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Sustaining America's Aquatic Biodiversity
Why Is Aquatic Biodiversity Declining?

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Introduction

When a species goes extinct, all the genetic information carried by individuals of that species is lost forever, never to be reproduced again. Extinction is a loss of potential solutions to future problems such as cures for diseases and solutions for survival in a changing world. Water animals and plants are our aquatic heritage, and sustaining their biodiversity must be our legacy to future generations.

Biodiversity is declining globally at rates unprecedented in human history – and the rate of species extinctions is accelerating which will have grave impacts on people around the world. Scientists agree that around 1 million animal and plant species are now threatened with extinction, many within decades, which is more than ever before in human history. Biologists estimate that since the year 1620, more than 500 species, subspecies, and varieties of plants and animals in the United States have gone extinct.

Aquatic fauna in the United States are more threatened than any other life forms. Freshwater species in the United States are disappearing at a rate two to five times faster than native land animals, and at a rate equal to those of the tropical rain forest fauna.

Aquatic organisms serve as important indicators of water quality and ecosystem health. For example, a fish kill or the disappearance of mussels or crayfish from a stream can alert citizens to a water pollution problem.

Unfortunately, many of these animals have declined sharply in numbers and distribution in the relatively recent past. At present, nearly 40 percent of our freshwater fishes, 70 percent of our mussels, 48 percent of our crayfishes, and 74 percent of our aquatic snails are imperiled, meaning they are either extinct, endangered, threatened, or of special concern. Of the approximately 250 species of amphibians in the United States, 21 to 61 percent are declining in population. Amphibian deformities, such as missing limbs, have been documented across the country.

Sustaining biodiversity involves more than protecting endangered species. It requires an understanding that most species and their ecosystems are interconnected and form an interdependent web of life that includes humans.

The greater the biodiversity, the greater the stability of an environment, and vice versa. For example, large tracts of undisturbed forest modify their own environments by stabilizing air temperatures, capturing rainfall, recycling water vapor, and preventing the accumulation of carbon dioxide and greenhouse gases.

The impact of development and human changes to our aquatic landscapes has caused massive reductions in our aquatic species biodiversity. Certain fish, snails, mussels, crayfish, and other aquatic creatures have completely disappeared. Others have been substantially and continually reduced in numbers over the years. Tragically, many species are lost before we even know that they existed.

Habitat Loss

Aquatic habitats are the areas where water plants and animals live and obtain shelter, water, nutrients, and food for survival. Habitat fragmentation (isolation) and destruction are the leading threats to aquatic biodiversity. Many of our native aquatic habitats were lost as early pioneers cleared the land, drained and filled wetlands, and cleared streamside forests.

More than one-half of the original wetlands in the United States have been drained and filled in the past 300 years. Agriculture, mining, forestry, housing and shopping developments, highways, powerlines, and other human activities are altering aquatic habitats and aquatic life each day. The destruction of wetlands is largely the result of human population increases and development pressure. For example, riversides are premium development properties, attracting large numbers of people and houses that threaten erosion and water pollution.

Thousands of miles of streams and rivers were lost to dams or straightened (channelized). Over 75,000 high dams and thousands of low dams block 600,000 miles of rivers (17 percent of all river miles) in the United States.

Dams isolate upstream and downstream populations of fish, mussels, crayfish, snails, and other aquatic animals. They also alter water quality and flows, changing rivers into reservoirs and sediment basins that will not support native stream life.

Our natural biodiversity is lost through many human activities including: the large-scale cutting of streamside forests, the overharvest of native plants and animals, the indiscriminate use of pesticides, draining and filling of wetlands, mining, stream gravel dredging, water pollution, flood control, dams, irrigation and water diversions, road construction, and the conversion of wetlands to agricultural and city development.

Preventing habitat loss is the first important step to take in protecting our native species, and restoring important degraded habitat is the second step. By protecting critical habitats and restoring degraded ones, by insisting on smart development and restricting urban sprawl, especially in sensitive riparian (streamside) areas, river corridors, and wetlands, we assure our native aquatic biodiversity will be sustained.

Aquatic Invasive Species

Aquatic invasive species are animals or plants that have been accidentally or intentionally introduced by human activity into areas beyond their native geographic range and that have the potential to cause harm to natural resources, economic activity, or human health.

Zebra mussels, for example, are native to Europe, but have been accidental hitchhikers transported into the United States where they are not native. Because they cause environmental and economic harm as they spread in their new location, zebra mussels are considered an invasive species in the United States. In fact, zebra mussels are just one of hundreds of species of invasive water plants, shellfish, fish, and disease microbes that have arrived in the United States. An estimated 300 invasive species now inhabit the San Francisco Bay watershed, and 200 invasive species have become established in the Chesapeake Bay watershed.

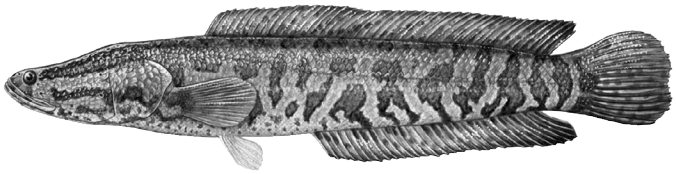
How do Aquatic Invasive Species Get Here?

Aquatic invasive species are introduced through human activity, sometimes accidentally and sometimes intentionally. Ballast water used in ships to maintain stability (added weight) on the open ocean often is pumped (along with aquatic animals and plants) on board in the home port and discharged at the destination port. About 3,000 aquatic species are moving around the globe in the ballast tanks of ships daily. Ships and airplanes serve as global conveyor belts rapidly distributing large numbers of plants and animals to areas where they are not found naturally. In this way, global transport and exchange systems have dramatically altered the biodiversity of our world's waters.

Although many of the introductions of exotic plants and animals are accidental, some are intentional imports as aquarium pets or for use on fish farms. Exotic species such as the Asian snakehead fish and African walking catfish, the Asian clam, the Chinese mitten crab, and South American aquatic plants that were introduced intentionally for the aquarium trade are causing problems.

Examples of Aquatic Invasive Species

The snakehead fish, an aggressive predator with sharp teeth native to Asia, has become established in the Chesapeake Bay watershed. These fish, sold in pet stores and later released into natural waters, destroy native fish species. Their sale is now banned in pet stores in many states and a federal law was enacted to ban them from distribution and sale in the United States.



The ruffe is a European fish in the perch family that was introduced into Wisconsin waters and can displace native fishes.

The European zebra mussel, a small striped freshwater mussel, is an environmental and economic disaster in the United States where it was accidentally introduced. Zebra mussels were transported into the Great Lakes and have spread throughout the United States. In waters infested with the invasive zebra mussel, rapid declines in the species and numbers of our native freshwater mussels have occurred, and large blooms of toxic blue-green algae may result. In high densities, zebra mussel colonies can outcompete our native fish and mussels for food and habitat.

Large colonies of zebra mussels have clogged water pipes and water intakes at power plants, dams, and waterworks in cities in Canada and the Great Lakes states, costing taxpayers hundreds of millions of dollars for pipe replacement, cleaning, and higher water and electric bills for millions of consumers. Zebra mussels foul motors, nets, pumps, boats, navigational bouys, and other submerged equipment resulting in expensive repairs and replacement.

Another shellfish, the Asian clam, was imported for food and the aquarium trade, and has now spread into rivers and lakes throughout the United States where it competes with native mussels.

The aggressive rusty crayfish preys on native aquatic plants, fish, and fish eggs and outcompetes native crayfishes. Sometimes used as fish bait, they have been spread around the country.

Eurasian water milfoil, purple loosestrife, and other invasive aquatic plants outgrow our native water plants and are becoming widely established.

Why are Aquatic Invasive Species a Problem?

Invasive aquatic plant and animal species can disrupt the balance of natural ecosystems. They threaten to outcompete (for food or space) native species, lowering biodiversity and the abundance of our native species.

In their new habitats, these invasive species have no natural predators and can eliminate native species directly or indirectly. They may carry diseases and parasites that can infect native plants and animals. Invasive organisms can potentially reproduce with native species and alter the gene pool, leading to hybridization and homogeneity, and reducing genetic diversity. In many places, native species are on the brink of extinction because of competition with invasive species.

Introduced nonnative species cause widespread destruction by reducing or eliminating economically-important native species. Exotic species may cause economic damage by

- reproducing with valuable species and producing worthless hybrids and crossbreeds;
- carrying or supporting harmful pests;
- reducing recreational boating, swimming, commercial fishing; and
- importing diseases that affect related native plants, animals, and even humans.

To protect our native fish and shellfish populations, we must prevent the import of invasive species into the United States and stop the further spread of invasive fish, shellfish, and other aquatic animals into waters nationwide.

To limit the import of invasive species into our country, we need to more strictly enforce our quarantine regulations, and more completely inspect animals and plants at ports of entry. We especially need to prevent the import of invasive species through the pet trade and by requiring that ships discharge ballast water at sea before entering port. To conserve our native aquatic biodiversity, do not release exotic pets into the wild.

Water Pollution

Air and water pollution are widespread threats that can directly poison threatened and endangered species, reduce their numbers, and diminish their available habitat. Nutrient pollutants include nitrogen and phosphorus from fertilizers, agricultural and urban

runoff, wastewater discharges, and air pollution. These nutrients cause blooms of algae that result in less sunlight reaching underwater plants that provide habitat and food for aquatic organisms. Excessive algal growth also causes decreased dissolved oxygen when the algae die and decompose, which impacts species that depend on well-oxygenated water.

Sediment is another pollutant that impacts aquatic biodiversity. Erosion introduces particles of soil into the water, which can smother bottom-dwelling species like mussels.

Warming Waters

In some areas, like the Chesapeake Bay, water temperatures are rising. This change is due to global warming as well as more local urbanization. Warmer waters hold less oxygen and cause stress to aquatic plants and animals that are adapted to cooler waters.

Web Links to More Information

Exotic, Invasive Species

- Stop Aquatic Hitchhikers: https://stopaquatichitchhikers.org.
- PlayCleanGo invasive species awareness campaign: https://playcleango.org.
- National Invasive Species Council: https://www.doi.gov/invasivespecies/.
- Florida Center For Invasive and Aquatic Plants: https://plants.ifas.ufl.edu.
- Virginia Invasive Species: http://www.invasivespeciesva.org.
- Sea Grant National Aquatic Nuisance Species (Invasive Species) Clearinghouse: https://seagrant.sunysb.edu/articles/t/aquatic-invasive-species-home.
- Aquatic Nuisance Species Task Force: http://www.anstaskforce.gov/.
- Don't Let It Loose - Promoting Responsible Pet Ownership: https://www.dontletitloose.com.
- North American Invasive Species Management Association: https://naisma.org.

Endangered Animals

- U.S. Fish and Wildlife Service: http://ecos.fws.gov/.
- Science NetLinks for information on rare, threatened, and endangered mammals: http://www.animalinfo.org/.
- Red List of Threatened Species: https://www.iucnredlist.org.
- NatureServe: http://www.natureserve.org/.

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