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# Leaky Sponge

**Research shows undisturbed wetland can serve quite well to protect lakes from excessive fertility. But if wetland is drained and farmed, then the nutrient contribution multiplies.**

What is a wetland?

Pockets of water rimmed with cattails, acres of moist sedge marshes, ducks, pheasants, marsh marigolds, bullfrogs, a whole world of minute plants and animals. Wetlands are all this, and more too: they are one of nature's biochemical and physical reactors, changing the water that flows or drains through them.

Just what effect do these changes have on the water quality of nearby lakes and streams? "Considerable," says G. Fred Lee of the University of Wisconsin's Water Chemistry Laboratory in Madison, "and it's decidedly beneficial."

For several years Dr. Lee and his students, under contract with the Department of Natural Resources, have studied a number of wetlands in the southern part of the state, including Waunakee and Horicon marshes. They have uncovered some interesting happenings in the private life of a wetland, both in its natural state and after draining.

Water may come into a wetland

from a variety of sources: a stream flowing into it; groundwater bubbling up in springs; runoff from surrounding lands; and rainfall. And in many wetlands, this incoming water flows slowly through them and into a stream or lake. The incoming water carries with it sediment—particles of sand, soil, plant and animal remains—and nutrients, especially nitrogen and phosphorus from agricultural land runoff, waste water and the natural decay of plants and animals.

The quality of the water leaving a wetland, however, is not the same as that of the water entering, according to Dr. Lee. What happens then to change water quality?

In the first place, the flow of water entering a wetland is slowed down by the resistance of the interlacing mass of vegetation. Some of the water is temporarily stored. And as the water is slowed in its passage, much of the load of sediment is trapped by the leaves and stems of plants. These actions tend to minimize both the erosion of downstream banks and the filling



Wetlands can serve to protect lakes by soaking up nutrients in summer and fall, then releasing the excess in spring when there's little harm done.

of lakes.

Another important occurrence in wetland is a transformation of the nutrients entering into or contained in the wetland so that they are less available to plants in the stream or lake below. The nutrients we are most concerned with are nitrogen and phosphorus. They are the plant growth promoters, and their fertilizing action is very apparent in the luxuriant stands of aquatic plants and the algae "bloom" greening over the lakes that receive an overabundance of these nutrients.

Nitrogen comes into a wetland in compounds known as nitrates. Some of the nitrates are changed by bacterial action into free nitrogen which is released into the air. Some are used by wetland vegetation during the growing season, and are thus tied up in plant tissue. Most of the nitrogen that leaves the wetland is bound up in dead organic tissue.

The other major fertilizing nutrient entering wetlands, phosphorus, is also used by vegetation during the growing season. Some phosphorus is physically bound to particles of sediment and remains locked up on the bottom. Some also leaves the wetland in the water flowing out.

Perhaps the greatest contribution of wetlands to water quality in lakes is their regulation of the flow of nutrients that do leave the wetland. In the summer and fall growing season, nutrients entering the wetland are being stored and transformed by vegetation. In the spring, high water in the wetlands flushes out excess nutrients into a stream or lake. But this action occurs before the time of nuisance algae bloom, and the nutrients are also diluted during the spring turnover of the lake water and are less accessible to plants. The wetlands, therefore, acts as a sponge, soaking up nutrients throughout the growing season and releasing the excess all at once during the high water period early the following spring.



Draining wetlands results in excessively high runoff of nutrients into lakes—and it is fertile water that brings on problems with algae and weeds.

Actually, Dr. Lee says, the sponge is a leaky one, for some nutrients escape during the growing season. But he believes this nutrient regulating action of wetlands does minimize the summer bloom of nuisance algae in lakes receiving drainage from wetlands.

There are some minuses, too, in the effects of wetlands on water quality. Dissolved organic matter from plant tissue frequently discolors the water, and may produce odors or off-tastes. Because of the tremendous amount of biological activity in a wetland—life, death, decay—there is often low dissolved oxygen which makes a wetland poor fish habitat. But this is usually not true in spring when fish are using a wetland for spawning.

Another revelation from the water chemistry research is the impact of wetland drainage on water quality in lakes—an impact sufficiently severe to eliminate all the beneficial effects of wetlands on water quality.

As a wetland is drained, a large amount of organic material, which has been stored in sediments, is

released into the water. And the continual leaching of nutrients bound in wetland soils results in a vast increase in the rate of release of nitrogen and phosphorus over a period of time.

Researchers have found, for example up in central Wisconsin, that about one-tenth of a pound of nitrogen and phosphorus per acre per year normally reach surface waters from typical agricultural land. One acre of drained wetland, however, may contribute over 50 times as much in a period of several years. Commercial fertilizers used for increased agricultural production add still more nutrients.

Dr. Lee and his students feel that the beneficial effects of wetlands on water quality far outweigh the detrimental. And in this day when wetlands are threatened with drainage for agricultural and suburban development, it is important to understand and properly evaluate the effects of drainage. The fertility of drained organic soil is high while it lasts, but so also is there a high runoff of nutrients into lakes and streams.