

**RESOURCE**

ENCYCLOPEDIC ENTRY



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# Wetland

Encyclopedic entry. A wetland is an area of land that is either covered by water or saturated with water.

**GRADES**

6 - 12+

**SUBJECTS**

Biology, Ecology, Earth Science, Geography, Physical Geography



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A wetland is an area of land that is either covered with water or saturated with water. Unique plants, called hydrophytes, define wetland ecosystems. This wooded wetland, near the Stillaguamish River in Washington, is dominated by western skunk cabbages, also called "swamp lanterns."

PHOTOGRAPH BY DAVE MCCOY, MYSHOT



## ENCYCLOPEDIC ENTRY

## VOCABULARY

A wetland is an area of land that is either covered by water or saturated with water. The water is often groundwater, seeping up from an aquifer or spring. A wetland's water can also come from a nearby river or lake. Seawater can also create wetlands, especially in coastal areas that experience strong tides.

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A wetland is entirely covered by water at least part of the year. The depth and duration of this seasonal flooding varies. Wetlands are transition zones. They are neither totally dry land nor totally underwater; they have characteristics of both.

The saturation of wetland soil determines the vegetation that surrounds it. Plants that live in wetlands are uniquely adapted to their watery (hydric) soil. Wetland plants are called hydrophytes. Seasonally dry wetlands or wetlands with slow-moving water can often support trees and other sturdy vegetation. More frequently flooded wetlands have mosses or grasses as

Wetlands exist in many kinds of climates, on every continent except Antarctica. They vary in size from isolated prairie potholes to huge salt marshes. They are found along coasts and inland. Some wetlands are flooded woodlands, full of trees. Others are more like flat, watery grasslands. Still others are choked by thick, spongy mosses.

Wetlands go by many names, such as swamps, peatlands, sloughs, marshes, muskegs, bogs, fens, potholes, and mires. Most scientists consider swamps, marshes, and bogs to be the three major kinds of wetlands.

## **Swamps**

A swamp is a wetland permanently saturated with water and dominated by trees. There are two main types of swamps: freshwater swamps and saltwater swamps. Freshwater swamps are common in inland areas. Saltwater swamps protect coasts from the open ocean.

### *Freshwater Swamps*

Freshwater swamps often form on flat land around lakes or streams, where the water table is high and runoff is slow. Seasonal flooding and rainwater cause the water level in these swamps to fluctuate, or change. Water-tolerant plants, such as cattails, lotus, and cypress, grow in the swamp's wet soil. These plants are key to maintaining the swamp's ecosystem.

Freshwater swamps are common in tropical areas near the Equator. These equatorial swamps usually experience year-round heat and humidity.

River, in the nations of the Democratic Republic of Congo and the Republic of the Congo. Tall evergreen trees dominate the swamp forests. Many species of these trees, such as bubinga and ovankol, are harvested for timber. Bubinga and ovankol are expensive, luxury woods used to make musical instruments such as violins, as well as furniture. The thick canopy of trees means Congolian swamp forests are more shaded and humid than other wetlands. The muddy floor of these swamps is home to hundreds of insects, reptiles, and amphibians, including dozens of species of frogs.

Congolian swamp forests are also home to a wide variety of large mammals. Most of these mammals are herbivores. Colobus and mangabey monkeys eat mostly tropical fruit. Other mammals, such as forest buffalo, forest elephants, and lowland gorillas, feed on the abundant vegetation of the wetland. In fact, an adult male gorilla can eat up to 32 kilograms (45 pounds) of leaves, fruit, and bark every day.

In more temperate climates, cypress trees often grow out of the still waters of freshwater swamps. Spanish moss may hang from tree branches. Willows and other shrubs may grow beneath the trees. Angular knobs called cypress knees sometimes poke as much as 4 meters (13 feet) above the water. Cypress knees are outgrowths of the trees' root systems. Scientists are not sure what purpose knees serve. They may simply provide support, or they may transport oxygen to the roots.

Tiny water plants called duckweed often form a green cover on the surface of the water. Alligators, frogs, and snakes called water moccasins may swim among the plants. Reptiles and amphibians thrive in freshwater swamps

Cypress swamps are common throughout the U.S. The bayous of the state of Louisiana, near slow-moving parts of the Mississippi River, are probably the most famous American swamplands. Shrimp, crawfish, wading birds, and fish such as catfish are native to bayous.

Distinct cultures have also developed near bayous and other freshwater swamps. In Louisiana, the food and music of Cajun culture is closely associated with bayou wildlife and imagery.

### *Saltwater Swamps*

Saltwater swamps are usually found along tropical coastlines. Formation of these swamps begins with bare flats of mud or sand that are thinly covered by seawater during high tides. The brackish water of saltwater swamps is not entirely seawater, but not entirely freshwater, either.

Some hydrophytes, such as mangrove trees, can tolerate brackish water. Mangroves are easy to recognize because of their tall, stilt-like roots, which hold the small trunks and branches of the trees above water. Mangrove roots anchor sediment and help soil accumulate around them. They also help build sediment through their growth and decay.

Many organisms live among mangrove roots. The root system provides shelter and a place to feed on fallen leaves and other material. Crabs, conchs, and other shellfish are abundant in mangrove swamps.

Saltwater swamps are also home to a huge variety of birds. Mangrove roots

and the water provide a habitat for many other saltwater organisms.

abundance of plants, insects, and small animals provides food for these birds, whose droppings help fertilize the swamp.

The Sundarbans, a saltwater swamp in India and Bangladesh, has the largest mangrove forest in the world. Located on mud flats near the delta of the Ganges River, the area is saturated in freshwater. The Sundarbans also experience strong tides from the Indian Ocean. The biodiversity of the Sundarbans stretches from tiny algae and moss to Bengal tigers. The Bangladeshi portion of the wetland is a UNESCO World Heritage Site.

Dozens, perhaps hundreds, of different species of mangrove trees thrive in the Sundarbans. In drier areas of the swamp, palms and grasses grow. Insects such as bees build hives in the trees. In fact, harvesting honey has been a major economic activity in the Sundarbans for centuries.

Bees and other insects are one of the main food sources for tropical birds in the area. Storks, ibises, and herons nest in the high branches of mangrove and palm trees. Smaller birds such as kingfishers and pigeons roost in shrubs. Some birds feed on the hundreds of fish that inhabit the Sundarbans' brackish water: rays, carp, eels, crabs, and shrimp.

Many reptiles and amphibians live in and around the swamp, including frogs, toads, turtles, and snakes. Some of the snakes of the Sundarbans, such as the Indian python, regularly grow up to 3 meters (10 feet) long. Monitor lizards and crocodiles, also native to the Sundarbans, are even larger.

of the Sundarbans is the Bengal tiger, an endangered species. Bengal tigers are apex predators—human beings are their only natural predator. In the Sundarbans, Bengal tigers swim in the swampy water and climb trees. The cats, which can grow to 220 kilograms (484 pounds), have been known to attack people in the swamp. Scientists and honey collectors are especially at risk.

## Marshes

North and south of the tropics, swamps give way to marshes. These wetlands form a flat, grassy fringe near river mouths, in bays, and along coastlines. Many are alternately flooded and exposed by the movement of tides. Like swamps, marshes are often divided into freshwater and saltwater categories.

### *Freshwater Marshes*

Freshwater marshes, often found hundreds of kilometers from the coast, are dominated by grasses and aquatic plants. These marshes often develop around lakes and streams.

Many freshwater marshes lie in the prairie pothole region of North America, the heart of which extends from central Canada through the northern Midwest of the United States.

Prairie potholes are bowl-shaped depressions left by chunks of glacial ice buried in the soil during the most recent ice age. When the ice melted,

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potholes have been drained and the land used for agriculture. Thousands of migratory birds depend on the remaining prairie potholes as they travel from the Arctic to more temperate climates every year.

Farther south, freshwater marshes form much of the Everglades, a huge wetland region in southern Florida. Water from Lake Okeechobee flows slowly through the Everglades on its way to the ocean. Sawgrass, cypress, and mangroves grow along its path. The muddy, slow-moving water is also home to rare types of orchid.

The Everglades are known for their diversity of wildlife. This marsh contains hundreds of species of wading birds, each of which is adapted to feed on insects, fish, clams, shrimp, or even rodents such as mice. Alligators make their nests in the dense sawgrass, and swim in the murky water. Deer and the endangered Florida panther live in the dry areas of the marsh, while manatees and even dolphins swim in the so-called “River of Grass.”

### *Saltwater Marshes*

Salt marshes are some of the richest ecosystems for biodiversity. Dominated by grasses, they provide food and shelter for algae, fungi, shellfish, fish, amphibians, and reptiles. Wading birds and other animals feed on the vegetation and abundant insects.

The warm saltwater marshes of northern Australia are influenced by the tides of the Indian and Pacific oceans. They often overlap with the freshwater marshes of rivers, such as the Jardine. A few mangrove trees may dot saltwater marshes, but they are dominated by grasses and a layer of



A wide variety of birds are found in Australia's saltwater marshes. Some of these birds nest in the shrubs and prey on insects and fish in the area. Others are migratory, only visiting the marsh when their home ranges become too cold or dry to support life.

Australia's saltwater marshes are also home to the saltwater crocodile. These enormous reptiles often spend the wet season in freshwater swamps and rivers, and migrate to saltwater marshes in the dry season. In addition to fish, Australia's saltwater crocodiles hunt larger animals that may pass through the wetland: kangaroos, birds, and wild boars. Many Australian beaches have strict warnings to swimmers during certain seasons, because saltwater crocodiles are a threat to people as well.

## **Bogs**

Swamps and marshes are generally found in warm climates. Bogs are more common in cold or even Arctic areas in North America, Europe, and Asia. They also exist at high altitudes in warmer regions, such as the Sierra Nevada in the United States. Bogs are often called moors or fens in Europe, and muskegs in Canada.

Like many wetlands, bogs develop in areas where the water table, or the upper surface of underground water, is high. They often begin in glacial depressions called kettle lakes, which are deeper than prairie potholes.

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becomes shallower, mosses and other plants growing along the edges of the lake extend into the water. They form a loose, floating layer of tangled vegetation on the water's surface. Eventually, these plants are followed by water-loving grasses and sedges. Soon, the water is choked with vegetation. The oldest, partially decayed vegetation at the bottom of the bog forms a thick, spongy mat called peat.

Peat is a valuable fuel in many parts of the world. It is often the first step in the creation of coal, a fossil fuel. (The fossils in coal are wetland plants.) Some people living near bogs cut and dry squares of peat. It is burned for heating and cooking, or used to insulate buildings. In Ireland, peat supplies a portion of the country's electrical energy.

Bogs preserve more than the remains of plants, however. The bodies of dozens of prehistoric people have been found in bogs in Europe and Asia. These "bog bodies" have been preserved for thousands of years. Bog bodies are in such excellent condition that anthropologists can examine clothes, tattoos, and hair color, and even investigate a cause of death. Most people found in bogs were killed, though historians and anthropologists debate whether they were murdered or sacrificed as part of a religious ritual.

Some bogs can support a person's weight. They are called quaking bogs because the surface quakes when a person walks on the spongy peat. The island of Ireland, with its cool, wet climate, has hundreds of quaking bogs.

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amount of acid in the soil and water is generally higher than that in swamps or marshes. The supply of nutrients, especially nitrogen, is low.

Only certain kinds of plants can grow in bogs. Some of the few plants harvested in the wet, acidic soil of bogs are cranberries and blueberries. Plants are autotrophs, meaning they are able to create their own food from air, water, and sunlight. Many bog plants have adapted to the poor nutrients in the soil and water by expanding their food source. Pitcher plants and sundew, common in bogs, are carnivorous. They trap and consume insects.

Because of the limited species of plants, bogs do not have the biodiversity common in other types of wetlands. Insects, common in all wetlands, include butterflies and dragonflies. These insects feed on the nectar in bog flowers. Ireland has dozens of native butterflies found in bogs. Birds, such as geese and pheasant, also make their homes in the bog, although it is unusual to find larger animals.

In North America, moose are one of the few large animals that thrive in bog habitats. Moose, the largest species of deer, consume aquatic plants such as pond lilies.

## **Vital Ecosystems**

Wetlands are some of the most valuable ecosystems on Earth. They act like giant sponges or reservoirs. During heavy rains, wetlands absorb excess water, limiting the effects of flooding. Wetlands also protect coastal areas

soil and sand.

Wetland ecosystems also act as water-treatment facilities. The plants, fungi, and algae of a wetland filter wastes and purify water. Nitrates and other runoff chemicals often wash into wetlands from urban areas and farms. Organisms there absorb the harmful chemicals. Pollutants not absorbed by plants slowly sink to the bottom, where they are buried in sand and other sediment.

Wetlands, especially marshes and swamps, are home to a wide variety of plant and animal life. Some animals, such as shrimp, live in tidal marshes. Many marine fishes, such as striped bass, enter coastal wetlands to spawn. Bass swim from the ocean and into salt marshes to lay their eggs. When the eggs hatch, the young bass find plenty of food and some protection in the grasses or tree roots. Oysters live in huge reefs in salt marshes. All of these wetlands are home to economically valuable fisheries.

The Chesapeake Bay watershed, on the East Coast of the United States, includes more than 60,000 hectares (1.5 million acres) of wetlands. Near the bay, the ecosystem is a tidal salt marsh. Farther from the Atlantic Ocean, freshwater marshes appear close to the Susquehanna River and its tributaries.

Chesapeake Bay wetlands are home to an extraordinary variety of wildlife. Plants include grasses, wild rice, pond lily, cattail, alder, and button bushes. Trees such as red maple, black gum, river birch, black willow, Atlantic white

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Chesapeake Bay wetlands are a major nesting area for the bald eagle, a symbol of the United States. The world's largest population of osprey also makes its home there. Bald eagles and ospreys feed on fish in the Chesapeake Bay. Many migratory birds, including swans and geese, spend winters in the Chesapeake wetlands.

Other animals native to the Chesapeake Bay include muskrats, beavers, otters, turtles, frogs, and numerous shellfish, as well as the fox squirrel and bog turtle, which are endangered species.

### **Economic Importance**

Wetlands are economically important to people. They are popular places for recreational activities, such as hunting, hiking, canoeing, and bird-watching. According to the U.S. Fish and Wildlife Service, Americans spend more than \$100 billion on wetland-related recreational activities every year.

More than 75% of the fish and shellfish that are commercially harvested worldwide are linked with wetlands. For example, the blue crab harvest from the Chesapeake Bay in 2007 was valued at about \$51 million. This crab is the official "state crustacean" of the U.S. state of Maryland, and plays an important part of the state's identity. Images of blue crabs are on thousands of souvenirs, and many Maryland restaurants serve crab cakes. The blue crab is also on Maryland's license plate featuring the Chesapeake Bay.

For most of history, wetlands were looked upon as wastelands. They do not easily support development. The soil is wet, spongy, and difficult to build

Until recently, draining wetlands was accepted practice. Drained wetlands provided land for agriculture, housing, industry, schools, and hospitals. The capital of the United States, Washington, D.C., is built on a drained wetland along the Potomac and Anacostia rivers.

Almost half of U.S. wetlands have been destroyed for development. Drainage and peat harvesting have destroyed wetlands in Ireland and Scandinavia.

Many fish that depend on wetlands have become rare. Some of these species, such as flounder, trout, and bass, are commercially important. Freshwater and ocean fisheries depend on wetlands to provide habitat for the next generation of fish.

In the early 1970s, governments began recognizing the enormous value of wetlands. To protect the vanishing ecosystems, hunting and fishing licenses were restricted. Living shorelines and other restoration projects encouraged the development of coastal wetlands to protect communities from storm surges. Fines and restrictions on agricultural and industrial runoff reduced the toxic chemicals spilling into wetlands.

In some parts of the world, including the United States, it is now against the law to alter or destroy wetlands. Through management plans and stricter laws, people are trying to protect remaining wetlands and to recreate them in areas where they have been destroyed.

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support the economy, health, and wildlife of an area. In the early 1990s, city leaders worked with the Army Corps of Engineers, the Environmental Protection Agency, and local environmental groups to create a wetland, the Tres Rios Demonstration Project. Tres Rios receives its water from a wastewater facility serving the busy urban area of Phoenix, as well as the seasonal streams of the Gila, Salt, and Agua Fria rivers.

More than two million gallons of wastewater flow into Tres Rios every day. Thousands of birds flock to Tres Rios: waterfowl, such as ducks and cormorants; terrestrial species, such as sparrows and cardinals; and migratory species, such as blackbirds. Even raptors such as osprey inhabit Tres Rios.

The habitat established at Tres Rios was so successful that wildlife managers were forced to relocate beavers, native to Arizona marshes, because multiplied too quickly for the wetland to sustain.

Tres Rios cleans the wastewater that flows into it. The ecosystem acts as a filter for toxic chemicals. Its position along the Salt River also makes Tres Rios a natural flood-control mechanism.

Finally, Tres Rios was less expensive to construct than a new water treatment plant for the city of Phoenix.

#### FAST FACT



for myths and ghost stories. One of the earliest written stories in the English language, *Beowulf*, takes place near a fen, or bog, in Scandinavia. One of the main characters in *Beowulf*, the monster Grendel, lives in a cave beneath the fen.

#### FAST FACT

##### **Ghost Airport**

In the 1970s, Florida's Miami-Dade Aviation Department planned to build a 101-square-kilometer (39-square-mile) airport complex and transportation corridor in the southern Florida wetlands. The Everglades Jetport would have blocked the flow of water into the Everglades, causing untold environmental damage. A group of activists, helped by the first-ever environmental impact study, successfully stopped the venture.

#### FAST FACT

##### **Pantanal**

The Pantanal is the largest natural wetland in the world. The Pantanal extends more than 171,000 square kilometers (66,000 square miles) through Brazil, Bolivia, and Paraguay.

## Soggy Cities

Some of the biggest cities in the U.S. were built on top of wetlands, including Boston, Massachusetts; San Francisco, California; and Washington, D.C. In fact, the "tidal basin" in front of the Jefferson Memorial in Washington, D.C., often floods the surrounding sidewalks with water from the Potomac River.

## Audio & Video

National Geographic Video: Explosions May Save Wetlands

## Maps

U.S. Fish and Wildlife Service: Wetlands Mapper

## Website

EPA: Wetlands—Marshes

EPA: Wetlands—Swamps

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