LPL-253

LITTLE BEARSKIN LAKE, ONEIDA CO, WI
--A Big Lake in a Small Setting--

Project Results Presented by Blue Water Science, St. Paul, MN

Project Results Are In: Good News and Bad News is the Verdict.

Little Bearskin Lake has good water clarity, moderate fertility, and a healthy plant community based on our 1992 study results. That is the good news. The bad news is that the deep water in Little Bearskin uses its oxygen by midsummer and the fertilizing nutrient phosphorus is found in high concentrations. If this phosphorus gets into the upper water, it may cause nuisance algae blooms.

Trophic State Index for Little Bearskin Lake, 1992

	Scores
Phosphorus	51
Algae	52
Water Clarity	45

What Does This Mean?

The Trophic State Index rates a lake from 1 to 100, with low numbers being the best. The clearest lakes in Wisconsin rate around 20 and the worst lakes are close to 100. Little Bearskin's scores indicate it is more fertile than many lakes in Wisconsin and it rates as eutrophic. However, there are many lakes in Wisconsin that are more fertile than Little Bearskin, including Big Bearskin.

Summary of Recommended Projects

Little Bearskin Lake has signs that some years there are plant problems and other years there isn't. The projects listed below are intended to reduce nuisance algae and aquatic plant problems.

Inexpensive Projects

1. No wake for boats or reduce speed limits.
2. Small-scale weed harvesting (by hand and net).
3. On-going lake monitoring ($300/yr).
4. Landscaping for wildlife.
5. No action alternatives--let nature take its course

Expensive Projects

6. Aeration ($30,000 + electricity).
7. Alum application ($40,000).
8. Large-scale mechanical weed harvesting ($300/acre).

A diverse plant community is one of the many trademarks of a robust lake ecosystem. Little Bearskin has a diverse plant community.

This special newsletter was prepared by Blue Water Science, St. Paul, Minnesota, and is part of a lake study conducted by Blue Water Science. This study was funded by a grant from the Wisconsin Department of Natural Resources and the Little Bearskin Lake Association. This was a Wisconsin Lake Management Grant Project.

What Was Studied in 1992: Nutrients, Plants, Fish, and Watershed

Nutrients:

Little Bearskin Lake was sampled in June, July, and August in 1992. Phosphorus and nitrogen were analyzed.

Aquatic Plants:

We conducted an aquatic plant survey in 1992. The entire shoreline of the lake was surveyed. We used a plant drag and sonar to check plant distribution and types of plants.

Fish:

We used existing DNR fishery records to evaluate the fish community.

Watershed:

We determined land use for the watershed using USGS maps and our own observations. We then constructed phosphorus budgets and performed lake modeling (trying to predict lake phosphorus concentrations).

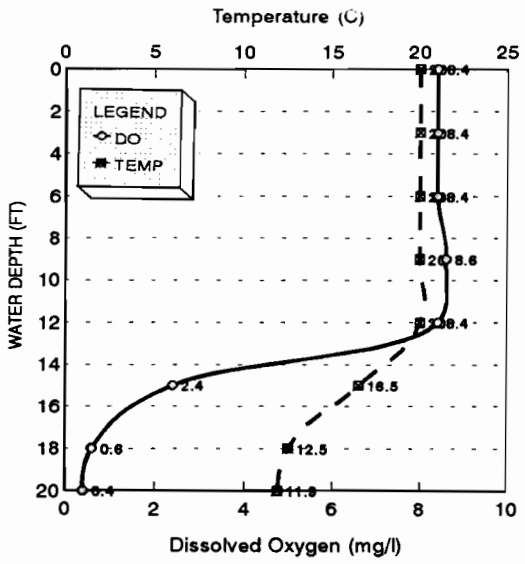
Underwater Video Report:

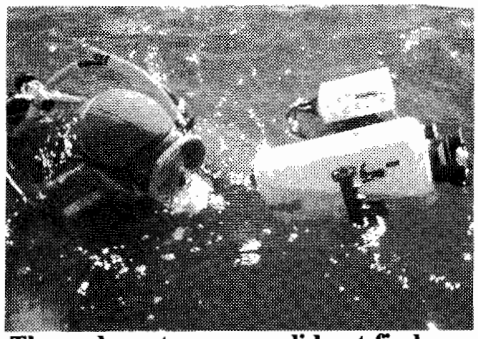
With the help of Little Bearskin Association members, Blue Water Science took the plunge in August to record the underwater world of Little Bearskin using our underwater video camera. The survey took in several representative areas of the lake and shows deep water and shallow water conditions. A copy of the video report is available from the Association President.

Results of the 1992 Lake Study: A Few Surprise Were Found

On my first sampling trip to Little Bearskin, I had to keep referring to the lake map where it said the surface area was 164 acres. The lake seemed bigger than that. The islands and the small bays make Little Bearskin feel bigger. However, it turns out that the islands and irregular shoreline may be built-in protection for Little Bearskin--protection from wind mixing up the lake. One of the surprises of this study was that the lake sediments are very fertile and they release phosphorus. We found 23 parts per billion (ppb) of phosphorus in the upper water and over 500 ppb of phosphorus in the bottom water. If the bottom water mixes up into the upper water, nuisance algae bloom can be produced.

This may explain why algae blooms occur some years and not others--when the lake doesn't mix in the summertime, algae blooms may not occur. The temperature and oxygen profiles we recorded in the summer show that oxygen declines rapidly after 14 feet. There must be a lot of organic material that bacteria are decomposing that accounts for the oxygen uptake.





The underwater survey did not find any giant water logged pine trees in the muck (left over from past logging operations) however there is plenty of muck.

Why Be Concerned About Phosphorus?

Phosphorus is the most essential nutrient for algae growth in lakes. In the lake context, phosphorus is the fuel that drives the algae engine. If the flow of phosphorus is throttled down the algae engine will slow down, (there will be less algae). It is impossible to eliminate all phosphorus and there will always be some algae in a lake. The goal is to maintain beneficial algae in a lake (zooplankton eat algae if algae are small enough). When phosphorus concentrations get over 50 parts per billion (ppb) nuisance algae may develop. Currently, the Little Bearskin Lake phosphorus concentration is 23 ppb.

What is Natural and What isn't for Little Bearskin Lake?

Is Little Bearskin Lake polluted or not? The answer is it depends on the year. In a good year the phosphorus concentrations is around the mid-twenties (parts per billion). This is the concentration that would be expected for an unpolluted lake in this part of Wisconsin (the natural concentration).

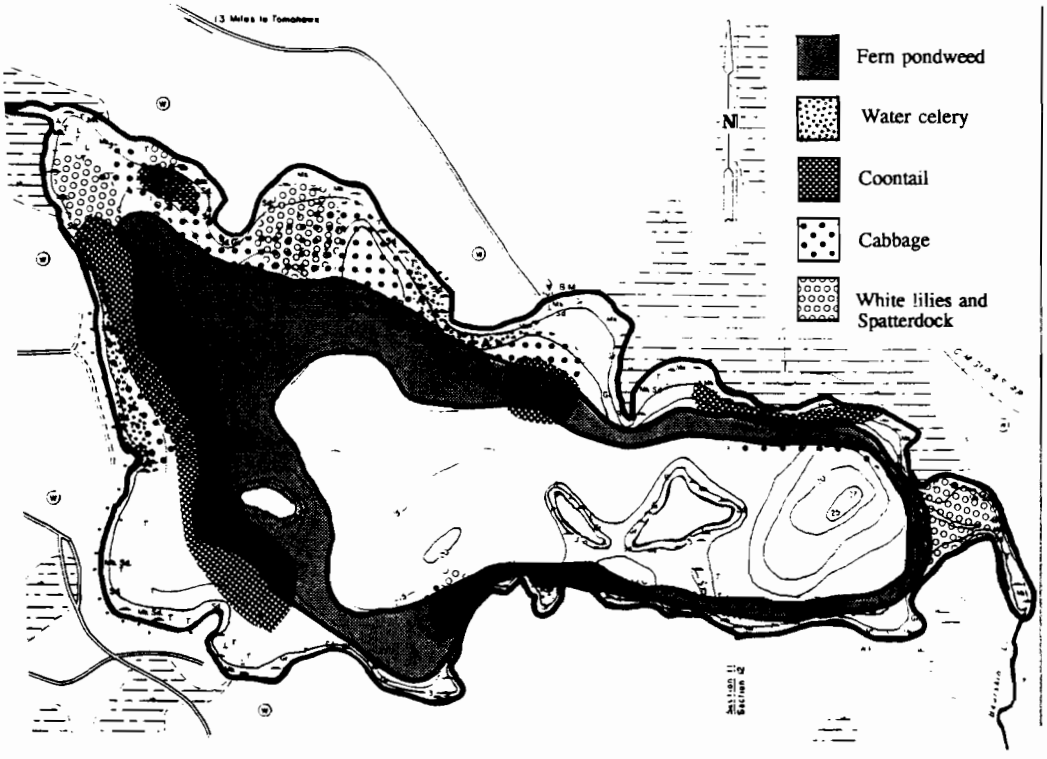
A natural phosphorus value for this part of Wisconsin is 20 ppb. Little Bearskin has that in some years.

However, some years nuisance algae blooms and plants appear in Little Bearskin. This is not natural for unpolluted lakes. This indicates Little Bearskin Lake has unnaturally high phosphorus that is the cause of nuisance algae blooms. We have not sampled the lake in a summer with nuisance algae blooms so we do not know what the phosphorus concentration is. But sampling results from 1992 indicate the bottom water of the lake is phosphorus enriched.

What is the source of this phosphorus? Is it the watershed? I don't think so. Currently there is little developed in the watershed and excessive nutrients should not be introduced. Is it Bearskin Creek? I don't think so. Bearskin Creek has good water quality running into Little Bearskin Lake (34 ppb of phosphorus in July) although it should be sampled more often. Is it the lake sediments? I think they are probably the culprit. Lake sediments have a tendency to release phosphorus when bottom water loses oxygen. Our sampling results indicate oxygen is lost in the bottom water of Little Bearskin. When this happens, chemical reactions take place that liberate phosphorus.

What is a watershed? A watershed is the land area around the lake where all the runoff from rainfall goes into the lake. The watershed is also called a drainage basin. If the watershed has a lot of pollution sources in it, then the pollution will be carried into the lake. The Little Bearskin Lake watershed is about 6,080 acres in size and does not have significant pollution sources at this time. Any future building in the watershed should emphasize erosion control and to reduce sediment inputs to the lake. Sediments carry in phosphorus.

Aquatic Plant Study in 1992: Normal Year or Freak of Nature?



Where did the plants go in 1992? In 1991, coontail was a major nuisance but in 1992 it was much better behaved. Weather conditions probably were a big factor in reduced algae and plant growth.

Aquatic plants are dynamic and it is difficult to predict what they will do from year to year. In 1992 aquatic plants had colonized about 51% of the lake bottom and they were not considered to be nuisance.

In years when coontail is a nuisance, it can easily be removed with nets or by hand raking because coontail is not rooted.

The Underwater World of Little Bearskin is Revealed

Rolling meadows of chest-high grass...is this some prairie off of Highway 51? No, it is the underwater view in Little Bearskin between 5 and 10 feet of water depth. The fern pondweed (*Potamogeton robbinsii*) was by far the dominant plant in Little Bearskin and when looked at from a fish's viewpoint (or when scuba diving) the lake bottom looked like a rolling, tall grass prairie.

From a fish's viewpoint the lake bottom looked like a rolling, tall grass prairie

The underwater view was captured on film this summer in an underwater video report produced by Blue Water Science. Blue Water Science is one of the few firms in the Country preparing underwater lake reports for Lake Associations. The 15 minute "report" shows watershed conditions as well as the underwater environment. The report closes with ideas on things homeowners can do to help Little Bearskin. Using information collected from the underwater observations coupled with water chemistry and aquatic plant information, we found that Little Bearskin is on the threshold of either having clear water or turbid water (caused by algae). The swing is probably related to spring and early summer weather conditions.

Acknowledgements

Contributors:
Little Bearskin Lake Association
Ken Mundt
Don Szatkiewicz
Barbara Szatkiewicz
Rollie Henkel
Mary Henkel
Ray Corti
Marge Phillips
Wisconsin DNR
Bob Young-Lake Management

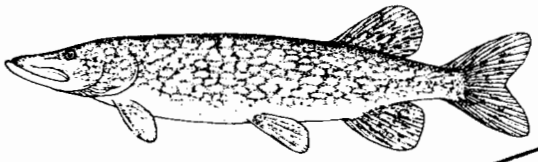
Consultant:
Blue Water Science
Steve McComas
Jo Schomaker
St. Paul, MN

LITTLE BEARSKIN LAKE ASSOCIATION
P.O. BOX 334
HAZELHURST, WI 54531

LPL-253 Bob Young

Little Bearskin Lake
A Big Lake in A Small Setting
A Watershed Poster

HOW LITTLE BEARSKIN WORKS



Fish: are the top predators in the lake. Big fish eat little fish, and little fish eat zooplankton. If the water is cloudy then fish have a hard time seeing their prey and gamefish can decrease.

Zooplankton: are small organisms that swim in the open water. Zooplankton eat open water algae, and are then fed upon by small fish.

Aquatic Invertebrates: are small organisms that graze on the algae growing on aquatic plant stems and leaves. Small fish will feed on these invertebrates as well.

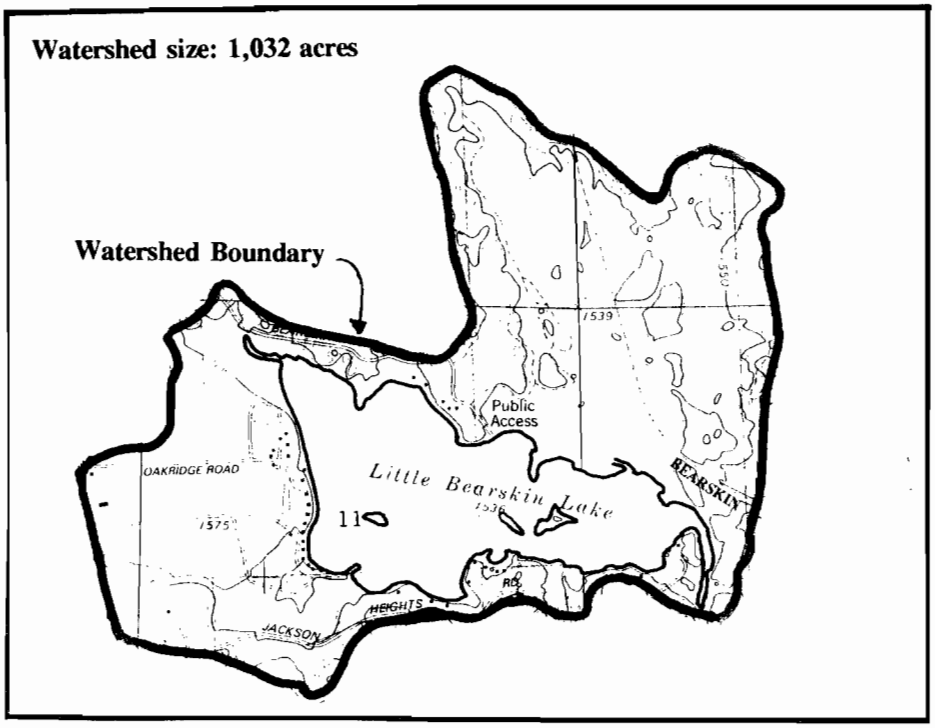
Algae: are microscopic plants that grow in the water and attached to plants. Their density depends on the amount of nutrients in the water. If the water has a greenish appearance, there are probably a lot of algae growing in the open water.

Plants (macrophytes): are important to lakes. They stabilize lake sediments and are used by aquatic bugs and small fish for protection. Algae grows on plant surfaces.

Phosphorus & Nitrogen: are the most important nutrients in the water. The higher the concentration of these two nutrients the greater the plant growth and the density of the algae.

Several ecological food webs operate in Little Bearskin Lake. One web starts with nutrients leading to algae then to zooplankton and finally to fish. Another food web starts with nutrients which affect growth rates of attached algae (on plants) then to aquatic insects and to the fish. Over the years, excessive nutrient inputs (primarily phosphorus) have caused algae to become dominant creating poor overall water quality. The food web with aquatic plants has become less important. If the aquatic plant food web could regain importance, the algae dominated food web would become less dominant and so would the occurrence of nuisance algae.

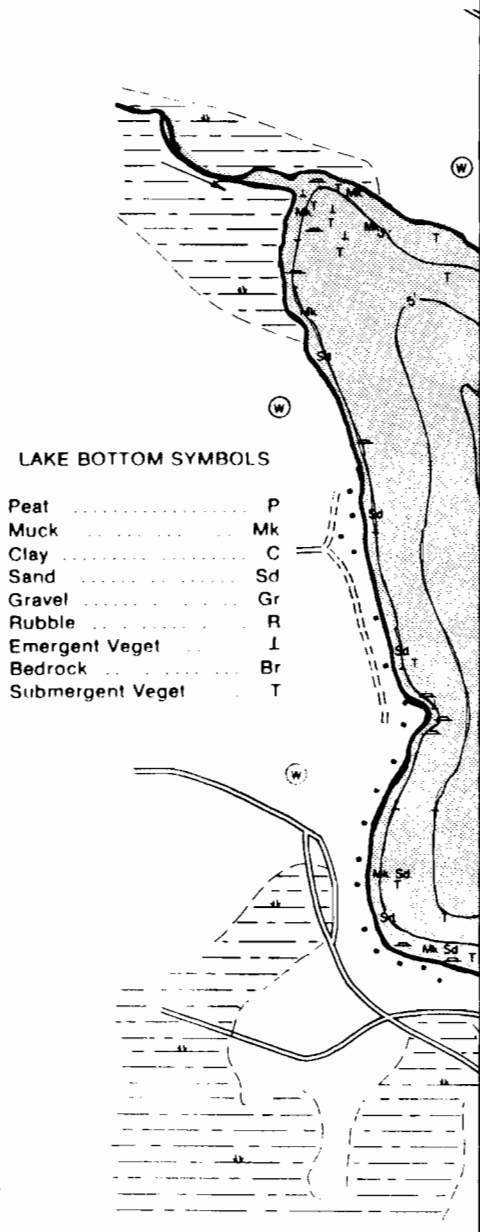
Little Bearskin Lake
Oneida County, Wisconsin



Little Bearskin Lake Cha

Area-163.7 acres
3.9 miles shoreline
Max. De
Water quality:
- pH = 9
- Alkalinity (ppm) = 35
- Total phosphorus (ppb): 23
- Water transparency (ft): 9
- Chlorophyll(ppb): 10

Latest survey - 1992



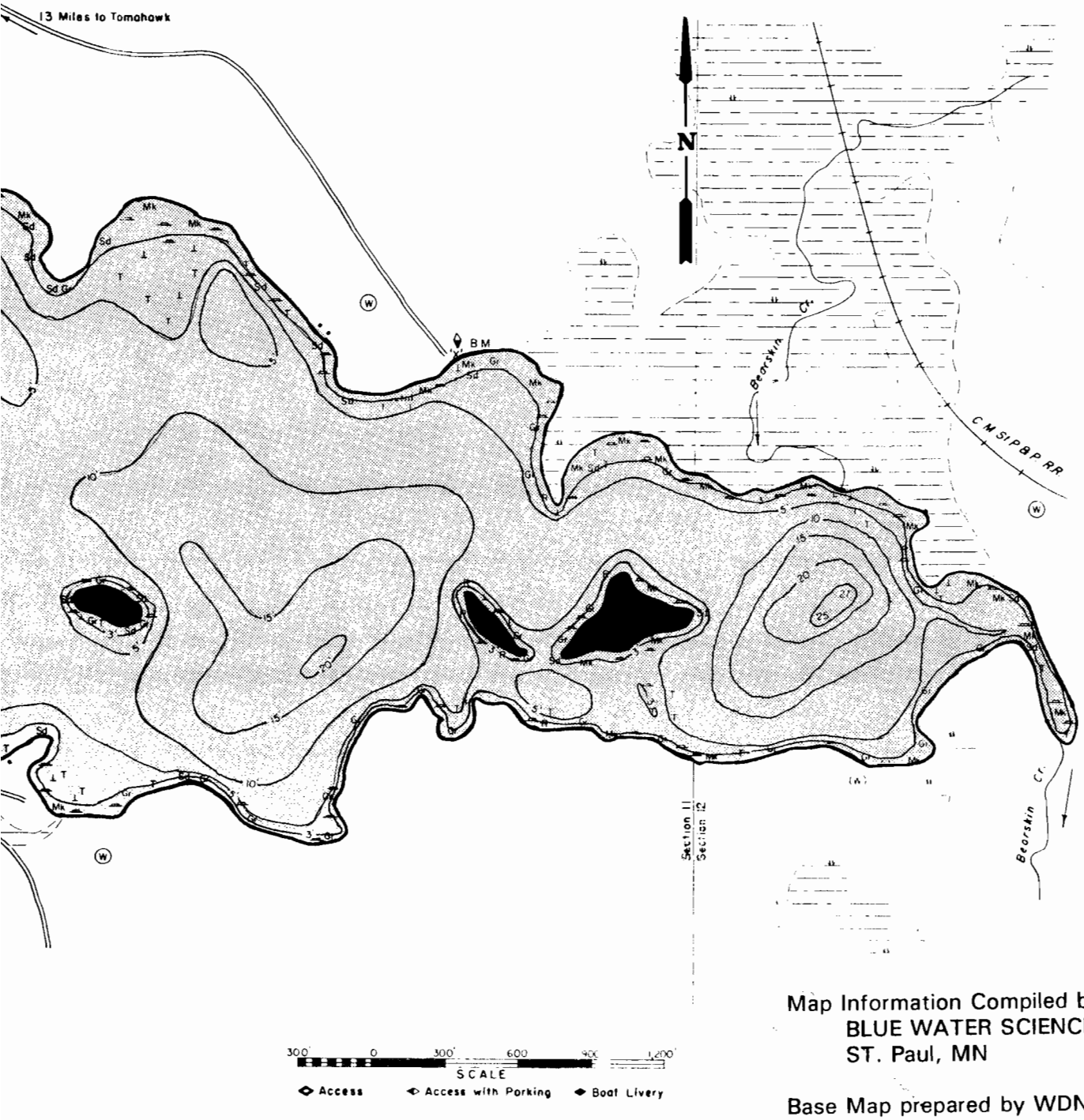
ıracteristics

ıth-27 ft

Fish Community Characteristics

Species	Relative Abundance
Muskellunge	Common
Northern Pike	Common
Walleye	Common
L.M. Bass	Common
Panfish	Abundant

Last fish survey was in 1972.



Map Information Compiled by:
BLUE WATER SCIENCE
ST. Paul, MN

Base Map prepared by WDNR

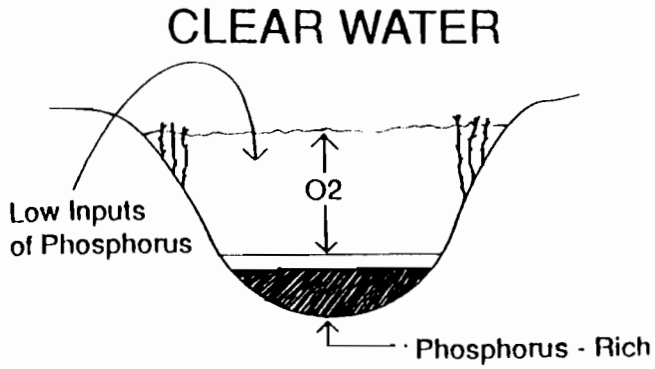
Is Little Bearskin Lake Close to Reaching A Threshold–A Point of No Return?

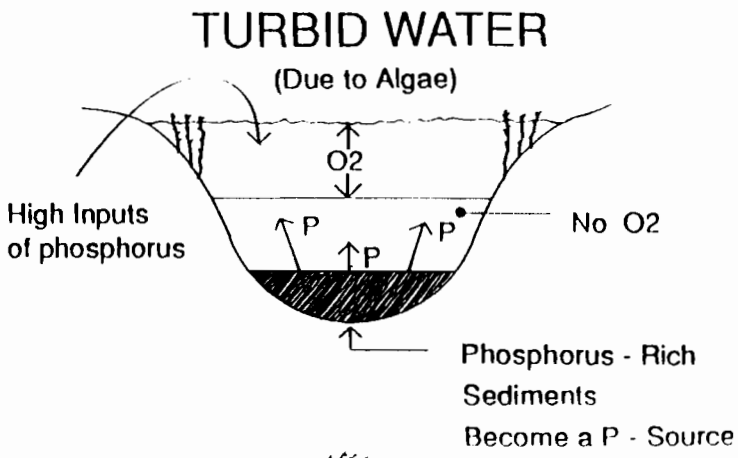
A Clear Water/Plant Condition is Generally More Desirable than a Turbid Water/Algae Condition.

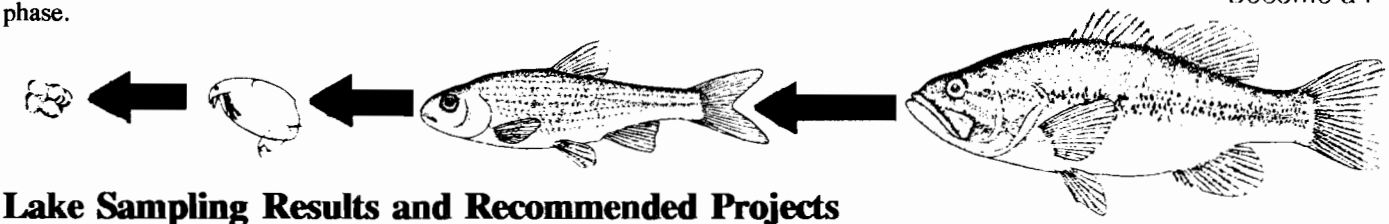
Clear Water/Plant Phase: New lakes generally start out with clear water and macrophytes. An undisturbed watershed's nutrient input is low. Oxygen is found even in deep water throughout the year. Sediments accumulate phosphorus, but release very little. Clear water allows gamefish to control undesirable bottom feeding fish such as carp.

Turbid Water/Algae Phase: Development in the watershed can produce a greater nutrient input to a lake. Because of increased nutrient inputs spring algae blooms increase and when they die and settle to the lake bottom, bacteria use oxygen as they decompose the algae. If oxygen is depleted, iron then dissolves in the lake sediments, and phosphorus, that was formerly tied up with the iron, is now released. The phosphorus is used by summertime algae, increasing water turbidity. Rooted plants can no longer grow in deep water because of reduced light penetration. Fewer plants also mean reduced surface area for attached algae growth so more algae are now free-living than attached. Bottom feeding fish also recycle phosphorus from the lake sediments. The algae blooms that die at the end of the summer represent an organic phosphorus source that will be available for algae growth in the spring. Sometimes, even if watershed phosphorus inputs decrease, the lake sediment phosphorus will be sufficient to fuel spring growth.

Little Bearskin Lake is currently in the clear water/plant phase.







Lake Sampling Results and Recommended Projects

Water quality in Little Bearskin Lake is fair with a phosphorus concentration around 40 parts per billion (ppb). The threshold phosphorus concentration that would cause problems is about 50 ppb.

Several projects have been recommended that will address some existing concerns and also serve to protect water quality for the long term.

--Recommended Projects--

1. No wake for boats or reduce speed limits. This would reduce the mixing of the lake water from the activities of fast boats.
2. Small-scale weed harvesting (by hand and net). This would help for small area of lake shore.
3. On-going lake monitoring ($300/yr). This would give a yearly record of the lake.
4. Landscaping for wildlife (planting of native trees, bushes, and grasses to enhance wildlife and to control erosion).
5. No action alternatives--let nature take its course. Possibilities are endless.
6. Aeration. This would put oxygen into the lower waters helping to relief the low oxygen problems.
7. Alum application. The addition of alum would cost a lot but the nuisance algae problems of some years would most likely not occur.
8. Large-scale mechanical weed harvesting.

Our results found Little Bearskin Lake to be in a protection/enhancement status rather than a restoration status.

This is a preferred status because it is awfully expensive to restore lakes and it is much more efficient to preserve good water quality.

Acknowledgements

Contributors:

Little Bearskin Lake Association
- Ken Mundt
- Don Szatkiewicz
- Barbara Szatkiewicz
- Rollie Henkel
- Mary Henkel
- Ray Corti
- Marge Phillips

Wisconsin DNR
- Bob Young-Lake Management

Consultant:

Blue Water Science
- Steve McComas
- Jo Schomaker
- St. Paul, MN