

# Food Web Project

## Background Information

### Part 4



## A: Mercury Contamination

Mercury is a naturally occurring metallic element found in trace amounts in air, water, and soil. Mercury is toxic to both aquatic life and humans, but its toxicity is primarily a human health concern.

Inorganic mercury occurs naturally due to its presence in rocks and soils, where it is slowly released through erosion and weathering into surface waters. Most of the mercury in surface waters remains inorganic, but in certain environments (low pH, low dissolved oxygen, and high organic matter, such as are found in the bottoms of lakes, marshes, and wetlands), some of it is converted to a much more toxic organic form—methylmercury. Airborne mercury from coal-fired power plants, mining operations, and other industrial sources can settle into soil and rivers, lakes, and oceans, where aquatic microbes convert it to methylmercury through a biochemical reaction. Elemental mercury released to the atmosphere can circulate around the world. The mercury people are exposed to comes not just from locally caught fish, but also, and for some primarily, from fish and shellfish caught elsewhere and sold in the market. Mercury pollution is truly a global problem.

Methylmercury tends to accumulate in the tissue of fish as they feed on other aquatic organisms. As larger fish eat smaller ones, concentrations of the pollutant increase in the bigger fish, a process known as **bioaccumulation**. Thus, mercury enters the food chain and becomes concentrated and is of particular interest from a human health standpoint. By far the most common route of mercury exposure in humans is eating fish and shellfish contaminated by methylmercury, according to the federal Centers for Disease Control.

## Suction Dredge Mining Activities

Mercury can be found in Idaho's environment from historic gold mining practices. To enhance gold recovery from hydraulic mining, hundreds of pounds of liquid mercury were added to riffles and troughs in a typical sluice. The high density of mercury allowed gold and gold-mercury amalgam to sink, while sand and gravel passed over the mercury and through the sluice. However, large volumes of turbulent water would flow through the sluice causing many of the finer gold and mercury particles to wash through and out of the sluice. Much of this mercury is still present in Idaho water bodies today, and suction dredge miners frequently encounter and collect mercury. To encourage safe collection, transport, and disposal of elemental mercury, DEQ has developed Best Management Practices for Mercury Collection from Suction Dredging Activities (April 2011).

## Fish Consumption Advisories

To help protect public health, the Idaho Department of Health and Welfare through the Idaho Fish Consumption Advisory Program issues fish consumption advisories when fish in Idaho water bodies are found to have methylmercury levels above what is considered safe. The need for fish consumption advisories for some Idaho water bodies indicates that mercury pollution is a factor in Idaho, as do the results of water quality studies that show some water bodies in Idaho are impaired and fail to meet water quality standards for mercury.

### Statewide Mercury Advisory For Bass:

A statewide advisory has been issued for all lakes, rivers, reservoirs and other water bodies in Idaho for **BASS** due to mercury contamination. To be safe it is recommended that:

- Women who are pregnant, planning to become pregnant, nursing and children under age 15 should not eat more than 2 meals a **MONTH** of Bass.
- The general population (women not of child bearing age, those older than age 15) should not eat more than 8 meals a **MONTH** of Bass.
- All people **SHOULD NOT** eat any other fish during the month if you eat these amounts of Bass caught in Idaho.

### Store-Bought Fish Advisory:

The Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA) have issued a joint advisory for women who are pregnant, nursing, or planning to become pregnant and for young children. They recommend that these women and children do not eat Shark, Swordfish, King Mackerel, or Tilefish. Other EPA and FDA recommendations include:

- Eat up to 2 meals a week of a variety of fish and shellfish that are lower in mercury such as Shrimp, canned Light Tuna, Salmon, and Pollock.
- Limit meals of Albacore Tuna to 2 meals a month. Albacore ("white") tuna has higher levels of mercury.

## B: Extinctions in a Food Web

A food web, according to the U.S. Geological Survey, is "who eats what." Also called the food chain, the food web describes the series of relationships that occur between predators and prey in an ecosystem. Because organisms in a food web depend on one another, the extinction of one species can spell trouble for other life in the ecosystem.

### Life and Death in the Food Web

Several types of life forms form the food web. Green plants that can make their own food through photosynthesis are the web's producers. They form the bottom of the chain. Animals that get food from other animals and plants are consumers. Decomposers feed off dead plants and animals because decomposers cannot make their own food. Every member in the food web is a predator, prey or both. For instance, one predator may become the prey for another predator.

### Extinctions and Disruptions

If one species in the food web ceases to exist, one or more members in the rest of the chain could cease to exist too. A plant or animal doesn't even have to become extinct to affect one of its predators. The harelip sucker fish, for example, used to eat snails in the 19th century. After waste, topsoil and other debris invaded rivers where the fish lived, the snail population dwindled. The U.S. Geological Survey notes that this decline probably caused the fish to go extinct.

### The Domino Effect

Interrelationships within a food web can be so intricate that a chain of disruptive events can occur when one ecosystem component changes. Polar bears, for example, rely on seals for food. The seal population may decline if Arctic cod, a key food supply for seals, dwindles. Cod eat zooplankton, and zooplankton eat ice algae. If climate change causes sea ice to melt, the ice algae population drops, creating a cascading effect that reduces the polar bear population.

### Humanity's Effect on the Food Web

Urbanization and industrialization around a natural habitat may have helped lead to the harelip sucker fish's demise. Humans also affect the food web in other ways. Overfishing occurs when people take too much food from the oceans, and species can't replace themselves. Atlantic cod almost became extinct in the 1900s when fishermen removed too many of those fish from the sea.

### Natural Disruptions Can Cause Extinctions

While the debate over whether humans affect Earth's temperature continues, weather changes cause negative effects in the food web. As water temperatures rise, the supply of corals decreases. Because other marine life forms live in coral reefs, fewer reefs will lead to disruptions in the food web for creatures that live in the ocean.

## C: Invasive Species

Invasive species are one of the leading threats to native wildlife. Approximately 42% of Threatened or Endangered species are at risk primarily due to invasive species. Human health and economies are also at risk from invasive species. The impacts of invasive species on our natural ecosystems and economy cost billions of dollars each year. Many of our commercial, agricultural, and recreational activities depend on healthy native ecosystems.

**What makes a species invasive?** An invasive species can be any kind of living organism—an amphibian, plant, insect, fish, fungus, bacteria, or even an organism's seeds or eggs—that is not native to an ecosystem and which causes harm. They can harm the environment, the economy or even, human health. Species that grow and reproduce quickly, and spread aggressively, with potential to cause harm, are given the label of “invasive”.

Invasive species are primarily spread by human activities, often unintentionally. People, and the goods we use, travel around the world very quickly, and they often carry uninvited species with them. Ships, wood products in shipping, ornamental plants, and released pets are a few of the biggest contributors to invasive species.

**Why do invasive species pose such a threat?** Invasive species cause harm to wildlife in many ways. When a new and aggressive species is introduced into an ecosystem, it might not have any natural predators or controls. It can breed and spread quickly, taking over an area. Native wildlife may not have evolved defenses against the invader or they cannot compete with a species that has no predators. The direct threats of invasive species include: preying on native species, out-competing native species for food or other resources, causing or carrying disease, or preventing native species from reproducing or killing their young.

The indirect threats of invasive species include: changing food webs by destroying or replacing native food sources, decreasing biodiversity, or altering ecosystem conditions. Aggressive plant species like kudzu can quickly replace a diverse ecosystem with a monoculture of just kudzu. Some invasive species are capable of changing the conditions in an ecosystem, such as changing soil chemistry or the intensity of wildfires.

### Examples of invasive species

- **Asian carp** – out-compete native fish for food and habitat.
- **West Nile virus**, spread by mosquitoes infected with the virus, is an invasive pathogen that has caused direct harm to humans as well as to wildlife.
- **Cogon grass** is an Asian plant that arrived in the U.S. as seeds in packing material. It provides no food value for native wildlife, and increases the threat of wildfire as it burns hotter and faster than native grasses.
- **Feral pigs** will eat almost anything, including native birds. They compete with native wildlife for food sources such as acorns. E. coli from their feces was implicated in the E. coli contamination of baby spinach in 2006.
- **Zebra mussels** first came to the U.S. from Eurasia in ship ballast water released into the Great Lakes. Since 1988, they have spread dramatically, out-competing native species for food and habitat.