The Lake CONNECTION

Disturbance and Invasions

Protect the good, improve the not-so-good

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Some observations from the Madison lakes:

"Turville Bay is filled with dense growths of aquatic vegetation";

"Along the southwest corner of Lake Waubesa there is abundant growths of larger aquatic plants in the shoal water":

Upper Mud Lake is " a dense tangle of wild rice, reeds, and rushes; water lilies abound everywhere …";

"Lake Monona has a practically continuous belt of weeds to a depth of three meters";

"Rowing across Squaw Bay was a long, hard pull through close-grown patches of reeds and lily pads …";

"Aquatic plant beds in Lake Waubesa were so dense that fisherman sometimes had difficulty in rowing boats through…";

"In Lake Wingra dense growths of chara were interspersed between the emergents and wild celery was particularly abundant".

Invasive species can out-compete native species—like the bed of Eurasian water milfoiil pictured above—but only if the conditions are right .

Can you tell what years these observations were made? Do they describe the last outing on your favorite lake? Your clue might be that everyone is rowing or paddling a boat—no motors. These observations describe conditions in the Madison lakes before the 1920s.

What do these observations tell us? First, abundant plant growth in lakes is not a new and secondly the shallow waters of lakes is an ideal place for plants to grow.

What plants need to grow

Think about it, what does a plant need to grow?—sunlight, water, nutrients, proper temperature and a stable soil to root in. Usually these are found in abundance in the shallow waters and surrounding

marsh edges of lakes. Water is no problem unless there is a drought or water drawdown. Summer temperatures are conducive to plant growth anywhere in Wisconsin and plants growing underwater aren't subjected to the wide temperature variations that affect land plants.

Nutrients are important but they are usually abundant enough in the water or bottom soils to support abundant plant growth. I know of no studies where nutrients were reduced enough to limit the growth of rooted aquatic plants. There are some soft-water lakes in northern Wisconsin where nutrients can be naturally limiting but there is even a suite of plants that are adapted to these conditions.

This leaves sunlight and stable soils as limiting factors. Plants can't root in extremely hard bottoms and they are easily uprooted in very soft bottoms. Some shorelines are high-energy. That is, they are constantly buffeted by high winds, waves, or currents so plants can't root. Lack of sunlight limits rooted plant growth to shallow water. How shallow depends on water clarity. In clear water lakes plants will grow in deeper water than in turbid waters. Some lakes are so turbid no plants will grow.

The results of disturbance are unpredictable. The resulting plant community can be dominated by species not present previous to the disturbance (an invasion), or it might be dominated by species that were dominant before the disturbance, or it might become dominated by species that were present before the disturbance but not dominant.

Disturbance and invasions

So what does this quick lesson in aquatic plant ecology have to do with the topics of disturbance and invasions?

Protecting native aquatic plant communities from disturbances can help prevent aquatic exotics such as Eurasian water milfoil from spreading within a lake. Exotic species tend to out-compete native plants when natives are removed or the lake's ecosystem is stressed. Pollution, shoreline development, motor boats, artificial lake manipulations, and other problems can lower lakes' natural defenses. Photo: UW-Extension Lakes Program.

Nature fills a vacuum. Where the habitat is right for plant growth, nature takes its course and something grows there. When there is a disturbance there is open habitat and a "race" to see who gets there first with the most—the winner of the invasion.

Often it is an exotic, invasive plant like Eurasian water milfoil. Eurasian water milfoil grows earlier in the spring and grows later into the fall than most native plants. It shoots quickly to the surface and shades out other plants. It reproduces vegetatively by stem fragments so it doesn't put a lot of energy into sexual reproduction. It has few predators. No wonder it is such a competitive plant.

Being a good competitor is not the whole story; it is more or less the end of the story. First an invader has to be transported to the area, it has to find the proper habitat to become established, and then it can spread. Disturbance opens areas, making establishment and spread easier.

Humans cause disturbances

There are many disturbances. Some are natural like drought, floods, ice scrapes in the winter, predation, and disease. But more and more disturbances are human caused—flooding

wetlands, dredging and filling, introducing exotic species like carp, herbicide treatment of plants, aquatic plant harvesting, and heavy boat traffic to name a few.

The results of disturbance are unpredictable: the resulting plant community can be dominated by species not present previous to the disturbance (an invasion), or it might be dominated by species that were dominant before the disturbance, or it might become dominated by species that were present before the disturbance but not dominant. We don't have any good way of predicting the outcome. Disturbances set back plant succession—that more or less orderly process that leads to a stable plant community.

Aquatic plant harvesting is one APM tool used to manage widespread, established nuisance plant growth conditions. Like any APM tool, it too has both pros and cons. Continual harvesting can be another type of disturbance. While harvesting provides better recreational access, it is not selective of the plants that are removed. Repeating harvesting may set back succession, creating a plant community that is tolerant of disturbance—the "weeds."

It is desirable from an ecological perspective to have a stable aquatic plant community composed of native species. It is the plant community with the most benefits for fish and wildlife habitat, for sequestering nutrients, for stabilizing bottom sediments, and even for aesthetic beauty. It may also be the community that is competitive enough to prevent the invasion of exotic species. This is hard to prove because disturbances can be found in most places where exotic invasions occurred. Lake George, New York is the only place I can think of where Eurasian water milfoil invaded a rather pristine lake. This may be changing as milfoil is creeping northward in Wisconsin.

Ecological study of other plant communities tells us the best way of preventing weeds is to have a good vegetative cover. We can't monitor every lake in Wisconsin to prevent exotic invasions. There are just too many. But, it is important to minimize disturbance because there are a number of exotic aquatic plants waiting to invade or spread in Wisconsin waters. Some could be more problematic than Eurasian water-milfoil and curly-leaf pondweed, the two most common exotic species in Wisconsin lakes. These species include: spiny naiad, hydrilla, water chestnut, European frog-bit, Carolina fanwort, and flowering rush.

Wisconsin Lakes Partnership

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