

Sustaining America's Aquatic Biodiversity

What Is Aquatic Biodiversity; Why Is it Important?

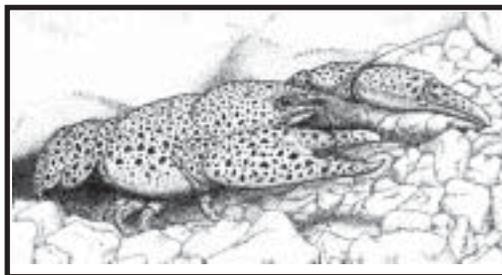
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Aquatic biodiversity is the rich and wonderful variety of plants and animals—from crayfish to catfish, from mussels to mayflies, from tadpoles to trout—that live in watery habitats. It is the number of different native species, or species richness. Over 1.4 million identified species live on earth, and experts estimate that as many as another 10 million to 100 million unidentified species may exist. About 200,000 species of plants and animals live in the United States, representing about 10 percent of the world's known biodiversity richness.

Many species of animals and plants live in water; some, like fish, spend all their lives underwater, whereas others, like toads and salamanders, may use surface waters only during the spring breeding season or as juveniles. Some aquatic creatures live their entire lives in the deep ocean, whereas others, like water striders, spend their life skipping along the surface of water.

Biodiversity is not only the richness of species; it is also their genetic variety and the multiple habitats and ecosystems in which these plants and animals live. Ecosystems contain both the living plants and animals and the nonliving elements (water, sunlight, soils) on which they depend.



Aquatic ecosystems (habitats and organisms) include our rivers and streams, ponds and lakes, oceans and bays, and swamps and marshes, and their associated animals. These species have evolved and adapted to watery habitats over millions of years. Aquatic habitats provide the food, water, shelter, and space essential for the survival of aquatic animals and plants.

The greater the diversity of habitats, whether in water or on land, the greater the biodiversity will be. Coastal estuaries and mangrove swamps, for example, are “edge” ecosystems that link salt- and freshwaters and trap nutrients that allow them to support a rich diversity of aquatic plants and animals.

Generally, the more complex or larger the ecosystem, the greater its biodiversity. Biodiversity in a limited area like a drop of water is less than that in the ocean. Species diversity also tends to increase from the poles toward the equator and with increasing rainfall and decreasing elevation. Islands generally have lower species diversity than the nearby mainland.

Tropical rain forests only cover about 7 percent of the earth's surface, but may contain as much as 50 percent of the earth's biodiversity. Why is

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biodiversity greater in the tropical rain forests? The warm, wet tropics with their great diversity of habitats have escaped glacial periods (ice ages), preserved their native species, and promoted the development of new species through climatic stability over a long period of history. The density and complexity of plants provides many habitats for animal species, particularly insects.

Although most public attention is directed toward tropical rain forests in South and Central America, the United States is a world center for freshwater biodiversity. The United States has a rich diversity of fish, mussels, crayfish, snails, salamanders, frogs, and toads. In fact, one of the richest diversities of aquatic animals in the world can be found in our own backyard.

The United States ranks first worldwide in the number of species of freshwater mussels, crayfish, snails, and many aquatic insects (mayflies, caddisflies, dragonflies, and damselflies). We rank seventh in our diversity of fishes, most of which are found in our Southeastern rivers and streams. However, we share a common theme with our tropical rain forest counterparts—an alarming vulnerability to development, habitat loss, and species declines.

The Value of Biodiversity

Each aquatic species from a tiny bacterium to a blue whale is unique. It is not size, but the genetic composition of plants and animals that makes all life forms special. Each species has its own inherent genetic library that codes its ability to survive in changing environments. The huge variety of species and genes represents a living library of options to adapt to change, to develop immunity to disease, and to pass improved fitness on to future generations.

Sustaining biodiversity is essential to the health of our environment and to the quality of human life. We depend on many aquatic plants and animals, and their ecological functions, for our survival. For example, we use surface waters and their inhabitants to help process our waste products. Each day, aquatic organisms (bacteria and fungi) continually break down harmful toxins and nutrients that we flush into our

sewage systems or discard directly into our rivers and streams.

Aquatic and terrestrial biodiversity are sources of medicine, food, energy, shelter, and the raw materials that we use and need. Although we seldom recognize them, each aquatic species has an important role in making our lives easier, healthier, and more productive. Every living organism has an important role to play, and many are indispensable.

Our aquatic wildlife are important sources of food, energy, jobs, atmospheric oxygen, buffers against new diseases, pests, and predators, and protection against food shortages and global climate change.

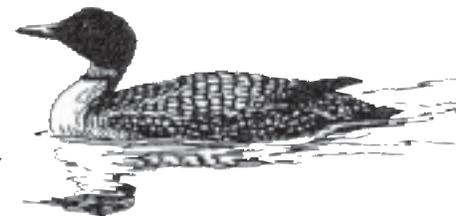
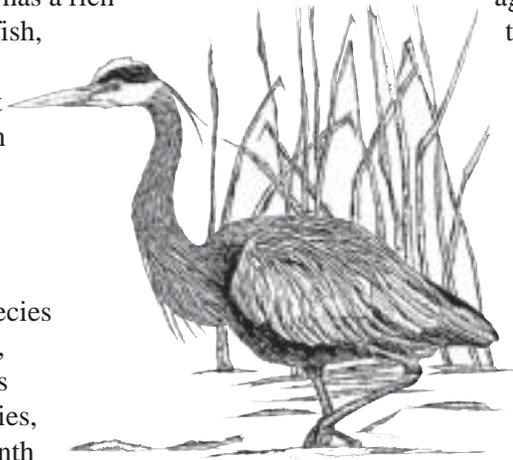
Conserving a rich diversity of plants and animals will

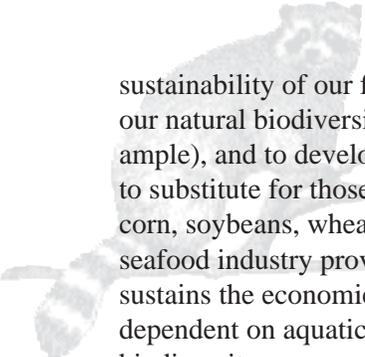
- help us to discover new drugs and medicines;
- provide food for the growing human populations;
- add oxygen and reduce ozone and carbon dioxide in our atmosphere; and
- add jobs and promote tourism through the enjoyment of nature.

Medical researchers constantly are hunting for organisms that produce special chemicals that may cure cancer and other diseases. Although many new drugs are synthetically made, nearly all are copies of natural chemicals. Even today, more than 40 percent of available medicines are derived from natural plants and animals.

The world's food supply is overly dependent on only a few species of plants and animals (a limited diversity of about 24 species, like corn), making our food supply vulnerable to new diseases or changing global climatic conditions (droughts and floods). Rice, an aquatic plant, is the primary food source for billions of people in the highly populated regions of the world. Similarly, fish is the primary source of animal protein for billions of people.

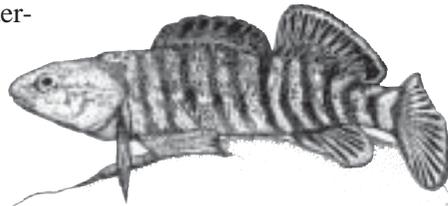
If a new strain of disease, climate change, or overharvest reduces the world's rice or fish crop, widespread starvation or malnutrition could result. To insure the





sustainability of our food supply, we need to protect our natural biodiversity (from overfishing for example), and to develop new, alternative food sources to substitute for those primary foods such as rice, corn, soybeans, wheat, beef, poultry, and fish. The seafood industry provides millions of jobs and sustains the economies of many nations; it is directly dependent on aquatic ecosystems and their biodiversity.

Tourism supports the economy in many countries. Coastal whale-watching cruises, seal and sea-bird tours, coral-reef snorkeling, ocean and freshwater sport fishing, river rafting, float trips, and other water-based activities are dependent and directly related to the biodiversity of the area. Tourists visit to fish and hunt, to view wildlife, and to see healthy natural ecosystems, and they rent rooms and buy meals and souvenirs, all of which support jobs for guides, boat captains, naturalists, students, and other local workers.



Without the rich natural diversity of native plants and animals, our lives would be poorer, the supply of medicines more limited, career opportunities more scarce, and the economy less healthy. We depend on biodiversity just as much as we depend on clean water and air. We should make an exceptional effort to conserve wild species for tomorrow.

National and World Biodiversity

- Center for Applied Biodiversity Science: <http://www.biodiversityscience.org/xp/CABS/home>
- Investigate Biodiversity: <http://investigate.conservation.org/xp/IB>
- USGS biodiversity home page: <http://www.nbio.gov/issues/biodiversity/index.html>
- Marine biodiversity: http://www.wri.org/wri/biodiv/marine_diversity.html
- Conservation status of 50,000 animals and plants: <http://www.natureserve.org/explorer/>
- Nature Serve: <http://www.natureserve.org/index.jsp>

- Animal Diversity Web: <http://animaldiversity.ummz.umich.edu/index.html>
- All Species Biodiversity: <http://www.all-species.org/>
- The Tree of Life: <http://tolweb.org/tree/phylogeny.html>
- Canadian Biodiversity Network: http://www.cbin.ec.gc.ca/default_e.cfm
- Ranking America's Biodiversity by States in the U.S.: <http://www.natureserve.org/Reports/stateofunions.pdf>
- Local Websites: <http://www.natureserve.org/visitLocal/index.jsp>
- National Geographic.Com Conservation site with teacher information: <http://www.nationalgeographic.com/gaw/biodiv/>

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