

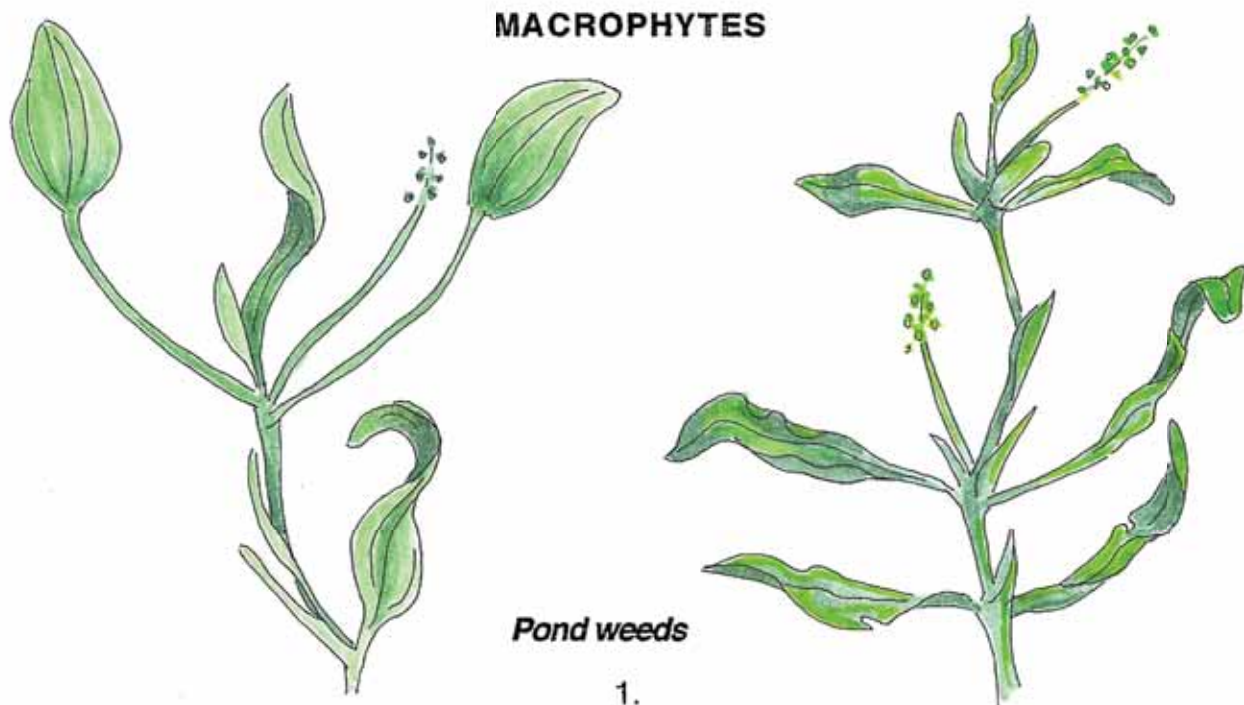
KANGAROO LAKE COMPREHENSIVE STUDY/MANAGEMENT PLAN

WATER QUALITY

Everyone enjoys a crystal-clear lake, and most of us probably assume that if the water is clear, the quality must be good. An accurate evaluation is much more difficult than that because lakes display problems in a multitude of ways, but comparing specific aspects that are important to lake ecology can provide valuable information. For example, we can compare historical data from our lake to data from similar lakes in our area or to an average of statewide data. To do this, we focus on three characteristics of water quality.

1. **Phosphorus** is the most important nutrient controlling the growth of plants in most Wisconsin lakes. (In lakes, the term "plants" includes both algae and macrophytes or pond weeds.) Too much phosphorus accelerates plant growth. Therefore, monitoring and evaluating concentrations of phosphorus in lake water helps us understand the growth rates of water plants.

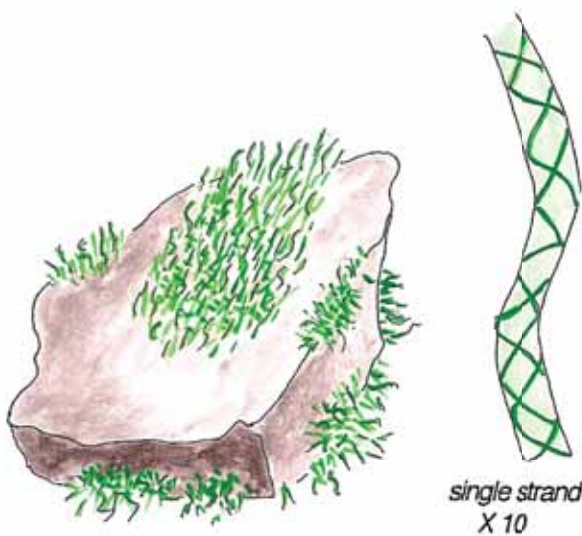
Phosphorus concentrations have been tabulated for Kangaroo Lake from 1973 to 2003. During that period, the average level was lower than the averages in both our region and the state. However, last year the phosphorus in our lake increased to the highest level since 1974. Phosphorus increase can be caused by chemical lawn fertilizers, farm chemicals in our lake's watershed, geese, failing septic systems, etc.



2. **Chlorophyll-a**, the green pigment that macrophytes/pond weeds and algae use during photosynthesis, is produced when algae or other plants take up nitrogen from the air, soil or water. Because algae floating in the lake are too small to be seen, scientists measure their quantity by collecting a sample of water, determining the amount of nitrogen present in the sample and using that data, to determine the density of algae in the lake. An overabundance of algae can fill a lake and cause it to appear murky.

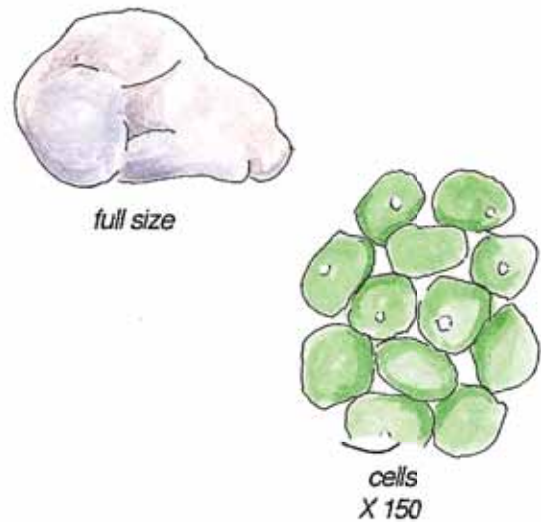
Chlorophyll-a concentrations tabulated for Kangaroo Lake from 1980 to 2003 were lower than both the region and state averages. However, the level of chlorophyll-a in 2003 was higher than in any year since 1994. The water quality index is good, but chlorophyll-a needs to be monitored on a regular basis to ensure no negative trend develops.

ALGAE



Spirogyra

(found on south side of causeway and on east and west shores)



possibly Coelosphaerium

(found at south end and east and west shores)

Phosphorus controls the abundance of algae, which are measured by their chlorophyll-a levels. Macrophytes/pond weeds also use phosphorus, but if these larger plants decrease in number, the excess phosphorus is used by algae. The concern regarding the higher level of phosphorus in Kangaroo Lake is heightened by the recent observation of two types of algae on the lakeshore. Wavy green strands of *Spirogyra* were found attached to rocks along both the east and west shores and on the south side of the causeway. Greenish gray balls (possibly the algae *Coelosphaerium*) were found floating in the lake, attached to rocks near the east and west shores and on the sand on the south end. This is likely a reflection of the increasing level of phosphorus in the lake water. Because many of the macrophytes/pond weeds have disappeared, the excess phosphorus promotes the growth of algae. Loss of pond weeds can also result in the loss of zooplankton, which live among the plants and eat algae.

3. **Water Clarity** is measured with a Secchi disk, a weighted circle 20 centimeters in diameter with alternating black and white quadrants. It is lowered into the water and the depth just before it disappears from sight is measured by marks on the cord attached to the disk. Measuring Secchi disk transparency over long periods of time is one of the best methods of monitoring lake health. In 2003 the depth at which a Secchi disk could be seen in Kangaroo Lake was about six feet, which is two feet less than the state average but 18 inches more than the regional average. It should be noted that the depth at which the Secchi disk could be seen in our lake in 2003 was the shallowest since 1996. This reading indicates a "fair" water quality index.

SECCHI DISK



The measurements of lake quality described above are inter-related. Water clarity, as measured by Secchi disk transparency, is directly affected by the particulates that are suspended in the water. In the most natural lakes in Wisconsin, the most common particulate matter is algae. Therefore, an abundance of algae directly affects water clarity. Studies show that water clarity is how most lake users judge water quality. If the water is clear, we assume it's clean.

Another factor that affects the quality of a lake is natural aging. Lakes usually fall into one of three categories:

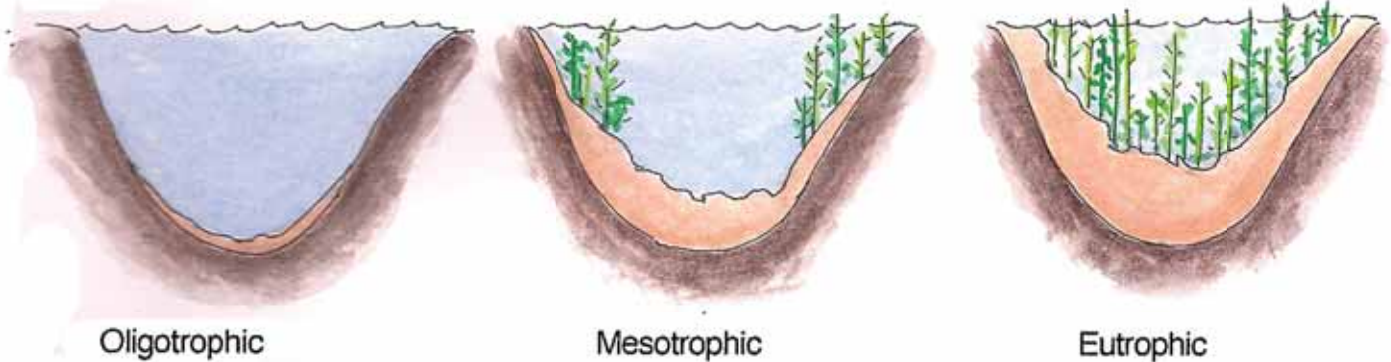
An **Oligotrophic** lake is usually deep and clear. It typically has few plants and may have large game fish. As it ages, it turns into....

A **Mesotrophic** lake that accumulates organic and inorganic matter on the bottom, has more plants and a greater variety of fish. As it ages even more, it becomes....

A **Eutrophic** lake, high in nutrients that produce lots of weeds and/or algae. Fish may be plentiful, and rough fish are common. A Eutrophic lake is not necessarily desirable and, though fishing may be good, other recreational activities may be limited.

In a natural state, the aging of a lake can take thousands of years, but human influence including nutrients from agricultural run-off, lawn fertilizers, geese, etc., has accelerated the process in most Wisconsin lakes. At this point, Kangaroo Lake is at the upper Mesotrophic - lower Eutrophic level.

AGING OF LAKES



Other factors that affect the quality of a lake are temperature and the level of dissolved oxygen. Many lakes stratify, with a warm layer on top and a cold layer on the bottom in the summer, then "turn over" in the fall so that the layers are reversed. This can cause winter fish kills. Kangaroo Lake is fortunate not to have this problem.

Six temperature/dissolved oxygen profiles were completed at Kangaroo Lake during 2003. Results of each profile indicated that the lake was well-mixed and had sufficient oxygen levels to support its fish. This is good news considering the shallow depth of the lake and its upper Mesotrophic/lower Eutrophic status, because shallow - lakes even those that do not "turn over" as the seasons change - often have too little oxygen to keep fish alive over the winter. At this time, there appears to be no danger of fish kills in our lake.

Concerns:

We are losing native aquatic plants. The loss of plant root structure that holds sediments in place on the lake bottom tends to increase the cloudiness of water. Continued loss of aquatic plants may cause Kangaroo Lake to shift to a perpetually cloudy state. Motor craft and wind can suspend bottom sediments in the water, impacting water quality.

Conclusions:

Current testing, as well as testing in the past, indicates that the water quality in Kangaroo Lake has fluctuated over decades and years, but has primarily been fair to good. The most realistic way to maintain the current water quality is to adopt the recommendations in the Lake Management Plan prepared by NES Ecological Services and presented at the 2004 annual meeting of the Kangaroo Lake Association.

Information Sources:

1. Comprehensive Management Plan for Kangaroo Lake prepared by NES Ecological Services.
2. NES Scientist/Ecologist presentation and comments.
3. KLA member observations.