the saltwater environment. However, in freshwater habitats, they cannot compete successfully with species that live there already.

Individual species respond in different ways to salinity, submergence, and other environmental factors; so vegetation zones, with more or less distinctive appearances, are usually evident.

Two zones that are easily identified are the Low Marsh Zone, where there are long periods of flooding by tides and high salt concentrations, and the High Marsh Zone, which is composed of species of lesser tolerance to salinity and tidal flooding.

Here are some of the more prominent "indicator species" of the Oregon intertidal salt marshes:

- *Low-marsh indicators*—pickleweed, salt grass, seaside arrow-grass (*Triglochin maritima*), and Lyngby's sedge (*Carex lyngbyei*).
- *High-marsh indicators*—saltwort, tufted hairgrass (*Deschampsia caespitosa*), lilaeopsis (*Lilaeopsis occidentalis*), and common spike rush (*Eleocharis palustris*).

There are also some plant species that, although they tend to concentrate in the upper portion of the marsh, are found scattered throughout the marsh system and extend into the upland. These species are called "nonindicators" —their presence cannot be used to identify either the intertidal salt marsh or the terrestrial (freshwater) environment.

Prominent nonindicator species are Pacific silverweed (*Potentilla pacifica*), Baltic rush (*Juncus balticus*), and redtop (*Agrostis alba*).

Intertidal animals and birds

Information about animal communities that live within the marsh proper is still incomplete, although populations of long-tailed mice and shrews are said to exist in the upper marsh. Deer, mink, muskrats, raccoons, and river otter may visit marshes, but they do not spend their entire lives within the marsh.

Many bird species use the Pacific Coast intertidal salt marshes, especially during the major migratory periods in the spring and fall. These marshes make up an important part of the North American Pacific Flyway.

At these times, numerous ducks pass through—pintail, teals, mergansers, widgeons, and others. Among geese that appear at these times are the Canadian, snow, and white-fronted.

A closer look shows many shore birds, such as dowitchers and the semipalmated plover.

Use of the marshes varies considerably among waterfowl species. Some use the marshes as feeding grounds. Others use them for just resting or loafing. A few species reproduce within the marshes.

How important are salt marshes?

Intertidal salt marshes have been described as among the most productive natural ecosystems in the world. "Productive" here refers to the amount of energy or food stored within the ecosystem. It is recognized that the productivity of estuarine flats and waters is related to adjacent intertidal marsh systems.

Vegetation decomposes on the marsh surface and in marsh creeks. Tidal action then washes this material out of the marsh and into the estuary, where it is consumed by detrital feeders (organisms that eat dead organic matter). These, in turn, are consumed by other organisms. The marshes are thus an indirect food source for shellfish and finfish.

Intertidal marshes may act as water purifiers. Investigators have found that polluted water improves in quality as it flows across a marsh. In fact, marshes purify such great quantities of water that some experts have speculated about using them to partially purify sewage. Whether or not this is feasible is not yet known.

Intertidal salt marshes benefit human activities in two additional ways. They control erosion along shorelines, and they prevent damage from tidal flooding. When marsh vegetation is removed, erosion and tidal flooding increase. Residential, commercial, and industrial facilities located on filled marshes have suffered heavy damage from both erosion and tidal flooding.

Protecting salt marshes

The productivity of estuaries drops as human activity reduces or damages marsh systems. Diking, dredge and fill operations, digging channels, and other activities have reduced the extent of intertidal salt marshes through the world.

Several states have adopted legislation to protect estuaries, including their associated intertidal marshes. These laws usually provide for the prevention of marsh destruction, or for mitigation of adverse impacts.

On the national level, Congress enacted the Coastal Zone Management Act in 1972. This established a national policy of protecting coastal marshes and provided for programs to manage, use beneficially, protect, and develop the resources of the coastal zone.

Section 404 of the Federal Water Pollution Control Act Amendments of 1972 also states a concern for the integrity of intertidal marshes in relation to dredge or fill materials being released into navigable waters.

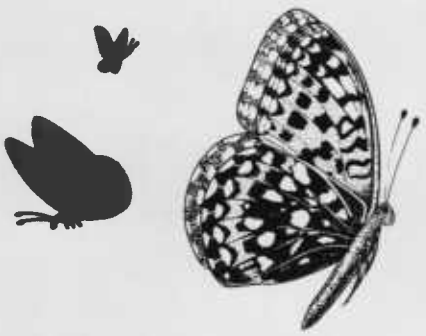
The administrator of the Environmental Protection Agency, in cooperation with the Army Corps of Engineers, may prohibit the designation of any area as a disposal site for dredged or other fill material, or restrict use of any area as a disposal site, if he or she has determined that the discharged material will have an adverse effect on municipal water supplies, shellfish beds, fishery areas, wildlife, or recreational areas. Intertidal salt marshes, because of their value to these resources, are included under Section 404 jurisdiction.

In Oregon, Federal initiatives have been reinforced at the state level. The Oregon Removal/Fill law, administered by the Division of State Lands, requires a permit for alteration of intertidal salt marshes and other wetlands. If all permit criteria are met and if an alteration is allowed, a developer must mitigate adverse impacts by restoring or creating at least an equal amount of salt marsh elsewhere in the estuary.

The purpose of mitigation is to prevent piecemeal loss of valuable salt marshes over the long term.

The Oregon Land Conservation and Development Commission's Planning Goal 16, "Estuarine Resources," also helps protect salt marshes:

- Major salt marshes must be placed in a "resource preservation" category, where no alterations are permitted.
- Smaller, but still biologically important, marshes must be placed in a "conservation" category, with only minor alterations allowed.
- In remaining areas where changes are permitted, a developer must meet strict criteria to obtain permission to dredge, fill, or otherwise alter an intertidal marsh.



One butterfly: A symbol of the salt marsh

Yes, you may find a butterfly in a salt marsh. Most butterflies tend to live their whole lives within rather restricted habitats—and salt marshes are one of those habitats. Cool and wet salt marshes don't shelter as many types of butterflies as, say, valley meadows.

But one of those that lives in and near salt marshes is very rare, so rare it's on the Endangered Species List. This is the Hippolyta Fritillary (*Speyeria zerene hippolyta*), a medium-sized, yellowish-orange butterfly about 2¼ inches (6 cm) in wingspread. A pattern of black spots appears on the wings' upper side; underneath, the lower pair of wings bears rows of silver spots (see the drawing at the left).

A rather late flier, it is usually seen in August and September. Formerly found along most of the coast, the Hippolyta Fritillary is now seen only on three small coastal sites. Construction projects, draining of marshes, and other human activities are steadily removing the vegetation it must have to survive.

So butterflies, too, "belong" to the salt marsh. Perhaps the Hippolyta Fritillary—already rare, depending for its very existence on the decisions men and women will make—is an apt symbol for the salt marsh itself . . . .

Summary

- Intertidal salt marshes are characterized by low-growing, rhizomatous, perennial plants.
- These marshes comprise an intermediate ecosystem between the estuarine and terrestrial environments.
- Tides are the most important environmental influence on the marsh system.
- Intertidal salt marshes provide habitat and food for waterfowl.
- Marshes are one of the most productive ecosystems in the world. Dead organic matter, which marshes move into adjacent estuarine waters, supports shellfish and finfish production.
- In the past, marshland has been destroyed by dredging, filling, and diking.
- Today the importance of marshes, both from ecological and economic points of view, is much better understood. Federal and state laws now protect these unique ecosystems.

For further information

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