FACT SHEET

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Grand Traverse Bay
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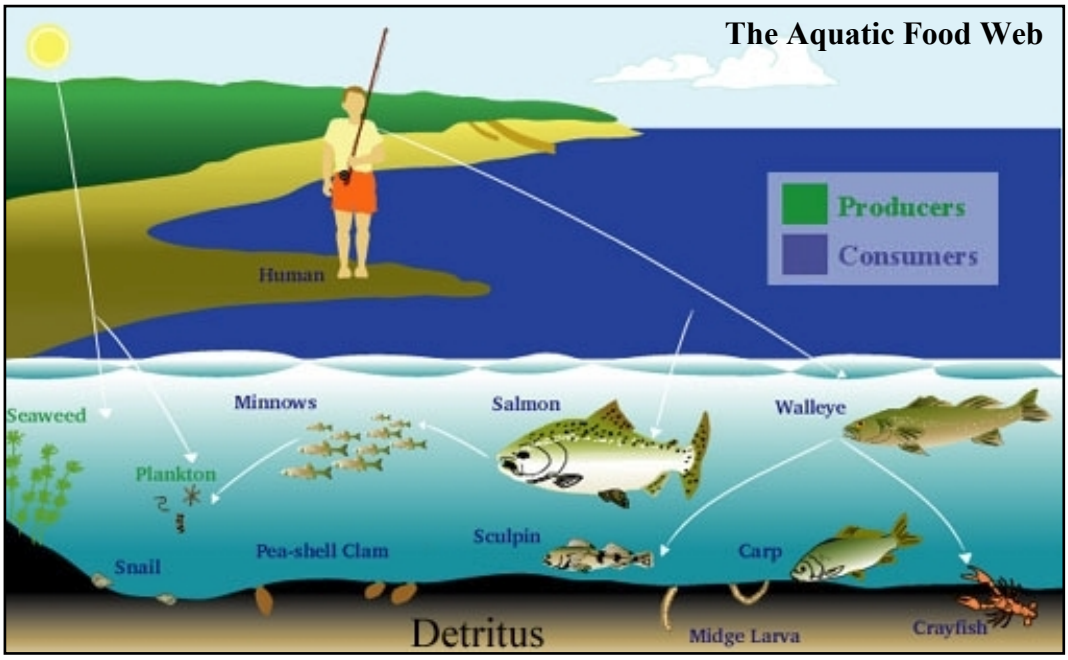
THE WATERSHED ECOSYSTEM

The Aquatic Food Web

The term "food web" refers to the fact that all living organisms are dependent on other organisms for food. Below the surface of Grand Traverse Bay are numerous plants and animals of different sizes, all dependent upon each other to maintain a balanced ecosystem. If a species were removed, it would impact the population of every other species. Together these plants and animals form an aquatic food web. The food web in a lake or stream changes a little year by year, depending on climate conditions and natural cycles of abundance of organisms, but all of the organisms are generally in balance with each other. Sometimes human actions can upset this balance and cause drastic and long-lasting changes to an aquatic ecosystem. Following is a description of the different components of the food web:



- ***Producers:*** Plants are considered ***producers*** in the food web since they make their own food by harnessing the energy of the sun. Other organisms depend on plants either for oxygen, which is produced as a by-product of photosynthesis, or for food, stored as glucose during photosynthesis. The producers comprise most of the total biomass in the entire food web and form the foundation of the food web in a lake or stream. In a water environment such as Grand Traverse Bay, the most common primary producers are microscopic algae, also called "phytoplankton", that live in the sunlit zone of the water (the upper few feet). Other plants, such as reeds and 'seaweed' root themselves in shallow water areas and grow to the surface or above.

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- ***Consumers:*** Unlike green plants, animals rely, either directly or indirectly, on other organisms for food. These animals are considered ***consumers***, because they must eat another organism for the energy to survive. Consumers can be further categorized base upon where they exist within the food chain (i.e., herbivores, carnivores, parasites, and scavengers). Some animals such as microscopic animals, larger invertebrates and some fish eat plant material. These animals are in turn eaten by larger animals, and so on up to the largest predator in the lake or stream. The number of different consumers and the size of each species population depend on the quality of the water in the lake or stream. Sports fish such as bass, perch or lake trout are of primary importance for recreation, but the health of their populations depends upon these other organisms within a lake ecosystem.

- ***Decomposers:*** Bacteria and fungi perform an important role in the food web by converting dead plant and animal matter into elemental gases such as carbon and nitrogen to be released back into the air, soil, or water. Decomposers are necessary since they recycle the nutrients to be used again by producers. The organic material that falls to the bottom of the Bay is generally called "detritus", and is broken down by these microscopic organisms.

Threats to the Food Web

- *Excessive sediment* – blocks sunlight and prevents it from reaching plants
- *Excessive nutrients* – can cause algae blooms which cover the top of the water, decreasing the amount of dissolved oxygen available to other organisms and preventing people from swimming or enjoying water sports
- *Invasive species* – disrupt native species populations and threaten the balance of an ecosystem, as well as cause damage to local industry and commerce. Without pressure from competing species, parasites, and pathogens that would normally keep their numbers in check, invasive species may grow and spread rapidly.

Types of Lakes and Their Aging Process

Lakes have an aging process, just like humans do. In the vastness of geologic time, lakes are transitory features of the landscape. Over time, sediments run off the land, plants and animals decay and these deposits fill the lake basin. Eventually, the lake fills in completely and returns to the land from which it came. Human activities can speed up the aging process; aerial photos of our lakes show plumes of sediments and decaying plant and animal material carried in by rivers. This large supply of nutrient rich, warmer water slowly changes the water quality of the lake.

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There are three basic steps in the aging process in lakes:

- ***Oligotrophic:*** These are classified as young lakes in geologic time and usually have limestone underneath the sediments. The water is usually very deep and clear with a rocky or sandy bottom. Because there are few nutrients in the water, there are few plant and fish species. Torch Lake and Crystal Lake are examples of oligotrophic lakes.
- ***Mesotrophic:*** These are middle-aged lakes that have a variety of fish and plant species and are usually shallower than oligotrophic. Lake Bellaire and Glen Lake are examples of mesotrophic lakes.
- ***Eutrophic:*** Over time, lakes get older and become more shallow and nutrient rich. These lakes are high in organic matter and appear cloudy because of sediments, algae, and other microscopic life suspended in the water. Older lakes are high in dissolved minerals such as nitrates, silica, and phosphate which provide abundant nutrients for plant production. Fewer species of fish are found in eutrophic lakes. Many of the smaller lakes in the Grand Traverse Bay Watershed are examples of eutrophic lakes.

How Can Land Use Affect the Health of an Aquatic Ecosystem?

The physical characteristics of lakes and streams, combined with the chemical composition of the water create the conditions for life to exist and help to determine which organisms live in a particular lake or stream. Conditions on the land uphill from a lake or stream can help contribute to conditions which either promote or deter life in the water.

Wetlands, riparian buffers (greenbelts), and groundwater recharge areas are critical to maintain the water quality necessary to promote the good health of aquatic ecosystems.

- ***Wetlands*** along the shore of a lake or stream serve as filters for pollutants that are carried by runoff into a body of water. When wetlands are dredged and filled, or wetland vegetation is cut down, the quality of the lake or stream can be affected and the organisms can decline as well. For more information about wetlands see the *Wetlands Fact Sheet*.
- ***Riparian buffers***, also known as greenbelts, are widely considered one of the best ways to control and reduce the amount of non-point source pollution entering a water body. These buffers consist of strips of trees, shrubs, and other vegetation lining a body of water that trap sediment and remove nutrients and pollution before they reach the water.
- ***Groundwater recharge areas*** have highly permeable soils which allow rainwater to filter down into areas where groundwater is stored. They are usually forested upland areas with steep slopes that are highly susceptible to erosion. These areas often serve as the source for residential drinking water. When upland areas are cleared, more rain water runs off the land and carries sediment with it instead of filtering into the ground and recharging the groundwater supply.

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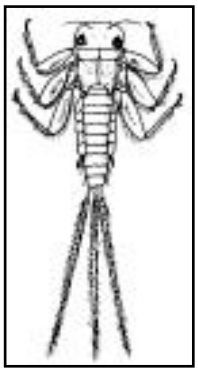
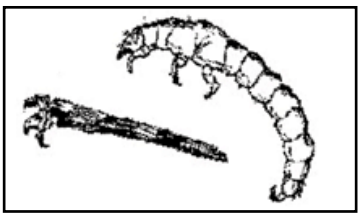
Some Common Indicators of Healthy Aquatic Ecosystems

Some species of animals can only survive in areas with excellent water quality and habitat. These animals are called ***indicator species*** because their presence indicates a healthy aquatic ecosystem. For example, the Common Loon may be considered an indicator species and is classified as a threatened species in Michigan because it has almost disappeared from the Lower Peninsula. Loons need clear high quality water in order to see and catch their food and to avoid predators that prey on loon chicks, such as snapping turtles and northern pike. They are also sensitive to toxic pollution (like mercury contamination) in the water.



Aquatic insects such as mayflies, caddisflies, and stoneflies also indicate a healthy aquatic ecosystem. These insects depend on stable flows, high water quality, and sufficient rocky in-stream habitat for survival. Caddisflies, mayflies, and stoneflies are all found in healthy trout streams.



Mayfly (left) and caddisfly larvae (right)