



Background Information for Inside the Outdoors Programs



ECOLOGY OF UPPER NEWPORT BAY

In Upper Newport Bay, mud bubbles and bakes in the sun during low tide. Long-legged birds stalk the shallow pools searching for fish and invertebrates. The afternoon breeze whistles through the cattails and cordgrass. All of these are vital components of the Upper Newport Bay ecosystem.

THE ECOSYSTEM

An **ecosystem** is all the living and nonliving things that interact in a particular area. A wetland can be defined as an ecosystem in which the land is covered by water for at least part of the year. There are many kinds of wetlands, such as swamps, bogs, moors, fens, riparian wetlands, and prairie potholes. Wetlands are characterized by a combination of the following three distinguishing features:

- presence of water, either at the surface or within the root zone, during some part of the growing season of each year
- special soil
- plants adapted to wet conditions (*hydrophytes*)

Wetlands are very diverse and differ in many ways. Some wetlands are influenced by changes in the tide, others are nontidal; some have fresh water, others salt water, and still others have brackish water (a mixture of fresh and salt water); some are continuously flooded, others only have water on the surface for as few as seven consecutive days each year; and some wetlands are small while others cover hundreds of square miles.

The Upper Newport Bay is a specific type of wetland, called an **estuary**. It is a type of wetland where fresh and salt water meet and mix. San Diego Creek, the principle freshwater source, drains into the Pacific Ocean, which is the source of the salt water. The two types of water meet in the sheltered bay and mix twice daily during the high tides.

The nonliving parts of this ecosystem are the sun, saltwater, freshwater, mud, and air. The mud is carried into the bay in the form of silt runoff from the surrounding watershed. A watershed is composed of a stream, river, lake, or reservoir and the surrounding natural pathways that carry rain water and snow melt to that water body. During the winter months, increased rainfall brings more fresh water into the bay. This temporarily decreases the salinity, or salt content, of the bay water and increases sedimentation.

The living parts of the ecosystem include birds, fish, invertebrates, and plants (including plankton). Of all these organisms, **plankton** are perhaps the most important to this ecosystem. Plankton are microscopic plants, animals, and algae that live in the water. The waters of the bay are rich in phytoplankton (floating algae) which is nourished by nutrients entering from San Diego Creek. The abundant plant growth provides a major food source for many animals.

THE FOOD CHAIN

Estuaries are one of the most productive ecosystems on Earth. The estuary plants and plankton, nourished by the bay's nutrient-rich water, convert the sun's energy to food through a process called **photosynthesis**. The plankton and decomposed marsh plants may be eaten by marsh zooplankton (animal plankton), crustaceans, worms, fish, and birds. Energy from the plants is then transferred to these animals. If the plant eaters (herbivores) are eaten by other animals (such as predatory birds, fish, or mammals) the food energy is passed on again. The transfer of food energy from one organism to another is called a **food chain**. The original source of the energy is always the sun. Food chains show how an ecosystem is interconnected. Consider the food chain with plankton – fish – bird. If farmers spray pesticides on their crops and that pesticide washes into the bay, the plankton may die. If the plankton dies, the fish that eat plankton may not survive. Without fish, the birds may also die. If one link of the food chain is removed or disturbed, the whole chain suffers. Everything in the Upper Newport Bay is connected in some way to something else in the bay.

IMPORTANCE OF THE BAY

The rich and productive ecosystem provides a habitat for numerous plants and animals. The abundant plankton supplies food for many fish. Seventy-eight different species of fish have been found in Newport Bay. The bay is used as a spawning ground and nursery for many coastal species of fish such as halibut, croaker, white seabass, and sand bass. The fish remain in the bay until they are large and strong enough to survive in the ocean. When they are ready, they swim to the ocean with the tide.

The bay is also very important for birds. The mudflats and water provide food, while the dense cordgrass and marsh vegetation provide shelter and nesting areas. The bay is a winter home or a winter migration stopover for thousands of birds. It is one of the few remaining places in Orange County where migrating waterfowl can rest.

Two birds found in Upper Newport Bay, the Ridgeway's Rail and the Beldings' Savannah Sparrow, are **endangered species**. An endangered species is a plant or animal whose survival is in danger because their population size is low. These birds are found only in salt marshes, and their habitat is disappearing. If people continue to develop and disturb this special and unique ecosystem, the effects will eventually be felt throughout the entire food web of which humans are also a part.

BIRDS OF UPPER NEWPORT BAY

The birds are the most noticeable residents of Upper Newport Bay. They can be seen floating in the water, feeding, resting on the mudflats, hopping through the vegetation, or soaring overhead. Over 160 species of birds have been recorded at the Bay, and on a midwinter day there may be 50,000 birds present! In spite of the great numbers, the vast majority of the birds represent around two dozen species.

Some birds are year-round residents of Bay. However, most birds are found at the Bay during the fall, winter, and early spring months. Birds are most abundant from August through April when migratory birds use the Bay as a winter home, or as a migrational stopover to and from their northern breeding grounds. The open water, mudflats, and abundant food make the Bay an important stopping place during **migration**. Migration is an animal's journey from one region to another; it is determined by seasons.

Any place with such great numbers of birds must have a wide variety of habitats to support all the different species. Upper Newport Bay is a diverse ecosystem with many habitats. So many birds are able to hunt at the Bay because birds use different habitats and eat different kinds of food. The major habitats are: open water, mudflats and marshes. By studying a bird and the habitat in which it lives, one can learn about the adaptations it needs to survive there.

OPEN WATER

Most of the birds swimming or floating on the waters of the Bay are ducks and grebes. In the deeper waters, diving ducks such as Buffleheads, Ruddy Ducks, and Canvas Backs can be found. Diving ducks have large feet and short legs set back to propel them underwater. Their feet, which are great for swimming, make them awkward on land. Other common deep water birds are grebes (Pied-billed, Eared, and Western). Their lobed feet are also set back for powerful swimming strokes. They swim and catch fish underwater with their long, serrated beaks. The dabbling ducks feed in the shallower water near the edges of the mudflats. These include the teals, pintails, shovelers, and American Widgeons. They feed in the shallows by tipping their tails up and dabbling in the mud. They have larger wings than the diving ducks, and their feet are set further forward allowing them to walk on land. Another bird of the water and mudflats is the American Coot. It searches for plant materials in the mud or on the bottom of the estuary.

MUDFLATS

During the winter months the mudflats can be covered with thousands of shorebirds. Most belong to the sandpiper family and range from the large Long-billed Curlew to the tiny sandpiper (or “peep”). The large, long-legged birds (Long-billed Curlews, Marbled Godwits, Willets, and Avocets) wade in the deeper water searching for food. The length of their bills and their feeding style determine how deep into the mud they probe. The medium-sized dowitchers probe for food in the shallower waters with a distinctive “sewing machine” bobbing action. The small sandpipers (Western and Least) feed on the exposed mud just above the water line. Plovers (Killdeer, Black-bellies, and Semipalmated) are another family of shorebirds. These short-billed birds feed on mollusks and insects picked off the surface of the mud.

MARSHES

The most noticeable birds of the marsh vegetation are herons and egrets. The Great Blue Heron is nearly four feet tall and lives in the Bay during winter. The large Common Egret and the dainty Snowy Egret are all white. These long-legged, long-necked waders walk along the shore searching for fish and mice. They do not use their long, pointed bills to spear the fish, rather they grab them quickly. Most herons and egrets move slowly and will stand motionless to feed or hide. Rails are birds living in the Bay that are rarely seen. The largest rail is the endangered Ridgeway’s Rail. This bird is only found in the coastal marches of southern California and Baja California. Other rails include the Sora, Virginia, and Black Rail. These birds prefer fresh water. Other birds found in the fresh water marshes include Song Sparrows, Marsh Wrens, and Red-winged Blackbirds. Another small bird, the Belding’s Savannah Sparrow, is an endangered species found in the salt marshes of the Bay.

SKIES

The skies above the Bay are often filled with great flocks of gulls, primarily California and Ring-billed Gulls. They stop at the Bay to rest between their feeding trips to the oceans and inland areas. They are often seen floating in the Bay like ducks. Some birds, like the Caspian Tern, often dive into the water hunting for fish. Red-tailed Hawks search the bluffs for rodents. Turkey Vultures soar above the Bay searching for carrion (decaying or rotten flesh).

PLANTS OF UPPER NEWPORT BAY

An estuary is an ecosystem where saltwater and freshwater meet, creating diverse habitats that attract and support a wide variety of fish and wildlife. The plants of Upper Newport Bay are strongly affected by the changes in salt content caused by the tides. The plants' survival demands unique adaptations to help them tolerate the salinity.

ZONES

All plants need water, sunlight, carbon dioxide, and minerals. Plants use water and absorbed nutrients from the soil and sunlight to create food. This process is known as **photosynthesis**. Varying degrees of freshwater and saltwater, along with soil types ranging from mudflats to dry slopes, create the following zones: marine, intertidal, freshwater marsh, riparian, and upland. The salinity of the water determines the type of plants that can survive in that zone.

THE MARINE ZONE

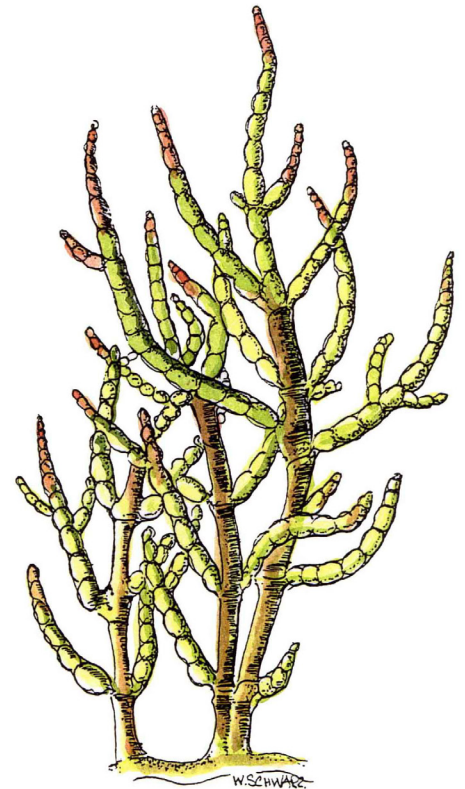
The marine zone is the most stable zone. It is consistently flooded by seawater, and populated by seaweed and eel grass. Nutrients from San Diego Creek nourish the water and produce plankton, the microorganisms consumed by many plants and animals.

THE INTERTIDAL ZONE

The next and largest zone is the intertidal zone. It is located between the lowest and highest tide lines. This zone is divided into the low, mid, and upper tide zones. Many estuary plants are found in this zone. This area is influenced by the daily rise and fall of the tides.

The low tide zone is a mud flat, covered with algae that feeds worms, mollusks, shore birds, dabbling ducks, and some fish. This algae helps recycle nutrients, thus supporting estuary life.

The mid and upper zones support salt marsh vegetation such as cord grass. Cord grass grows close to the main body of water. It has hollow stems that send oxygen to its roots and adapts to the high levels of salt by losing or “sweating” the salt. Pickleweed is the most abundant plant in this zone. It adapts to the salty environment by concentrating salt in parts of the stem which then break off. Salt grass is another plant of this zone. It can live in drier soil, and it also rids itself of excess salt by releasing it through its leaves. The adaptations of these hardy plants help them survive in the estuary ecosystem.



Pickleweed

FRESHWATER MARSH, RIPARIAN and UPLAND ZONES

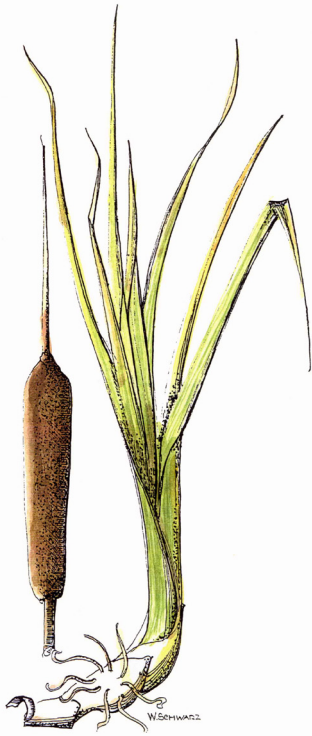
The freshwater marsh, riparian, and upland zones contain the least amount of salt. The plants of these zones provide valuable food sources and shelter for Upper Newport Bay animals. These plants are not adapted to adverse conditions caused by high levels of salinity.

The freshwater marsh zone consists of plants such as cattails, sedges, and bulrush.

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cattail

The riparian zone plants, like the freshwater marsh plants, withstand lower levels of salinity. These plants are usually large bushes such as willows or mulefat, and they provide habitat for many songbirds.

The upland zone, which includes the bluffs, cliffs, and undeveloped land of the mesas, contains plants that are adapted to drier conditions. Coastal sage scrub plants are found in this zone.

The five vegetation zones of Upper Newport Bay support many plants and animals, which helps make Upper Newport Bay a unique, complex, and important ecosystem.

CURRENT THREATS TO NEWPORT BAY

SILTATION

The battle between the Newport Bay ecosystem and nearby development is not over. Siltation (to choke, fill, cover, or obstruct with sediment or mud) is a major problem of the estuary. Urbanization has caused large amounts of silt-laden water to enter Newport Bay through San Diego Creek. Restoration projects funded by local agencies have been undertaken to dredge the extra silt, but these projects cost millions of dollars. People are looking to individual developers to prevent soil erosion at their construction sites, so that the estuary does not become entirely a mudflat.

NITRATES

High levels of nitrates are a problem in the estuary. Water runs off from commercial nurseries, landscapes, and farmlands causing algae “blooms” in the bay. Algae blooms decrease the water quality by decreasing visibility and the level of oxygen. When the algae dies it decomposes, using most of the available oxygen in the water. Algae blooms also draw large numbers of algae-eating fish, upsetting the natural balance of the estuary ecosystem.

TRASH

Whether carelessly dropped by a visitor to the Bay, or washed in by a storm drain, litter is a continuing concern for the Bay. The remnants of styrofoam cups create a tremendous amount of the Bay’s trash problem. Paper, cans, bottles, and an array of plastic products including bags and packaging materials account for a huge portion as well. These plastic packaging products can become death traps for fish, water fowl, and other animals who make Upper Newport Bay their home. Cigarette butts are also a large problem and a source of litter in the estuary and along coastal waters.