Why has Rice Lake been listed as an "Impaired Water"?

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You may have read in recent news reports that Rice Lake has been listed by the Minnesota Pollution Control Agency (MPCA) as an "Impaired Water" (draft 2008 list). I have written this paper for the RLA membership to explain how this happened and what it may mean for RLA's efforts to improve water quality in the future.

I have used a question and answer format. In the answers, the first paragraph gives a state-wide perspective. Most text is taken from the MPCA web site

http://www.pca.state.mn.us/water/tmdl/index.html.

The second paragraph provides the specifics for Rice Lake.

Question 1: What is an "Impaired Water"?

MPCA: "Impaired waters" are those streams, rivers and lakes that currently do not meet their *designated use* and associated water quality standards. During the 1970's, each river, stream, and lake in Minnesota was assigned a "designated use". For each designated use, the standards define the maximum amounts of specific pollutants that may be present in a water body and not adversely affect that particular designated use. There are seven classes of designated uses, including aquatic life, recreation, drinking water, agriculture, wildlife and other uses. Under Section 303 of the 1972 federal Clean Water Act, all states, territories, and authorized tribes are required to assess their waters and develop lists of impaired waters.

Rice Lake: The designated use for Rice Lake is "Aquatic Recreation". The associated water quality standard that is not met by Rice Lake relates to the concentration of *Total Phosphorus* in the water. "Total Phosphorus" is the combination of Phosphorus dissolved in the water and Phosphorus found in the sediments suspended in the water. The amount of algae and plant life in a lake is limited by the nutrients needed to sustain life. In a natural setting, Phosphorus is usually the limiting factor, because other nutrients such as nitrogen and carbon compounds are in sufficient supply to support life. So water quality is often assessed by measuring the concentration of Total Phosphorus in water samples. For many years, Rice Lake water samples have been acquired and analyzed by RMB Laboratory, a MPCA-certified laboratory. Only in the last three years have water samples been taken regularly and often enough, using the required sampling protocol, to provide an overall determination of the average Total Phosphorus concentration for the lake.

Question 2: What lakes, rivers and streams have been assessed to date? How was Rice Lake assessed and found to be "impaired"?

MPCA:

- About 10% of Minnesota's stream miles have been assessed, with approximately 40% of those that have been found to be impaired.
- About 16% Minnesota's lakes have been assessed, and about 37% of those assessed were found to be impaired.
- MPCA has scheduled 300 projects, covering over 730 impairments from conventional pollutants identified in 2006 impaired waters list.

The Minnesota's Impaired Water list - updated every two years - identifies assessed waters that do not meet quality standards. The 2006 list shows 2,250 impairments on 1,693 waters in Minnesota. Listed waters include 1,013 lakes and 284 rivers and creeks, many with multiple impairments.

Rice Lake: To understand how Rice Lake was "assessed" by the MPCA and found to be impaired, we first need to know the standards used for assessment. The standards for Total Phosphorus vary by "ecoregion". Rice Lake is in the "North Central Hardwood Forests" (NCHF) ecoregion. The following table shows values for "reference lakes" in our ecoregion. These are lakes that are carefully monitored and typical of our region. The chart means that the cleanest 25% of the reference lakes have a mean TP < 23 ug/L. The "worst" 25% have a mean TP > 50 ug/L. Our mean TP over the last ten years has been 60 ug/L, putting us in the latter category.

Our Ecoregion Reference Lakes	TP (ug/L)	Chl-A (ppb)	Secchi (ft)	TSI-TP	TSI-Chl-A	TSI-Secchi	Average TSI	Trophic State
75% level	23	5	10.5	49	46	43	46	Mesotrophic
25% level	50	22	4.9	61	61	54	59	Eutrophic

The following table gives the thresholds used by MPCA for each of four ecosystems found in Minnesota. [From the MPCA web site.] Note that NCHF contains Rice Lake.

Trophic Status Thresholds for Determination of Use Support for Lakes.

(Carlson's TSI Noted for Each Threshold.)

Ecoregion	**Not Listed: (TP in Ppb)**	**In Review: (TP Range in ppb)**	**Listed: (TP in ppb)**
NLF	< 30	30 – 35	> 35
(TSI)	(< 53)	(53-56)	(> 56)
NCHF	< 40	40 - 45	**> 45**
(TSI)	(< 57)	(57 – 59)	**(> 59)**
WCBP & NGP	< 70	70 - 90	> 90
(TSI)	(< 66)	(66 – 69)	(> 69)

TSI = Carlson's Trophic State Index

MPCA has determined that the *average* Rice Lake Total Phosphorus concentration over the last ten years has been 60 ug/L; the *standard* for lakes in our area is 45 ug/L. This is why Rice Lake was listed as impaired. It should also be noted that Chlorophyll-a, a measure of algae growth, is also measured in Rice Lake at levels that exceed the standard. Our mean is 26.1 ppb; the standard is 18 ppb. If you have been out on the lake at all, this is probably not a big surprise…

Question 3: What is a TMDL (Total Maximum Daily Load) Study?

MPCA: The federal Clean Water Act of 1972 requires the appropriate state agency, in our case the MPCA, to report to the federal Environmental Protection Agency (EPA) a list of all water bodies and streams that have been "assessed" as "impaired" (that is, they do not meet standards for their designated use) during a formal listing process. This happens every two years. Then the state is required to conduct a "TMDL" study for each pollutant that causes a water body to fail to meet its designated use and the associated state water

quality standards. The TMDL study is a written plan that analyzes the causes of the problem and determines how water quality standards will be attained. A TMDL study identifies both point and non-point sources of each pollutant that fails to meet water quality standards. Lakes, rivers and streams may have several TMDLs, one for each pollutant. A good example of an approved TMDL study, for Lake Independence in Wright County, can be found at:

http://www.pca.state.mn.us/water/tmdl/project-lakeindependence-nutrients.html

Rice Lake: For our lake, a TMDL study is scheduled to begin in 2011. We believe this study is a good thing for Rice Lake, however we believe it needs to begin sooner. For many years, people around the lake have expressed their opinions as to where our nutrients are coming from and how these problems should be addressed. Through a TMDL study, these issues will be addressed through a scientific inquiry and documented in a widely recognized manner. Once our TMDL study is published, we can move ahead with increased authority, to acquire the necessary resources / grant funding to address problems and to require the local actions necessary to improve our water quality.

Question 4: What can we all do <u>now</u> to improve the water quality in Rice Lake?

The objective of a TMDL study is to focus efforts for improving our water quality. But we can all help do that for Rice Lake right now. There is a lot of information for lake shore owners on how to improve water quality. I think the following article gives a simple and easy to understand list of actions we all can take. [Written for *DNR News* by Paul Radomski, Minnesota DNR]

Your Lake, Our Lakes: Three ways to reduce pollution from your lakeshore property

Lake home owners have a strong desire to protect their lake. Healthy lakes provide the recreational and aesthetic benefits lakeshore residents value. In addition, healthy lakes enhance

lakeshore property values. There are three ways we can reduce pollution and maintain healthy lakes:

- Reduce runoff from roofs and driveways by getting rainwater into the ground near where it falls.
- Reduce lawn size by reverting back to natural shorelines.
- Maintain our septic systems.

REDUCE RUNOFF

Rainwater runoff is a major source of water pollution. Nationally, runoff is responsible for up to 15 percent of rivers and lakes with poor water quality. Rainwater runoff comes from roads, driveways, roofs and lawns. Rainwater that does not infiltrate into the ground or evaporate becomes runoff. Runoff is not only occurring when streams are full after a rain, but it also occurs when small sheets of water flow over the surface of our lawns and head down to the lake. Runoff carries pollutants, such as oil, dissolved metals, pesticides, suspended solids, pet waste and nutrients, such as phosphorous, which can lead to algae blooms.

Good rainwater management can help reduce pollutants and excessive nutrients from entering our lakes. When rainwater is allowed to infiltrate into the ground, the soil and plants can purify the water before it reaches the lake or river.

There are two ways to manage rainwater. The traditional way has been to move water off fast. This approach uses storm water sewers, pipes and ponds. Unfortunately, civil engineers have found that this expensive approach does not work well. Often, the outcome is water quality and water quantity problems downstream or downhill.

The second way of managing rainwater is to get the water and the pollutants it carries into the ground near where it falls. This can often be a small-scale, decentralized and low-cost option. This approach uses infiltration basins, rain gardens, grass overflow parking areas, grass swales, porous or pervious paver blocks, parking lot infiltration islands and fewer impervious surfaces. Infiltration reduces pollutants and nutrients entering our lakes, thus protecting the lake water quality.

For lakeshore owners, a simple start to managing rainwater is to redirect gutter downspouts that run onto impervious surfaces, such as driveways and sidewalks so they run onto vegetated areas instead. If that is not feasible, rain barrows can hold water for sprinkling your lawn later. Rain gardens are a good way to capture runoff when greater infiltration is needed. Check with the Stearns County Soil and Water Conservation District office for more information.

REDUCE LAWN SIZE

Managing rainwater also includes protecting natural areas important for water transport and filtering, such as wetlands, streams, and vegetated buffers near water. A shoreline buffer of natural vegetation traps, filters and impedes runoff. The simplest and sometimes most effective way to recreate this buffer is to stop mowing down to the lake. A smaller lawn with a larger shoreline buffer will help infiltration and reduce runoff. Again, check with your local county Soil and Water Conservation District office for assistance.

MAINTAIN SEPTIC SYSTEMS

Finally, for those lake home owners who use septic systems to treat and disperse waste and recycle water, maintenance is critical. Sludge builds up in the septic tank and should be pumped out every two to three years. If sludge accumulates to the level of the outlet pipe, clogging will occur, which will damage the drain field and reduce the life expectancy of the system. Drain fields can also fail when they are overloaded, either with too much water or too much garbage disposal waste. The average life of a drain field is 10 to 20 years.

Lake home owner management of septic systems is sometimes inadequate. Some government organizations and communities have developed septic system management programs that track routine maintenance and compliance with public health standards. These programs can save homeowners money, because regular maintenance and inspection costs are much less than cost to replace failed systems.