Lesson 3. Solutions to Pollution

Aquatic Plants

Aquatic plants are critical to our freshwater ecosystems. Many people misunderstand the importance of plants in our bodies of water. The presence of native aquatic plants around our ponds and lakes is not bad. They can provide many advantages to the aquatic ecosystem.

Aquatic plants can provide an important food source to many animals. Ducks and geese feed on the leafy parts of aquatic plants such as pondweeds and duckweeds. Even humans have utilized aquatic vegetation for food sources in the past. Native Americans once consumed arrowheads, large edible tubers at the root ends.

Aquatic plants can also provide important living space for small animals in the aquatic ecosystem. Vegetated areas tend to support more insects, snails, and crustaceans than unvegetated areas because they offer habitat to these small creatures. These small animals are important to the ecosystem because they in turn provide food for fish and waterfowl. Aquatic plants can provide cover from predation and a source of food for juvenile fish and amphibians.

Aquatic plants are not only beneficial to the biological community, but they are also critical to the physical and chemical processes that occur in the aquatic ecosystem. Plants help prevent soil erosion around lakes and ponds by sheltering the shoreline from waves, currents, and wind actions. They also help stabilize the sediments. Together, this helps increase water clarity and reduce the amount of pollution entering the waterways through sediment erosion.

Aquatic plants are a vital part of the chemical cycling in lakes and ponds. They can actually absorb nutrients in the water that would otherwise be used by algae. This can increase the amount of oxygen in the water and create a healthy habitat for fish. Good aquatic plants can make a body of water a better place for fishing!

If aquatic plants are so wonderful for the aquatic ecosystem, why are they seen as a problem? Most problems with aquatic plants arise when growth becomes too dense. Thick plant growth can invade areas used for recreational activities such as swimming and fishing. Unnatural amounts of plant growth are usually caused by high levels of nutrients. These nutrients enter the lake through runoff of fertilizers, agricultural waste, and failing septic systems. Excess nutrients in the water cause accelerated plant growth.

Another problem can arise when non-native aquatic plants are introduced to a lake or pond. A plant

that is transported from its place of origin and introduced into a new environment is called **exotic**. Exotic plants originate on other continents like Africa, South America, and Asia. A plant that lives and thrives in its place of origin is called a **native** plant. Native plants can grow and reproduce without assistance because they are in their natural habitat.

Exotic plants often invade and displace native plants. These plants are not useful to the aquatic ecosystem. The native wildlife have evolved to depend on native plants for food and shelter. When exotic plants replace native plants the animals that are dependent on the native plants will move away or perish.

Common Exotic Plants

Exotic plants enter the freshwater ecosystem by being removed from aquariums and placed into lakes and ponds, and being disposed of improperly. Once in the aquatic ecosystem these plants have the ability to alter the chemical and biological processes of the natural habitat.

When these plants form dense mats on the surface they can block sunlight from reaching other plant species in the water, provide habitat for mosquitoes, trap sediments and pollutants, and prevent water movement. These factors lead to problems, which endanger the natural freshwater plants and animals. We can prevent these species from entering our watersheds by preventing or eliminating pollution, properly disposing of aquarium plants, and collecting and identifying aquatic plants. Awareness of aquatic plants is important for detecting and controlling problems in the aquatic ecosystem.

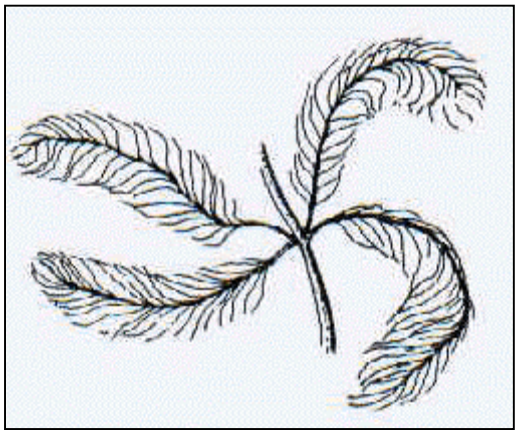
Water Hyacinth (*Eichornia crassipes*)

Water hyacinth is native to South America, but is found in subtropical and tropical climates of the world. It has been naturalized in most of the southern United States. The flower is light blue to violet and has been widely distributed because of its beauty. Water hyacinths are distinctive-looking plants. They are floating plants with shiny, round leaves. The leaf stalk is thick and spongy and helps the plant stay buoyant. The plant has a mass of roots hanging in the water underneath it.

Source:http://aquat1.ifas.ufl.edu

Eurasian Watermilfoil (*Myriophyllum spicatum*)

Eurasian watermilfoil (milfoil) originated from Europe and Asia. It was introduced to North American many years ago and is now found over much of the United States. It was once commonly sold as an aquarium plant. Milfoil forms very dense mats on the surface of the water, which interfere with swimming and fishing. These mats cause problems by blocking out sunlight to other species, creating good habitat for mosquitoes, robbing oxygen from the water, and trapping sediments.



Source:http://www.wa.gov/plants/

Milfoil are easy to identify because of feather-like leaves arranged in a whorl around the stem. It is an attractive plant with feathery underwater foliage.

Hydrilla (*Hydrilla verticillata*)

Hydrilla is native to Africa, Australia, and parts of Asia, but was introduced to Florida in 1960 through the aquarium trade. In the 1990s Hydrilla became well established in the southern United States. Hydrilla has now been introduced into the western United States.
Hydrilla can quickly overcome other plant species because it has the ability to grow with less light and more efficiently takes up nutrients.

Hydrilla is distinctive because it forms structures called turions and tubers. **Turions** are buds along the leafy stem. They settle to the bottom and start new plants. **Tubers** form at the end of the roots, underground. They are small, potato-like, and are white to yellow in color. Other characteristics of Hydrilla include leaves in whorls of five around the stem, and small spines along the leaf edges.

Source:http://www.wa.gov/plants/

Brazilian Elodea (*Egeria densa*)

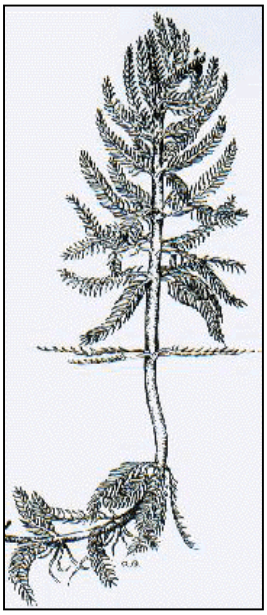
Brazilian Elodea is native to South America and introduced to North America as a popular aquarium

plant. This is a very bushy plant with bright green leaves that form whorls of four around the stem. The flowers are small, white, and have three petals. Brazilian elodea is commonly confused with hydrilla, but Brazilian elodea does not produce tubers.

Parrotfeather (*Myriophyllum aquaticum*)

Parrotfeather is native to South America and was sold in North America for aquatic gardens and aquarium use. Parrotfeather gets its name from its feather-like leaves. This plant has leaves above and below the water surface.

Parrotfeather is easily identified by its bright green, stiff, feather-like foliage that can extend above the water surface, leaves arranged in whorls around the stem, dense mats of brownish stems on the water surface, and reddish, limp, underwater leaves.



Source:http://www.wa.gov/plants/

Who Protects Our Freshwater?

The people who help protect water quality include the state and regional agencies, city and county governments, environmental/community groups, and individuals who contribute to protecting water quality.

State environmental agencies are responsible for regulating water quality of drinking water, as well as any lakes, rivers, beaches, or wetlands within the state. These agencies are also responsible for cleaning and testing water before it is consumed by the public, and proper waste disposal.

The USEPA (United States Environmental Protection Agency) is responsible for defining and enforcing national drinking water standards that protect the health of everyone who receives water from public water systems. The EPA has set standards for more than 80 contaminants. These standards limit the amount of each substance allowed to be present in drinking water.

How You Can Help Protect Your Drinking Water

It is important that everyone understands how their actions may hurt the water they use. By educating neighbors about the danger that household chemicals pose to drinking water supplies, non-point source pollution can be decreased. Many communities sponsor waste disposal days to educate proper handling of waste paints and thinners, pesticides, used oil, and other hazardous materials. Your state or local government will have information on environmental programs available in your community.

Activity 3-1 The Role of Plants in Water Filtration

Source: modified from the Environmental Protection Agency Environmental Education. For more information visit http://www.epa.gov

Objective

To understand the role of plants in filtering the water moving through the watershed before it enters a pond or lake.

Materials Needed:

- Six potted plants, with pots roughly 6-8'' in diameter, and holes in the bottom. These plants need to be moderately dry. Plants with saturated soil will not absorb water, and very dry plants will absorb it all.
- Six clear containers, such as cups, which will support the plants and allow drainage to be viewed. You will need separate plants and cups for each of the materials in the water.
- Soil from outside. The best soil is loamy, with organic bits and particles smaller than sand.
- Unsweetened powdered drink mix, preferably grape or cherry for color.
- Vegetable oil
- One or two different household cleaners (one liquid, the other powder)

Activity

1. Place the potted plants into the top of their cups. Pour clean water slowly through one of the pots and watch it percolate through the bottom of the pot. The water should look as clean as what was poured.
2. Add a gram or so of soil to 6-8 oz. of water and stir so that the soil is well suspended and distributed in the water. Pour slowly into another flower pot. The water percolating through should look much cleaner than the dirty water poured.
3. Add about one ounce of vegetable oil to 6-8 oz. of water, stir and pour into a third pot. See if the vegetable oil percolated through or is caught up by the plant roots.
4. Add some powdered drink mix to 6-8 oz. of water and pour through a fourth pot. See if the water percolating through retains the color.Add some powdered cleanser to 6-8 oz. of water and pour through a fifth pot. Is the cleanser retained in the soil?
5. Add some liquid soap to the water. Does the soap percolate through the soil?
6. Using the “contaminated” plants, pour some clean water at the same rate through each one (simulating a rain shower). Is more of the “pollutant” rinsed away from the soil by the clean water?

Discussion Questions

1. In what ways can plants and soil benefit drinking water quality?
2. We saw plants and soil remove some types of impurities from water. How might the plants remove larger quantities?

3. Can plants and soil remove any type of impurity from water?
4. What other organisms in the soil-plant system might aid the uptake of water pollutants?
5. What is the role of rainwater moving through contaminated soil?

Student Information Sheet
Solutions to Pollution

Aquatic plants are helpful in the environment for several reasons. They can provide a source of food for plant eating animals and humans. They also shelter animals from their predators. Additionally aquatic plants prevent soil erosion around lakes and ponds by keeping sediments in place. Plants also provide oxygen for fish.

Unfortunately aquatic plants can also cause problems in their habitats. As they begin to grow and spread, they take over areas that could be used by humans for swimming and fishing. Plants that come from other continents are called exotic. These plants were brought here to be used in aquariums and ponds for decoration. They enter the natural habitat through improper disposal. They replace native plants and can change the conditions in the water. The Water Hyacinth is one of these nuisance plants because it clogs waterways. Exotic plants are also responsible for harboring mosquitoes. Proper disposal of aquatic plants can help prevent further pollution of our waterways.

All members of your community can get involved to help protect the waterways from pollution. Organizations that help protect water quality include water management districts, city and county governments, and environmental groups. The Environmental Protection Agency (EPA) is in charge of defining and enforcing national drinking water standards. Each state also regulates the quality of its drinking water. They are also concerned with the quality of the water found in lakes, rivers, and wetland areas.

As members of a global community, we can help keep our water safe and usable by being responsible citizens.