



Water Watch

A newsletter for the Maquoketa River Watershed

Project News

Maquoketa headwaters council studies N management

by John Rodecap, ISU Extension project coordinator, MWP

Since April 1999, the Maquoketa Headwaters Watershed Council has reviewed water-monitoring data taken within and at the bottom of the 40,000-acre watershed entering Backbone Lake. The nitrate concentrations near Backbone Lake during April through June 1999 were: snowmelt, 8.5 milligrams per liter (mg/L); base flow (tile drainage), 12.4 mg/L; and peak flow 11.3 mg/L. (Drinking water is designated as unsafe at 10 mg/L.)

The watershed council is made up of residents of the watershed south of Arlington and Strawberry Point. They set a goal to reduce by 50 percent the nitrogen (N), phosphorus and sediment leaving the watershed and entering Backbone Lake.

Staff of the Texas Institute for Applied Environmental Research (TIAER) have developed computer modeling to aid in analyzing the watershed. The model's baseline uses 30 years of local weather records (precipitation and temperature) and data from interviews with watershed producers in crop and livestock production.

Using accepted principles of scientific research, economic analysis and computer modeling,

TIAER staff changed several management practices one by one to analyze the impact on N load. Some changes in practices result in **improved profitability and improved environmental performance**, as shown in table 1.

A major reduction in surface-water soluble N load can be achieved by taking credit for the N in manure, refined commercial N use and lower N rates for corn following soybean or alfalfa crops.









Maquoketa Watershed producer baseline survey interviews indicated an average use of 158 pounds

of N per acre for corn following corn with a range of 100 to 318 pounds per acre. Corn following soybeans received an average N rate of 128 pounds per acre, with a range of 75 to 260 pounds per acre.

Livestock in the Maquoketa headwaters watershed during 1998 were estimated to excrete 118,000 tons of manure, containing approximately 1,300,000 pounds of N with a commercial N equivalent value of nearly \$200,000. This would have provided 84 pounds of excreted manure N per acre if applied to 15,800 acres of corn.

continued next page

Table 1. Changes in nutrient practices and their effect on N load.

Change from baseline	Change in sol. N load ¹ (% of total)	Change in sed. N load ² (% of total)	Economic impact (\$/acre/year)
Reduce commercial N accounting for manure contributions	 -43%	 -10%	+\$8.93/acre
Manure application at the crop P removal rate	 -31%	 -3%	+\$8.34/acre
Moderate starter fertilizer, exclude fall diammonium phosphate	 -12%	 -41%	+\$18.86/acre (Includes P savings)
Side dress N, exclude fall crop removal diammonium phosphate	 -24%	 1%	+\$18.67/acre (Includes P savings)

¹Soluble N is mostly plant available nitrate nitrogen and drains from the field through tile lines and surface runoff. ²Sediment N is attached to sediment that erodes from the field.

Maquoketa cont.

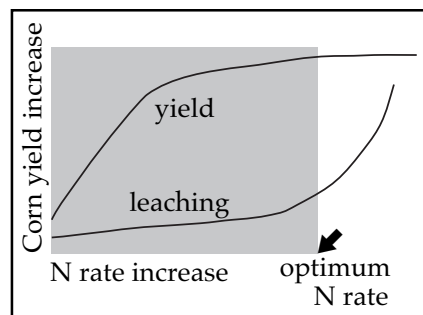
Some changes in tillage and land management practices keep water and nutrients on the field longer, thus increasing the soluble N that will be delivered through tile lines. The sediment N lost with eroding soils and field runoff is significantly reduced with soil conservation practices. However, there is an annual projected cost (using a 30 year period) associated with these management changes (table 2).

Field-based research conducted by land-grant universities in the north central United States, part of Management Systems Evaluation Area (MSEA), has shown that leaching losses usually remain low if applied N rates are at or below the amount required for optimum crop yield. The potential for nitrate leaching increases rapidly when N from mineralization of organic matter, crop residues, manure and commercial fertilizer exceeds the

optimum rate for crop production (see diagram below).

The watershed council is aware that changes in production practices will be selectively adopted by producers. However, the heart of the local watershed council plan is that citizens participate in some way so collectively there will be significant and sustainable changes in the quality of water entering Backbone Lake.

Watershed residents are invited to join the council's discussions on the environmental and economic impact of these N management changes. To receive meeting notices, contact the Maquoketa project office, P.O. Box 487, Fayette, Iowa 52142, or call (319) 425-3233.



Impact of N supply from all sources on corn grain yield and the potential for nitrate leaching.

Table 2. Changes in selected conservation practices and resulting N load.

Change from baseline	Change in sol. N load (% of total)	Change in sed. N load (% of total)	Economic impact (\$/acre/year)
No-till on all crop land	13%	-43%	-\$4.10/acre
Terraces on slopes over 2%	5%	-73%	-\$26.20/acre
Contouring on cropland over 2% slope	4%	-36%	-\$2.60/acre
Contour buffer 20:80 buffer to cropland ratio	4%	-47%	-\$10.51/acre
Enhancing and developing waterways	2%	-45%	-\$8.80/acre

New tillage-fertilizer system tried in demonstrations

Maquoketa Watershed corn growers Lavern Moorman, LaVerne Jones and Ron Carpenter, and Gary Soules are experimenting with a new tillage and fertilizer placement system. They used demonstration equipment provided by Monsanto-Dekalb on soybean fields to be planted to corn in crop year 2000.

The new tillage system builds ridges in the fall using a flanged knife operating seven inches deep and coulters to move surrounding soil onto the loosened soil over the knife opening. The equipment

places fertilizer six inches deep where it will be available to the small corn plant in the spring. There is minimal disturbance to the fragile soybean residue, which protects the soil from erosion.

Corn growers in northeast Iowa need to capture maximum early-season energy (heat units) and season-long soil moisture while using production practices that protect the soil from erosion and early-season compaction, according to Chad Ingels, Iowa State University Extension nutrient and manure management specialist with the

Maquoketa Watershed Project.

The goal is to plant corn earlier in the spring on the ridges, which should be warmer and dryer resulting in more uniform germination, early plant development and final plant populations.

High, medium or no fertilizer was applied in the ridges at all three demonstrations. These comparisons are needed to separate the effect of fertilizer from the impact of ridge building compared to the adjacent crop production practices

continued next page

New tillage cont.

the cooperating producers normally use on their farms.

The variable-rate fertilizer demonstrations are being used because soil sampling within the watershed has indicated 88 percent of the soils are testing high or very high in phosphorus, and water monitoring has shown phosphorus levels, depending on the monitoring site, to be two to five times desirable levels. The subsurface fertilizer placement protects the fertilizer from moving off the soil surface during erosive rainfall events.

Lavern Moorman will include, in addition to the ridge-built treatment, fall chisel, no-till and his conventional spring field prepara-

tion in the side-by-side trials on his farm.

LaVerne Jones and Ron Carpenter applied fall anhydrous ammonia to half of the ridge-built area and will apply spring anhydrous ammonia to the other half. They will do the same spring and fall nitrogen comparison on their conventional soil preparation.

Gary Soules applied very late-season fall anhydrous ammonia and will compare yields to spring-applied nitrogen on both the ridge-built and adjacent conventional spring field cultivated strips.

It is possible with this new system to have just one field operation (planting) in the spring to lessen

early season soil compaction and retain soil moisture.

Conservation tillage research conducted by the U. S. Department of Agriculture's Agricultural Research Service shows that a 30 percent residue cover reduces evaporation potential by 30 percent. This may be especially important for crop year 2000 with subsoil moisture levels below normal in northeast Iowa.

These field demonstrations and 10 similar on-farm manure and three nitrogen and phosphorus demonstrations hosted by producers in the Maquoketa headwaters watershed are in response to the water quality study being made by citizens in the watershed.

Maquoketa watershed's small streams important to fisheries

by Joe Wilkerson, IDNR information specialist

"When I was a boy, we'd go fishing down in the pasture," recalled the white-haired man who had stopped by an Iowa Department of Natural Resources booth at an outdoor show a couple years ago. "We'd catch bass—smallmouth—and suckers, those big suckers, all day long. There's nothing down there now."

From a fisheries standpoint, those feeder streams are still valuable as clean water conduits and aquatic nurseries for larger waterways.

"The overwhelming impact is sedimentation. It can destroy the habitat in that little stream," says Greg Gellwicks, research biologist based at the IDNR's Manchester district office.

Smallmouth bass require rocky substrate for survival and reproduction. So do a variety of forage fish. Crayfish and myriad other invertebrates live throughout a healthy stream. Eggs hatch and fry

thrive on the cobbled bottom and edges. The smallmouth and invertebrates are valuable environmental indicators of the back-pasture ecosystem.

In river and lake systems where dams hold back the silt load, much of the silt drops out into the lake bed. Relatively silt-free water spills over the dam, scouring the downstream river bottom. As incoming silt is flushed downstream, the areas just below the dams become prime fishing areas, such as the area below Lake Delhi on the Maquoketa River.

"The clear water is actually cleaning out the riffles and gravel. The water energy is pushing sediment further downstream. That rocky habitat lies below a lot of Iowa rivers, but it is buried in silt. That's true in smaller tributaries, too," says Gellwicks.

Silt slowdown is better performed upstream. Bank stabilization projects, buffer strips, continuous

CRP signup and other initiatives help keep soil out of the stream table. "The stability of the banks is affected by the land use," says Gellwicks.

Smallmouth bass, catfish and other game fish use the tributaries as spawning areas. After hatching, the young fish take advantage of insect hatches and other, smaller, forage fish in the tributaries. As they mature, they'll eventually move back into the main stream.

Sedimentation has left its mark on the Maquoketa River and most of Iowa's waterways. Even in their damaged condition, though, those feeder streams still play a valuable role. It is a role that could be maintained or even improved by stepped-up management practices.

"The first step is to stop runoff on the watershed. Then you can go in and start stabilizing banks and doing other habitat work. Neither one is successful without the other," says Gellwicks.

Grassed waterways receive CRP payments

Rainfall, as it runs off fields, moves into small in-field rills that can quickly erode soil, with the potential of forming gullies in bare soil.

New grassed waterways to prevent erosion are eligible for attractive continuous Conservation Reserve Program (CRP) payments if constructed according to Natural Resources Conservation Service (NRCS) design.

The annual CRP payments are based on the county average rental rate for the same soil type plus a 20 percent incentive to encourage waterway construction.

As topsoil is eroded away, it removes crop nutrients, organic

matter and sediment which reduces the long-term ability to grow crops profitably.

For most soils an annual soil removal rate of five tons or less is considered to be the tolerable limit. That's because appropriate conservation practices applied over many years can provide an equal soil development rate.

Soil erosion on fields caused by water can be reduced by covering the soil or by slowing the water's movement off a field.

Sod-forming grasses planted in grassed waterways prevent runoff water from tearing away soil and forming large gullies.

Waterways filter some sediment and other contaminants from water before it leaves the field and enters streams. The grass in the waterways slows the water and guides it off the field.

Waterway dimensions are based on the size of the area the waterway will be draining. They are designed with sufficient depth and width to carry the peak runoff from a 10-year frequency, 24-hour storm. County NRCS staff will assist in the design of waterways.

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Maquoketa River projects update

More than 85 **Mineral Creek Watershed** residents (Jones County) participated in the watershed project information meeting Feb. 24. Twenty-six residents have volunteered as watershed council members.

Five proposals, three requesting modification of continuous CRP enrollment rules, were ratified by the **Maquoketa Headwaters Council** on March 1. The requests

were sent to the FSA and SWCD chairmen in Buchanan, Clayton, Delaware and Fayette counties, and copies sent to state directors of NRCS, FSA, IDNR and ISU Extension.

The **Lake Delhi Recreation Association** has received a matching IDNR grant to conduct a feasibility study for restoration of Lake Delhi. Contact Sue Behrens at (319) 273-8905.

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