WaterWatch

A newsletter for the Maquoketa River Watershed

Project News

Phosphorus, algae in water, human health linked

by John Rodecap, ISU Extension project coordinator, Maquoketa Watershed Project

We have worried about the health effects of high nitrates in water, but in recent years we've learned that when phosphorus builds up to very high levels in the soil, it, too, can wash off. When excess phosphorus enters surface waters it stimulates blooms of algae and undesirable weeds, accelerating the natural aging of lakes or streams (eutrophication).

In 1996, the U.S. Environmental Protection Agency identified eutrophication as the main cause of impaired surface water. According to a U.S. Department of Agriculture Agricultural Research Service (ARS) report, neurological damage has occurred in some people along the East Coast exposed to a highly toxic, volatile chemical produced by some algae. This has increased public awareness of eutrophication and the need for solutions.

In today's global marketplace, Northeast Iowa farmers are challenged to produce competitively while protecting the environment. Production is more and more intensive every year, especially livestock production. It is a challenge to assure neighbors and communities that they can coexist with intensive agriculture.

Nutrient management plans are needed to focus on utilizing on-farm manure and legume crop nutrient resources. We need to refine the use of commercial phosphorus fertilizers that are imported from Canada and petroleum to make nitrogen imported from the Middle East and other areas.

The question can be asked: Why export money from local farming operations for commercial fertilizer that isn't needed on fields that test high or very high for phosphorus?

The ARS reports only 30 percent of the fertilizer and feed phosphorus input into farming systems is output in annual crop production. The National Research Council in 1993 reported an annual phosphorus surplus of 30 pounds per acre.

There are serious concerns that agricultural runoff and erosion from high phosphorus soils will take a long time to correct. Phosphorus accumulation on farms has built up soil phosphorus to levels that significantly exceed crop needs.

In the past, manure management plans have called for application rates designed to meet the nitrogen requirements of the crop. This usually resulted in a buildup of soil test phosphorus and considerably more phosphorus than what is removed in harvested crops.

Crop removal rates of phosphorus fertilizer applied to high-phosphorus-testing soils continue to add to the problem. A study reported in the Journal of Environmental Quality shows that soil test phosphorus levels greater than 60 parts per million in a silt loam soil caused the dissolved phosphorus concentration in tile drainage water to increase dramatically.

Manipulation of phosphorus intake by animals can help balance phosphorus input and output. A Wisconsin study indicated a 17 percent reduction in excreted phosphorus resulted from reducing phosphorus intake in dairy cows from 82 to 60 grams per day. Phytase enzyme additions to swine rations increase the efficiency of

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Phosphorus cont.

phosphorus uptake from grain during digestion. If other sources of phosphorus such as dicalcium phosphate are reduced when phytase is added to the swine ration it has been found in Iowa State University trials that phosphorus levels in swine manure can be decreased up to 40 percent.

Ten livestock producers are voluntary cooperators who have phosphorus management as part of their manure management field demonstrations this year. They are David Moorman, David and Richard Venteicher, Darrell Rosburg, Rodney and Randy Hamlett, Marvin Heims, LaVerne Jones and Ron Carpenter, Tom Hayes, Jim Grimes, NICC-Calmar and Verle Jones.

Tillage and corn-following-soybeans field demonstration cooperators where various rates of phosphorus will be evaluated this crop season include Lavern Moorman, LaVerne Jones and Ron Carpenter, Gary Soules (two), Joe Wingert and Jule Brown.

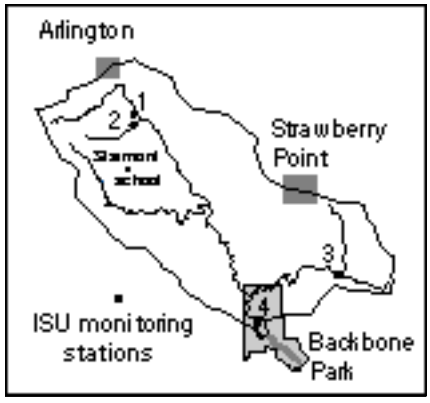
ISU continues water monitoring in headwaters watershed

Monitoring of streamflow and water quality is being conducted in the Maquoketa Headwaters Watershed to further understand the influences of row-crop agriculture, increased concentration of animals in production facilities and land application of manure.

In November 1998, flowmeters were installed at the outlet of four watersheds (see map below) in the Maquoketa headwaters watershed to monitor the water level every five minutes.

When the water level increases by approximately three inches, an automatic water sampler is triggered to take the first water sample. Thereafter, the next three samples are taken at 30-minute intervals, the next four samples every hour and the next sixteen samples every two hours. It takes about 1.5 days to collect a complete set of 24 bottles. The samples are analyzed for concentrations of sediments, nitrate nitrogen, kjeldahl nitrogen, total soluble phosphates, orthophosphate, ammonium nitrogen and chemical oxygen demand.

Bill Hayes of Arlington at monitoring station number two near his farm. Hayes keeps an eye on all four stations in the Maquoketa headwaters watershed and also takes grab samples for Iowa State University.



Maquoketa headwaters watershed showing four monitoring sites.

Tipping bucket rain gauges are connected to the flowmeters to measure rainfall amount every five minutes. The flowmeter logs both water stage and rainfall, except during freezing conditions when the instruments are turned off. During cold weather grab samples are collected for analysis at all four locations.

During 1999 losses of sediments and nutrients per acre were higher in site 3 than the other two internal watersheds. This can be attributed to the flash nature of runoff events indicating faster surface flow velocity and higher runoff rates. The nitrate nitrogen concentration at sites 2 and 3 were generally higher than sites 1 and 4. This reflects the effect of the contribution of tile drainage flow in sites 2 and 3. Other factors that may have to be considered in explaining higher runoff losses in site 3 include the slope of the area, intensive tillage, population of livestock in the area and surface application of manure.

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Monitoring cont.

Additional water monitoring results will be reported when the data analysis is complete. The intense water monitoring is expected to continue through the current crop growing season. This research is funded by a special appropriation from the 1998 legislative session, through the Iowa State University Department of Agricultural and Biosystems engineering and the Iowa Department of Natural Resources.

The automated monitoring stations and equipment are on loan from the Texas Institute for Applied Environmental Research. Institute staff use the monitoring data to aid in establishing reliable computer modeling of practices to improve water quality.

Conservation incentives for Maquoketa headwaters

The Maquoketa Headwaters Water Quality Project is an effort to accelerate the adoption of practices to improve and protect water quality in the Maquoketa headwaters, which features a cold water trout fishery between Highway 3 and Backbone Lake.

The project area includes the 40,000-acre watershed from Arlington to Strawberry Point to Backbone Lake.

Landowners and farm operators are encouraged with cost-share assistance to aggressively participate and adopt practices to create water quality improvements. The cost share assistance is the result of continued use of current conservation practice funding and a water quality project proposal submitted by the Clayton, Fayette, Delaware and Buchanan Soil and Water Conservation Districts.

Several soil conservation and nutrient management practices have been identified for funding:

- Grassed waterways
- Filter strips
- Contour buffer strips
- Riparian buffers
- Streambank stabilization
- Nutrient and pest management plans
- Water and sediment control basins
- Timber stand improvement
- Manure storage structures
- Grade stabilization structures
- Stream protection (fencing)
- Planned grazing systems
- Wetland development
- Terraces

The Maquoketa Headwaters Project has been active since April 1999, with the citizen-led council meeting monthly to discuss water quality issues and evaluate Iowa Legislature-funded and Iowa State University-led water monitoring at four sites in the watershed.

The council has set a goal of reducing by 50 percent the sediment, nitrogen and phosphorus leaving the watershed and entering Backbone Lake. This goal was called attainable by Texas Institute for Applied Environmental Research staff, who assisted the council with environmental and economic computer modeling based on 30 years of precipitation and temperature data, and interviews with producers concerning production practices.

All citizens and farm owners and operators are encouraged to do at least one water quality improvement practice so that collectively there will be significant and sustainable improvement in the water entering Backbone Lake, said Tom Hayes, chairman of the watershed council.

For more information, contact the Natural Resources Conservation Service staff in Clayton, Fayette, Delaware or Buchanan counties, or the Iowa State University Extension project staff in Fayette, phone (319) 425-3233.

Extra care when handling manure can avoid fish kills

Iowa Department of Natural Resources (IDNR) staff encourage livestock manure handlers to take extra precautions to avoid spills. When ammonia in manure enters water, it can kill fish immediately. Otherwise, fish kills occur during biological breakdown of manure depleting water of oxygen.

An additional fish kill problem is acid, chlorine and base cleaners used to sanitize milking equipment. These are sometimes delivered directly from the milkhouse to a stream.

Jerry Rattenborg, Manchester field supervisor, IDNR Environmental Protection Division, lists the following ways to reduce potential problems with manure releases:

• Pay attention to weather reports with consideration to the space remaining in a storage structure, feedlot runoff control structure or manure accumulation on an open lot.

• Have enough land available to apply the right amount of manure.

• Be aware of how saturated the soil is before spreading manure.

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Manure spills cont.

• Promptly repair any holes, leaks or breaks in structures, manure delivery lines or hoses.

• As the slope on a field increases, the potential for manure runoff increases.

• Crop residue on a field may aid in keeping manure nutrients in place.

• Open lots should be cleaned frequently.

• Lots should not be overloaded with high numbers of animals.

• Divert clean water around the livestock lot and manure storage.

• Use roof gutters and eaves spouts to collect and deliver roof water away from the lot.

• Vegetative filter strips below lots can offer some protection.

• If manure is not injected or incorporated within 24 hours, the separation distance required is 200 feet from sinkholes, intakes, lakes, etc.

Although most attention is given to large operations, last year 23 out of 31 reported fish kills were caused by runoff from small open feedlots.

Rattenborg emphasizes the need for immediate reporting and containment of manure spills to protect downstream water users and aquatic life. Iowa law requires any spill to be reported to the IDNR and local law enforcement as soon as possible but no later than six hours after discovery.

The IDNR has a 24-hour hotline for reporting any potential or actual hazardous substance release. That number is (515) 281-8694.

Maquoketa River projects update

The **Lake Delhi Maquoketa River Water Quality Team** has begun a twice-monthly water sampling program in four tributaries and Lake Delhi. Lake Delhi Restoration Project information is posted on the Web site, http://www.lakedelhi.com.

Maquoketa Headwaters Project's contract has been approved by the four county soil and water district commissioners, IDNR, and IDALS to hire a technician, who will assist in the development of BMPs and related cost-share funding with cooperators. Two council members attended IOWATER monitoring workshops in May.

The **Mineral Creek Project** proposal was recently submitted to IDNR and IDALS. Ten members of the citizen council have volunteered to attend the IOWATER monitoring workshops.

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