Phosphorus Control Efforts in the Sheboygan River Basin

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The Nature Conservancy (TNC) and the Sheboygan County Planning and Conservation Department embarked on an effort to test "targeting" of specific fields in a watershed to control soil and phosphorus runoff to streams. They received a $1.56 million dollar grant from the Kohler Trust for Preservation to study the effectiveness of changing farming practices in one watershed (Otter Creek) compared to a nearby similar sized control watershed (Fisher Creek) where farming practices were not changed. Several agencies and conservation groups contributed to the study, each taking on a specific role in the project.

Otter Creek, the test watershed, has 3,019 acres of fields of which 233 fields (96%) were studied during the project. That watershed has mostly clayey soils which had phosphorus levels of 28.4 parts per million compared to 25.0 ppm in Fisher Creek watershed fields. Fisher Creek watershed has 3,971 acres of farm fields of which we studied 180 fields or 81% of the fields. It too had mostly clayey soils.

Water samples are collected during runoff events at the downstream end of each watershed with an automated water sampler. The sampler is run by the US Geological Survey and takes/stores water samples as needed to compare water quality between the watersheds. It is estimated that we would need to reduce phosphorus runoff by 30-35% to detect a statistically valid change in water quality. That level of change is difficult to attain. We are also monitoring changes in the fish and aquatic insect populations of each watershed to detect how water quality changes affect aquatic animals.

We are using a computer model called SNAP-Plus to measure how much soil and phosphorus is lost from farming practices on individual fields. The computer model was developed by the UW-Madison College of Agricultural and Life Sciences. It takes into account the physical characteristics of a specific field and how the field is farmed over time to calculate both the amount of soil and phosphorus lost from that field. It can then be used to detect how changes in farming that field will reduce or increase soil and phosphorus loss. When all the fields in the watershed are individually run through the model, the fields with the greatest potential for phosphorus loss are identified. Those "hot" fields are then targeted for making changes to how they are farmed or where practices such as stream edge buffers are needed.

TNC, Sheboygan County, and its partners are trying to get targeted farms to make one or more changes to their farming practices. The first tool is the development of a Nutrient Management Plan (NMP) for the land that a specific farmer either owns or rents. The NMP prescribes specific crop rotations, fertilizer or manure application, and tillage options for each field. In some cases, the farmer should actually save money on reducing the amount of nutrients being applied to their land while still getting good crop production.

A second practice that we are encouraging is the use of "cover crops" where feasible. Cover crops are the planting of some form of plant cover following harvest of the previous crop so that plant life protects the soil during the period between crops, mostly winter and spring. Besides conserving soil and

preventing runoff of nutrients, the cover crops help build the quality of the soil. Both farmers and the environment benefit from cover crops.

Crop rotation is another important aspect of farming. Rotations can reduce weed pressure, reduce harmful insect populations, help build better soil structure, and promote better soil conservation. Crops such as winter wheat and grass/alfalfa in a rotation generally help reduce pollution.

No-till planting of crops has not been popular in eastern Wisconsin because farmers contend that that strategy does not work well on our heavy clay soils. However, some farmers in our area have been successful and the right strategy for success is on the horizon. No-till leaves crop residue on the surface of the soil, protecting it from rain caused erosion. It helps build better soil structure so that water infiltrates the soil and is retained for periods of drought.

Grassed waterways and buffers are also an important practice to incorporate where heavy runoff and soil loss is expected. We are working with several farmers to protect areas of fields where overland flow is concentrated and soil loss is greatest. We are also encouraging those farmers to harvest grass from the buffers at least twice each year to maintain the integrity of the grass cover and to actually remove phosphorus with the harvested crop.

Tillage changes are important as well. While no-till farming would be the ideal answer to reducing soil loss, proper tillage is very important as well. Only a few farmers still use the old mold-board plow in tilling land. Today's modern tillage tools leave far more crop residue (leaves and stalks) on the field surface to protect the soil from erosion. Our goal is to have 30% of the field surface covered by crop residue after the new crop is planted.

Managed grazing of dairy cattle is very protective of water quality as the land surface is constantly protected with grass cover. Under this form of farming, livestock are moved from pasture to pasture daily to give them good quality grass food and to maintain the health of the plants. We had one farmer convert 80 acres to managed grazing. That change is expected to reduce phosphorus runoff by over 200 lbs. each year compared to the previous cropping of those 80 acres.

Using SNAP-Plus then gives us an idea of how many pounds of soil and phosphorus we can keep from running off into Otter Creek with the practice changes we are able to incorporate. To date, we have documented a savings of 538 lbs. of phosphorus saved. That is only around a 7% savings. We have had a difficult task in finding enough phosphorus savings in Otter Creek as that watershed had already been worked on some 15 years ago as a "priority" watershed and most of the serious pollution problems had been solved at that time.

We learned a lot of lessons during this project. Some of those lessons are:

- Field by field evaluations are both expensive and time consuming
- We may be able to use other computer models to focus our efforts to a smaller number of fields
- An effort such as ours takes a lot of trust building and voluntary cooperation

- Success is largely dependent on how many control efforts are available to attack
- There are a lot of cost-sharing opportunities for farmers to address pollution problems
- Changes to farming operations must make financial sense to the farmer – they still have to make a decent living and support their families. Most would like to be good land and water stewards.
- Changing a farm operation is difficult and slow. Farmers are understandably not willing to risk their survival by changing how they operate unless it can be proven to them that a practice works well. There is a dire need for demonstration farms.
- Not all farmers have access to the equipment they need to better farm their land. The new tillage tools require higher horsepower tractors and tillage equipment is expensive.

There are some very encouraging changes on the horizon for farming in eastern Wisconsin that may have huge impacts on soil health and water quality. It may take a generation to have those changes take place on most of the landscape.

Finally, I described a "Minnesota Filter" project on Martha Lake in Minnesota which shows some promise to remove phosphorus from tile lines. The basic concept is to have field tile water flow through a filter of sand and iron fillings where the iron grabs onto the phosphorus. It is a totally new concept that show some promise. In some cases, 70% of the phosphorus has been removed by the filter.

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