

# A Guidebook for Lake Associations

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## A GUIDEBOOK FOR LAKE ASSOCIATIONS

The Minnesota Lakes Association, as part of our effort to serve each lake association, has decided to begin publishing and maintaining a guidebook. This guidebook is purposely designed in a loose leaf format so it can be added to periodically and continuously updated.

As a base for the guidebook, MLA has taken the lake association guidebook developed for lakes in the western part of Minnesota and altered it so it is useful statewide.

We hope this booklet, which was developed as a tool to inform, educate, and empower local lakeshore groups, will assist with the many difficult issues that face those interested in managing Minnesota's lake resource.

We intend to use the guidebook as a vehicle to communicate progress on the LCMR-funded Sustainable Lakes Project.

The MLA would appreciate your comments regarding the contents of this guidebook. The book will be updated continuously, and your suggestions pertaining to additions, expansions, corrections, format, etc. to improve the manual and its usefulness to member lake associations would be appreciated. Please forward your comments to the Minnesota Lakes Association, PO Box 321, Brainerd, MN 56401.

This guidebook was originally developed as a component of the Surface Water Outreach Assistance Project (SWOAP), a joint venture between the Minnesota Pollution Control Agency and the International Coalition for Land and Water Stewardship in the Red River Basin. Major funding was provided by the West Central Minnesota Initiative Fund.

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FOR LAND AND WATER STEWARDSHIP  
IN THE RED RIVER BASIN (TIC)**

PO Box 127 Moorhead, MN 56561-0127

Principal Author: Tim James

Editing and Composition: Julie Goehring and Kathy Spanjer

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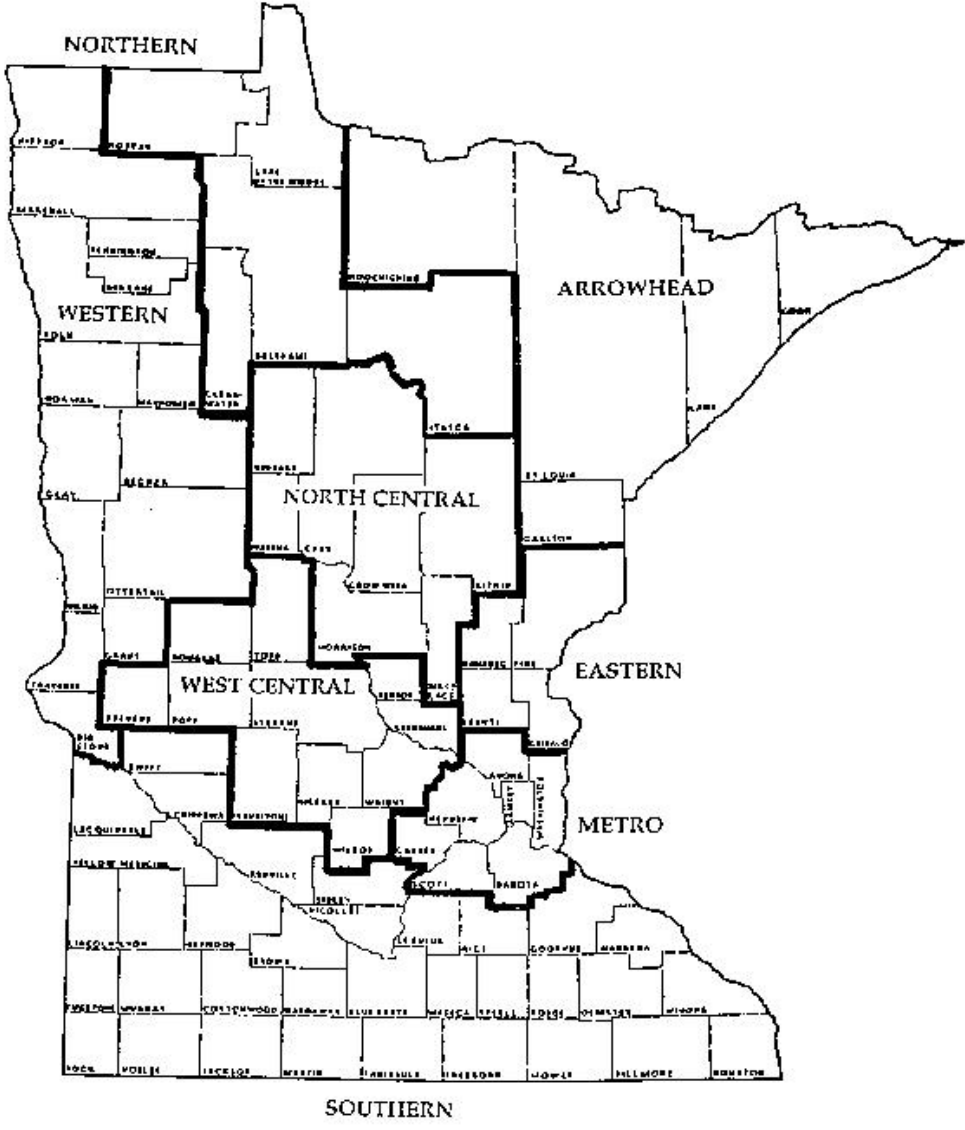
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## WHAT IS MINNESOTA LAKES ASSOCIATION?

The Minnesota Lakes Association is a non-profit organization with a rich history of grassroots networking and accomplishment. We tackle tough issues such as:

- |  |                         |  |                              |
|--|-------------------------|--|------------------------------|
|  | • Unfair property taxes |  | • Agency rules & regulations |
|  | • Exotic species        |  | • Pollution sources          |
|  | • Water quality         |  |                              |

The Minnesota Lakes Association also sponsors statewide educational conferences and networking events for its members; we bring together individuals, associations, businesses, and government officials. We work closely with state legislators to keep them informed of lake-related issues that affect you. We are organized into 8 districts, as shown below.



## Board Members & Support Services

### **Gary Botzek**

#### **Lobbyist**

26 E Exchange St. #120  
St Paul, MN 55101  
Res. 651-293-9295  
Fax. 651-293-0373  
Email: [gbotzek@aol.com](mailto:gbotzek@aol.com)  
Term Limit: ()

### **George Orning**

#### **Sustainable Lakes Project**

169 Windsor Lane  
New Brighton, MN 55112  
Res. 651-633-9444  
Fax. 612-626-0273  
Email: [ornin002@tc.umn.edu](mailto:ornin002@tc.umn.edu)  
Term Limit: ()

### **Marlene Waller**

#### **Office Manager**

PO Box 321  
Brainerd, MN 56401  
Res. 800-515-5253  
Fax. 218-829-0635  
Email: [lakes@mnlakesassn.org](mailto:lakes@mnlakesassn.org)  
Term Limit: ()

### **Paula West**

#### **Director of Communications & Development**

23351 County Road 30  
Aitkin, MN 64431  
Res. 218-546-6402  
Fax. 218-546-8161  
Email: [westcom@emily.net](mailto:westcom@emily.net)  
Term Limit: ()

### **ARROWHEAD**

#### **Ed Orman**

##### **None**

4971 East Pike Lake Rd  
Duluth, MN 55811  
Res. 218-729-7329  
Fax. None  
Email: [edward@duluth.com](mailto:edward@duluth.com)  
Term Limit: (2002)

### **ARROWHEAD**

#### **Phil Serrin**

##### **None**

25 Bearskin Road South  
Grand Marais, Minnesota 55604  
Res. 218-388-9933  
Fax. same  
Email: [serrin@azstarnet.com](mailto:serrin@azstarnet.com)  
Term Limit: (2000)

### **METRO**

#### **Kit Searight**

##### **None**

400 Groveland Avenue #114  
Minneapolis, MN 55403  
Res. 612-813-0258  
Fax. 612-813-0258  
Email: [ksearight@aol.com](mailto:ksearight@aol.com)  
Term Limit: (2001)

### **METRO**

#### **Jack Wallschlaeger**

##### **Vice President**

RR 1 Box 137  
Pequot Lakes, MN 56472  
Res. 218-543-6257  
Fax. None  
Email: [jwallsch@uslink.net](mailto:jwallsch@uslink.net)  
Term Limit: (2002)

### **NORTH CENTRAL**

#### **Carl Bullen**

##### **Webmaster**

R1 Box 371  
Pequot Lakes, MN 56472  
Res. 218-568-5041  
Fax. None  
Email: [cbullen@ilikeit.net](mailto:cbullen@ilikeit.net)  
Term Limit: (2000)

### **NORTH CENTRAL**

#### **Jim Halloran**

##### **None**

7450 Paradise Drive  
Nisswa, MN 56468  
Res. 218-829-3496  
Fax. 218-829-3496  
Email: None  
Term Limit: (2001)

### **NORTH CENTRAL**

#### **Mary-Jo Schneider**

##### **Treasurer**

RR1, Box 187  
Pequot Lakes, MN 56472  
Res. 218-543-6798  
Fax. 218-543-6798  
Email: [mjfp@uslink.net](mailto:mjfp@uslink.net)  
Term Limit: (2000)

### **NORTH CENTRAL**

#### **Paula West**

##### **Secretary**

23351 County Rd 30  
Aitkin, MN 56431  
Res. 218-546-8161  
Fax. 218-546-8161  
Email: [westcom@emily.net](mailto:westcom@emily.net)  
Term Limit: ()

### **WEST CENTRAL**

#### **Kay Cook**

##### **None**

20783 Eastway Court  
Richmond, MN 56368  
Res. 320-597-2794  
Fax. None  
Email: [neilkay@cloudnet.com](mailto:neilkay@cloudnet.com)  
Term Limit: (2003)

### **WEST CENTRAL**

#### **Bob Iten**

##### **None**

3703 74th Street  
Clear Lake, MN 55319  
Res. 320-253-4626  
Fax. None  
Email: None  
Term Limit: (2002)

### **WESTERN**

#### **Ruth Bergquist**

##### **None**

32693 Many Point Camp Road  
Ponsford, MN 56575  
Res. 218-573-2314  
Fax. 218-573-2314  
Email: [roundlke@aol.com](mailto:roundlke@aol.com)  
Term Limit: (2000)

### **WESTERN**

#### **Louis Mertz**

##### **Gambling Manager**

Route 2, Box 56  
Osage, MN 56570  
Res. 218-573-3807  
Fax. 218-573-3807  
Email: None  
Term Limit: (1999)

### **WESTERN**

#### **Donna Peterson**

##### **Past President**

19 Govern Addition  
Richville, MN 56576  
Res. 218-758-2163  
Fax. 218-758-2315  
Email: [dvpet@eot.com](mailto:dvpet@eot.com)  
Term Limit: (2000)

### **WESTERN**

#### **Doug Thorson**

##### **None**

RR 1 Box 703  
Mentor, MN 56736  
Res. 218-637-2528  
Fax. 218-637-2528  
Email: [dat@means.net](mailto:dat@means.net)  
Term Limit: (2003)

**EASTERN****Richard Zelenak****None**

1473 Arlington Ave East  
 St. Paul, MN 55106  
 Res. 651-774-2593  
 Fax. None  
 Email: [zelen001@tc.umn.edu](mailto:zelen001@tc.umn.edu)  
 Term Limit: (2000)

**Southern District****Tom Stone****None**

16 S. Silver Lake Road  
 Fairmont, Minnesota 56031  
 Res. 507-238-9404  
 Fax. None  
 Email: None  
 Term Limit: (2001)

**Standing Committees & Chairpersons****Affiliations****Education****Richard Zelenak**

1473 Arlington Ave., East  
 St. Paul, MN 55106  
 Res. 612-774-2593  
 Fax. None  
 Email: [zelen001@tc.umn.edu](mailto:zelen001@tc.umn.edu)

**Personnel****Jack Wallschlaeger**

RR 1 Box 137  
 Pequot Lakes, MN 56472  
 Res. 218-543-6257  
 Fax. 218-543-6257  
 Email: [jwallsch@uslink.net](mailto:jwallsch@uslink.net)

**Awards & Recognition****Jim Parson**

3133 Siseebakwet Shores  
 Cohasset, MN 55721  
 Res. 218-326-4586  
 Fax. 218-327-9349  
 Email: [cdrcreek@uslink.net](mailto:cdrcreek@uslink.net)

**Executive****Phil Serrin**

25 Bearskin Road S.  
 Grand Marais, MN 56604  
 Res. 218-388-9933  
 Fax. 218-388-9933  
 Email: [serrin@boreal.org](mailto:serrin@boreal.org)

**Taxes****Jim Halloran**

7450 Paradise Drive  
 Nisswa, MN 56468  
 Res. 218-829-3496  
 Fax. 218-829-3496  
 Email: None

**Charitable Gambling****Phil Serrin**

25 Bearskin Rd S  
 Grand Marais, MN 55604  
 Res. 218-388-9933  
 Fax. 218-388-9933  
 Email: [serrin@azstarnet.com](mailto:serrin@azstarnet.com)

**Financial****Jack Wallschlaeger**

RR 1 Box 137  
 Pequot Lakes, MN 56472  
 Res. 218-543-6257  
 Fax. 218-543-6257  
 Email: [jwallsch@uslink.net](mailto:jwallsch@uslink.net)

**Water Quality****Terry Polsfuss**

5314 114 Avenue  
 Clear Lake, MN 55319  
 Res. 320-743-2714  
 Fax. 320-743-2714  
 Email: None

**COLA****Ruth Bergquist**

32693 Many Pt. Camp  
 Ponsford, MN 56575  
 Res. 218-573-2314  
 Fax. None  
 Email: [roundlke@aol.com](mailto:roundlke@aol.com)

**Government Affairs****Jim Halloran**

7450 Paradise Drive  
 Nisswa, MN 56468  
 Res. 218-829-3496  
 Fax. 218-829-3496  
 Email: None

**Water Surface Use****Carl Bullen**

R1 Box 371  
 Pequot Lakes, MN 56472  
 Res. 218-568-5041  
 Fax. None  
 Email: [cbullen@ilikeit.net](mailto:cbullen@ilikeit.net)

**Communication****Kit Searight**

400 Groveland Ave #1  
 Minneapolis, MN 55403  
 Res. 612-813-0258  
 Fax. None  
 Email: [ksearight@aol.com](mailto:ksearight@aol.com)

**Membership****Paula West**

23351 Cty Rd. 30  
 Aitkin, MN 56431  
 Res. 218-546-8161  
 Fax. 218-546-8161  
 Email: [westcom@emily.net](mailto:westcom@emily.net)

**Website****Carl Bullen**

R1 Box 371  
 Pequot Lakes, MN 56472  
 Res. 218-568-5041  
 Fax. None  
 Email: [cbullen@ilikeit.net](mailto:cbullen@ilikeit.net)

**Conferences****Paula West**

23351 Cty Rd. 30  
 Aitkin, MN 56431  
 Res. 218-546-8161  
 Fax. 218-546-8161  
 Email: [westcom@emily.net](mailto:westcom@emily.net)

**Nominating****Donna Peterson**

19 Govern Addition  
 Richville, MN 56468  
 Res. 218-758-2163  
 Fax. 218-758-2315  
 Email: [dvpet@eot.com](mailto:dvpet@eot.com)

## INTRODUCTION

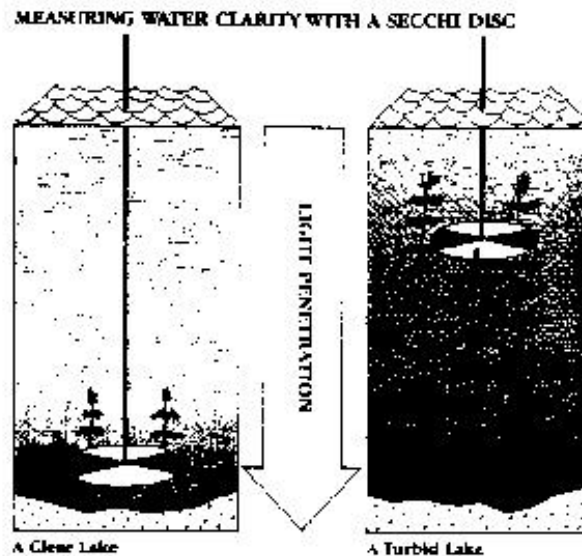
Minnesota's 10,000 lakes are an extremely valuable resource to the people of our state. It is difficult to fully realize the aesthetic and economic impacts this resource has on our policies and perceptions. Much of the state's economy is based on tourism directly connected to the high quality of our surface water resource. Likewise, this resource provides a large tax base because of the desirability of developing commercial and residential property on the water. Any degradation of this resource will inevitably result in lower property values and decreased recreational value. What can lakeshore residents do to protect and enhance the water quality of their lake? Plenty! As you proceed through this booklet, you will begin to understand the complexity of the elements of lake management. You'll need to equip yourself with a general basis of understanding of a wide range of topics, including biology, chemistry, geology, administration, and politics. By learning a few basic skills about the organization of activities and the science of lake systems, you will gain the information required to be in charge of your lake's destiny and the quality of the environment in which you live and play.

This booklet is divided into three sections of lake management needs: Basic Limnology (Lake Systems), Lake Association Organization, and Networking and Political Activities. Words and phrases that are commonly used when talking about aquatic environments are in bold and italicized. A glossary on page A - 1 defines these terms.

### I. BASIC LIMNOLOGY (LAKE SYSTEMS)

A lake is a living system that is constantly changing. It is a system that depends on varied factors which are interdependent, interrelated, and necessary to the whole process of production in the aquatic community. As in all specific areas of study, lake managers use a language of their own to describe their subject. Scientists who study lakes and stream systems are called limnologists.

TSI	Secchi Disk (ft)	Surface Phosphorus (mg m <sup>-3</sup> )	Surface Chlorophyll (mg m <sup>-3</sup> )
0	210	0.75	0.04
10	105	1.5	0.12
20	52	3	0.34
30	26	6	0.94
40	13	12	2.6
50	7	24	6.4
60	3	48	20
70	19"	96	56
80	10"	192	154
90	5"	384	427
100	2.5"	768	1183



Source: Carlson, R.E. 1977. A trophic state index for lakes. *Limnol. Oceanog.* 22:363-9

Figure 2 - Secchi disc monitoring. Water clarity governs the depth of light penetration in lakes. Periodic testing with a secchi disc shows variations in clarity.

Figure 1 - Completed trophic state index (TSI) and its associated parameters.

A term you will encounter as you learn about lakes is the trophic status index (Figure 1). This index is a number from 1 to 100 that categorizes a lake's eutrophication status. Each Minnesota lake can be assigned a trophic status number through some very simple water quality monitoring using a Secchi disc (Figure 2). Secchi monitoring will be discussed later in more detail on page II-3. The following factors must be considered when looking at what makes a lake behave the way it does:

- Formation of lakes
- Lifespan of a lake
- Morphometric parameters
- Watershed characteristics
- Nutrients
- Plankton
- Aquatic vascular plants
- Fisheries
- Top predators
- Land use activities

### FORMATION OF LAKES

Most of Minnesota's lakes were formed during the last ice age, about 10,000 to 20,000 years ago. Continental glaciers advanced huge sheets of ice from the north, scouring the land and wiping out all obstacles in their path.

There are several factors to be considered when assessing the health and productivity of a particular lake. It must be understood that, although lakes can be categorized and studied as similar systems, each lake is unique and may behave differently from another lake, given the same set of circumstances. The ecoregion concept has helped improve our understanding of lakes in Minnesota. Generally, lakes within a particular ecoregion will tend to behave similarly to other lakes within that ecoregion, but differently from those outside that ecoregion. A map of Minnesota's ecoregions appears in Appendix Q.

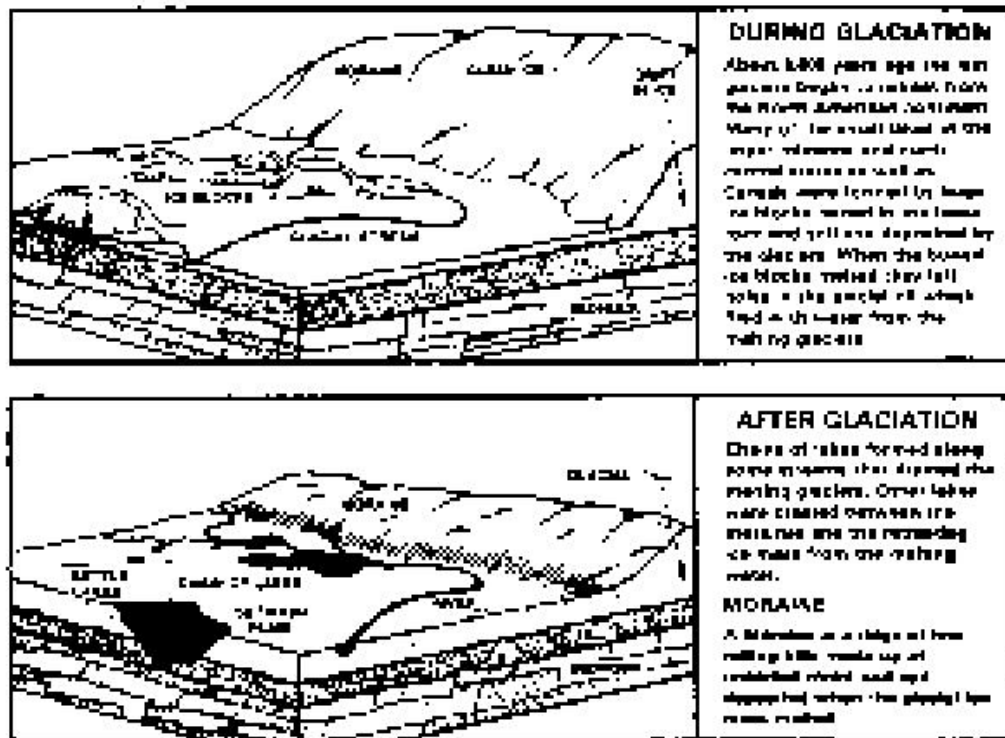


Figure 3 - The effects of glaciation in shaping lake basins.

As the ice advanced, it picked up many varied materials and held them in suspension. Then as the climate changed, the ice began to melt back and slowly deposited its accumulated load of sand, gravel, rock, and soil. Massive blocks of ice were left behind the retreating glacier buried under

various thicknesses of this material; as these ice blocks melted, the depressions they created filled with meltwater, resulting in lakes. Because of the random sizes of ice blocks which were left by the glaciers, we find every imaginable size and shape of lake basin in Minnesota, ranging from round, bowl-shaped basins like Big Pine Lake in Otter Tail County, to multi-bayed collections like Lake Minnetonka, to a staggering number of shallow prairie potholes.

Because of the relative shallowness of these ice block lakes, they also have a relatively short life span, in terms of geologic time (Figure 3).

## LIFESPAN OF A LAKE

Lakes are constantly changing and, as do most things in nature, follow a path from formation through transition and death. Through the processes of sedimentation of dead organisms and erosion, lakes slowly fill in over the span of thousands of years. Starting out as a pristine, deep environment, the lake will slowly fill in, becoming shallower and shallower, until it becomes a wetland, then a bog, and then finally ceases to exist altogether. This very slow process is called natural eutrophication and is the inevitable result of time. Human activity, however, can greatly accelerate this process and change the nature of the water quality in the span of a few decades. This human-induced process is called cultural eutrophication. Water quality changes follow this pattern of cultural eutrophication, moving from clear, nutrient-poor waters to green, nutrient-rich waters (Figure 4).

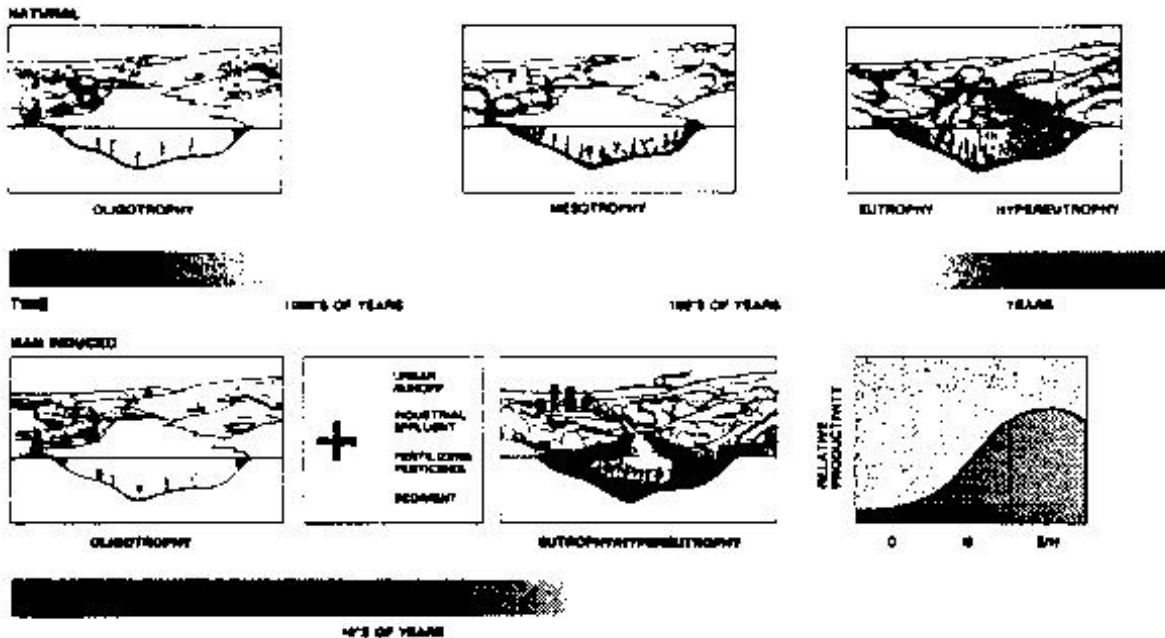


Figure 4 - The process of lake aging. Above: The progression of natural lake aging or eutrophication through nutrient-poor (oligotrophy) to nutrient-rich (eutrophy) states. Hypereutrophy represents extreme productivity characterized by algal blooms or dense macrophyte populations (or both) plus a high level of sedimentation. The diagram depicts the natural process of gradual nutrient enrichment and basic filling over a long period of time (e.g., thousands of years). Below: Man-induced or cultural eutrophication in which lake aging is greatly accelerated (e.g., tens of years) by increased inputs of nutrients and sediments to a lake, as a result of watershed disturbance by man.

## MORPHOMETRIC PARAMETERS

The physical factors that affect a lake basin are referred to as the lake's morphometry. A lake's morphometry dictates to a large extent how the lake will behave, so it becomes important for a lake manager to recognize what attributes and limitations are placed on the lake by these features. The Minnesota Department of Natural Resources (MNDNR) will provide you with the information you need regarding your lake's morphometric parameters.

It is very important to understand that a lake's overall water quality is tied to the physical dimensions of its basin. Generally speaking, lakes that are small in surface area and great in depth will exhibit higher water clarity and quality than those that are larger in surface area and shallower in depth. This is referred to as the surface to volume ratio (Figure 5).

Maximum depth and median depth are two parameters that you should know. You will also want to know the percentage of littoral area. Limnologists refer to the littoral area as that part of the lake basin to which enough light penetrates to allow aquatic plants and algae to grow. Most lakes in central Minnesota have a littoral area that extends from the shoreline out to about 15 feet deep; however, littoral area is influenced by water clarity and may be different for each lake (Figure 6).

EXAMPLE: If the littoral area is 60%, then only 40% of the lake is too deep for aquatic plants to grow because not enough sunlight will reach the



lake bottom.

Another important factor to consider is the ratio between the area of the lake's watershed and the surface area of the lake. If the lake has a very large watershed compared to its surface area, then the lake will receive surface runoff water from a very large area, with the potential for large nutrient loads.

By understanding your lake's morphometric parameters, you can make some judgments about how sensitive it is to the effects of cultural eutrophication.

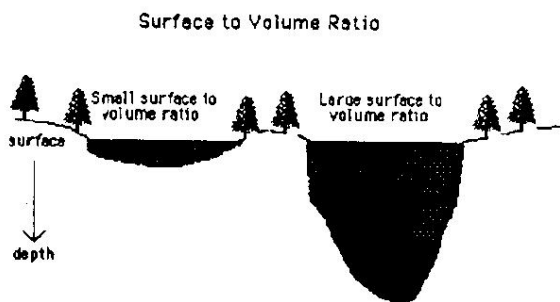


Figure 5 - Surface to volume ratio.

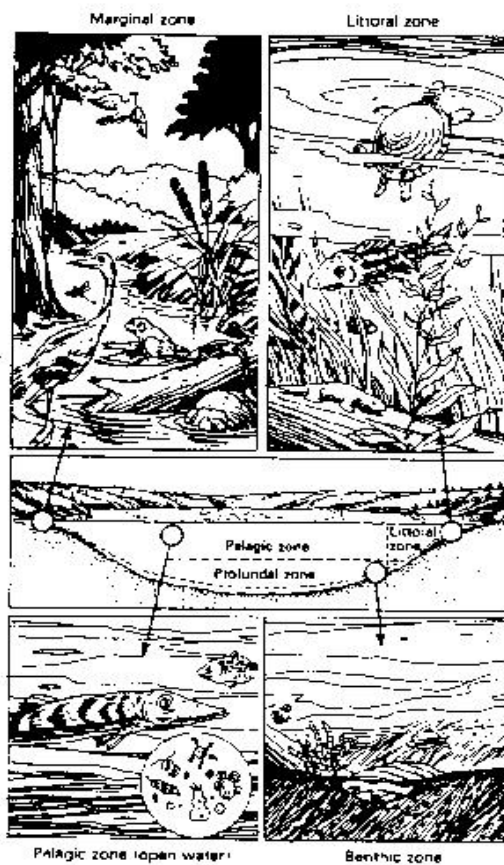


Figure 6 - The location and nature of typical lake communities, habitats, and organisms. In addition to the lake's watershed, all of these components are part of the lake ecosystem.

EXAMPLE:

	Very Sensitive	Less Sensitive
Maximum Depth	Shallow	Deep
Median Depth	Shallow	Deep
Surface/Volume	Small	Large
% Littoral Area	Large	Small
Watershed/Surface	Large	Small

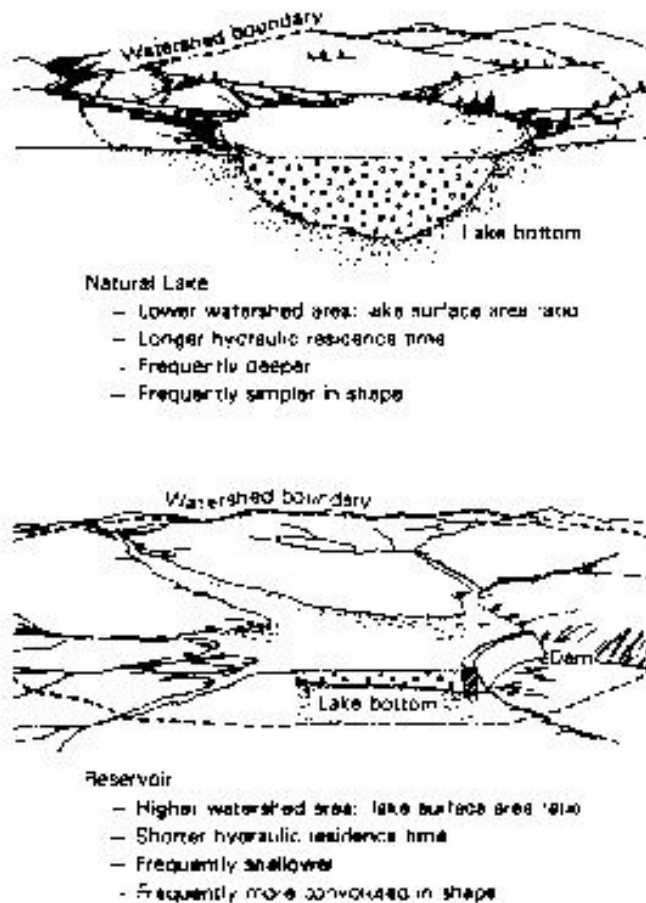


Figure 7 - Comparison of natural lakes to reservoirs.

**WATERSHED CHARACTERISTICS**

The characteristics of a lake's watershed are very important in terms of its sensitivity to cultural eutrophication. A lake is a reflection of its watershed - a concept that simplifies the way we should think about our input into the lake system (Figure 7).

A watershed consists of all the land that contributes surface runoff to a specific body of water. To outline watershed boundaries, connect the points of highest elevation around the lake on a topographic map. Water falling within this bowl flows by gravity, in streams and groundwater, to the lake. Any substance within the watershed that can be transported by water eventually reaches the lake and affects its water quality. Past lake protection efforts have primarily focused on shoreline land use, perhaps mistakenly creating the impression that only activities along the shore influence water quality. In reality, land use everywhere within the lake's watershed affects the lake's health.

As discussed earlier, the overall size of the watershed determines how much surface runoff will enter the lake basin. This, in turn, will determine the extent to which sediment and nutrients will impact the lake. Generally speaking, a lake with a large watershed is much more sensitive than one that has a smaller watershed. Another aspect of the watershed to consider is whether the lake is a closed or open system. A closed system is one that has no outlet. All the water a lake receives stays within the lake basin and does not flow out through a channel or river. If there is no outlet, the lake is not able to flush itself and is, therefore, more sensitive than a lake with an outlet (an open system).

Lakes that have both inlets and outlets or just an outlet will have a flushing rate ranging from a few days to several years, depending on the size of the watershed, the size of the lake basin, the physical characteristics of the lake basin, the number of inlets and outlets, and their rates of flow (Figure 8).

Soil types and their susceptibility to erosion is another important component of the watershed. The type of vegetation that grows on these soils can determine the extent to which erosion may occur. Areas of native, undisturbed vegetation such as forest, scrubland, and prairie are less prone to erosion than areas of disturbed vegetation such as agricultural lands, construction zones, and other lands that are void of cover. This leads to the importance of land use activities within the watershed. Any activity on the land that alters the natural vegetation will lead to increased surface runoff and possible erosion.

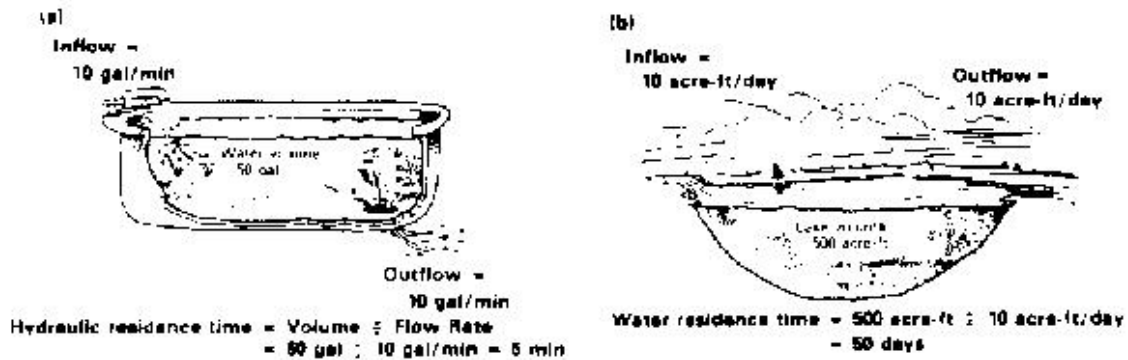


Figure 8 - Residence time/flushing rate. Hydraulic residence time is an important factor to consider in restoration programs. The sample formula given in the figure assumes that inflow is equal to outflow.

One final consideration within the watershed is the upstream water quality. Lakes on the upper end of a watershed will most likely display different water quality than those on the lower end. Depending on the overall physical and biological factors influencing these upstream lakes, the downstream water quality may be affected either positively or negatively. It is extremely important, therefore, to know the status of the upstream components of your watershed to make informed decisions about managing your lake.

### NUTRIENTS

Nutrients are one of the basic requirements that plants need for growth, along with water and sunlight. If we think of nutrients as fertilizer, it is easy to understand their function in the lake system. Aquatic plants and algae respond quickly to small changes in the amount of nutrients present in the water, so it is very important to understand the concentration of nutrients in the lake water and in the inflows to the lake. Then, it is vital to find the source of these nutrients what areas of the watershed and what land use activities produce them

The two most important nutrients, when considering cultural eutrophication, are phosphorus and nitrogen. Both occur naturally in a sufficient quantity to allow a lake to function as a healthy system; however, through man-made changes in land use, their transport to the lake is increased. Too much fertilizer causes too much plant and algae growth; consequently, the lake changes to a more eutrophic condition than its original state.

This causes problems for lakeshore residents resulting from the growth of dense beds of aquatic plants and blooms of blue-green algae that create scums and foul odors, negatively impacting the physical appearance and recreational suitability of a lake.

Generally, phosphorus is more critical than nitrogen because there is less of it available to the lake than nitrogen and it may be easier to control. Each lake has a nitrogen to phosphorus ratio (N:P) that defines the relative abundance of these nutrients. For example, an N:P ratio of around 20:1 or higher means that phosphorus is considered to be the nutrient controlling the growth of algae and aquatic plants. At N:P ratios of less than about 12:1, there is an overabundance of phosphorus available relative to nitrogen. In this instance, nitrogen is considered the nutrient limiting the growth of plants. In the majority of lakes in Minnesota, phosphorus is the most important nutrient. As a basic rule, one pound of phosphorus in the lake equals 500 pounds of plants and algae produced (Figure 9).

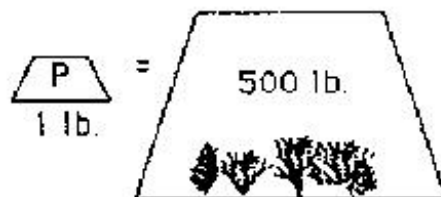


Figure 9 - Relationship of phosphorus to aquatic plants.

## PLANKTON

Most people think of plankton as something that only occurs in oceans, but indeed, they are in lakes as well, and are the basis of the entire food chain. Without a healthy plankton population, there would be virtually no fish and other animals in our lakes. Plankton can be put into two main groups, algae and zooplankton (Figure 10).

Algae are free-floating, non-rooted green plants that use nutrients as fertilizer. Algae photosynthesize in the same manner as terrestrial plants. Through the process of photosynthesis, oxygen is given off by the algae into the water in a dissolved form. Most of the oxygen necessary for fish survival is produced by algae. Algae also form the base of the food chain and are utilized as such by a wide variety of organisms. Algae respond quickly to changes in nutrient levels, temperature, and light intensity, and huge changes in population size can occur in very short periods of time.

There are several groups of algae that move through successive periods of dominance throughout the year. The algae that create nuisances for people are usually the filamentous green and the blue-green forms. These usually occur in mid- to late summer and, as nuisances, appear as long floating strings, mats, or large areas of very green, brown, gray, and murky water. When temperature, light, and nutrient conditions are ideal for them, their population can soar to bloom proportion within a few days and may persist for several weeks before conditions change. Periods in mid-summer to late summer of hot, clear, calm weather are perfect conditions for algae blooms.

Zooplankton are free-floating microscopic invertebrate animals that live in the water column. Some are plant eaters and prey on many forms of algae, which is called grazing. Their populations respond quickly to changes in the algae population and they have the capacity to greatly reduce algae over short periods. Other zooplankton are predators and feed on other zooplankton (Figure 11).

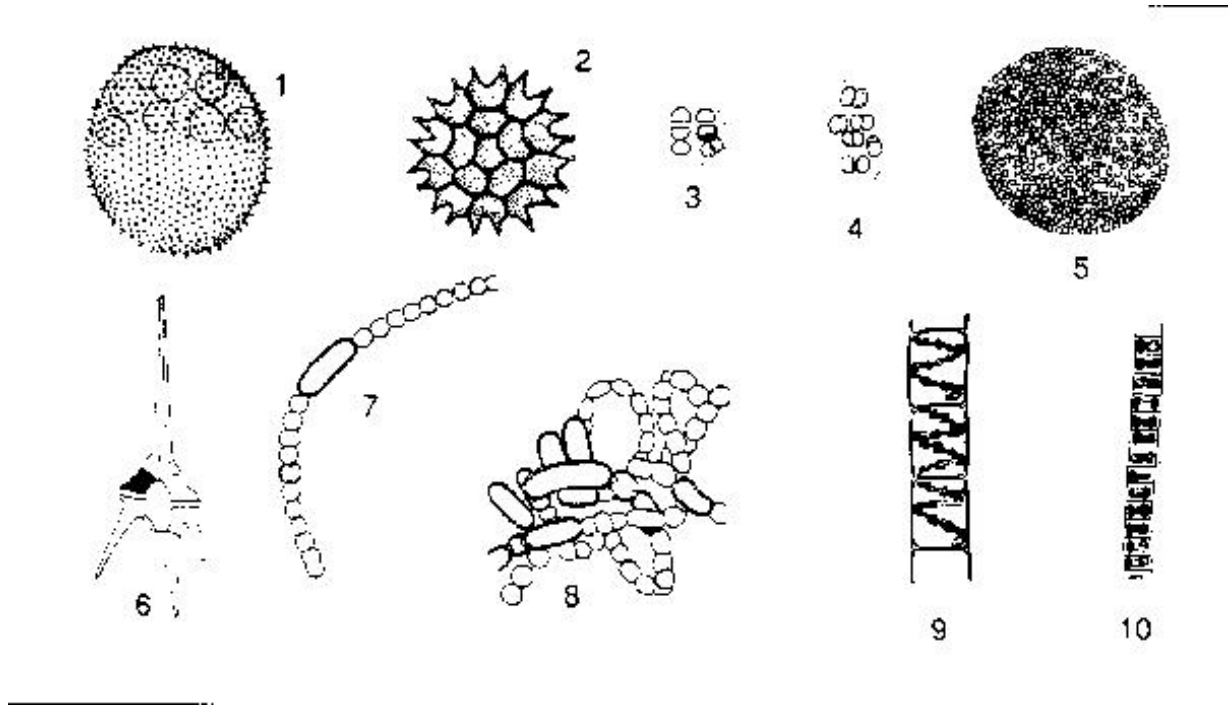


Figure 10 - Common blue-green freshwater algae types. 1: *Volvox aureus* Ehrenberg, 2: *Pediatrum boryanum* (Turp.) Meneghini, 3: *Chroococcus limneticus* Lemmermann, 4: *Chroococcus limneticus* var. *carneus* (Chod.), 5: *Microcystis aeruginosa* Kuetz.; emend. Elenkin: unperforated colony (*M. flos-aquae*), 6: *Ceratium hirundinella* (O.F. Muell.) Dujardin, 7: *Anabaena circinalis* var. *macrospora* (Wittr.) DeToni, 8: *Anabaena flos-aquae*

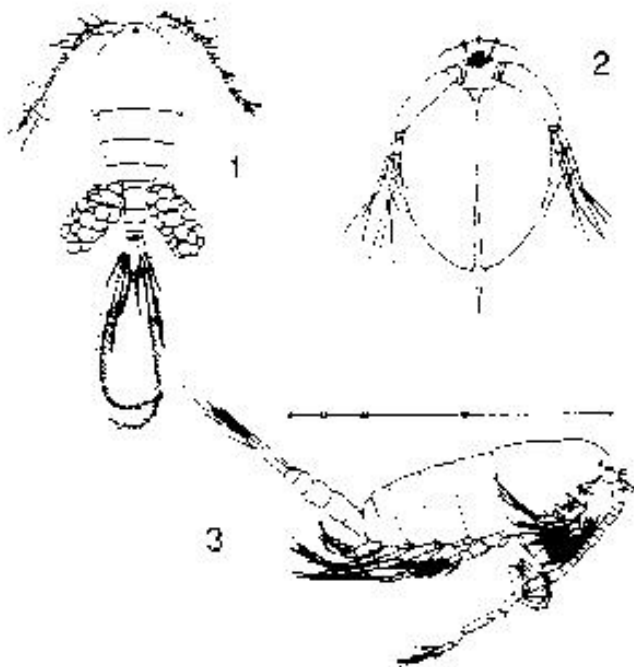


Figure 11 - Zooplankton. 1: Female Macrocyclus ater with egg masses, 2: ventral view of Daphnia magna, 3: male Limnocalanus macrurus.

Plankton serve as a food source for some aquatic insects, other invertebrates, minnows, and young game fish, forming a foundation for the entire food chain of the lake.

**AQUATIC VASCULAR PLANTS**

Although they should be referred to as aquatic vascular plants, most people are more familiar with the more commonly used term, weeds. A huge variety of aquatic vascular plants can be found in Minnesota, with as many as 150 species present in a healthy lake. Some of the more familiar of these are water lilies, bulrush, coontail, cabbage weeds, and cattails. Weeds are very important and beneficial to a healthy lake and their mere presence should not be regarded as a nuisance.

Because they are vascular plants, most of the water weeds have quite delicate and beautiful flowers at some stage of their life cycle. If a person takes the time to get to know these plants, they can provide hours of enjoyment that any gardener would truly appreciate.

We can break weeds down into two basic groups to understand their functions more easily. Those that grow near shore and stand up out of the water are called emergent aquatic vegetation. They include bulrush, cattail, burrweed, tule grass, wild rice, and many others. Emergent vegetation provides excellent cover for young game fish, bait fish, and insects; supplies building material for the nests of many waterfowl and muskrats; and provides area suitable for the spawning of some kinds of fish.

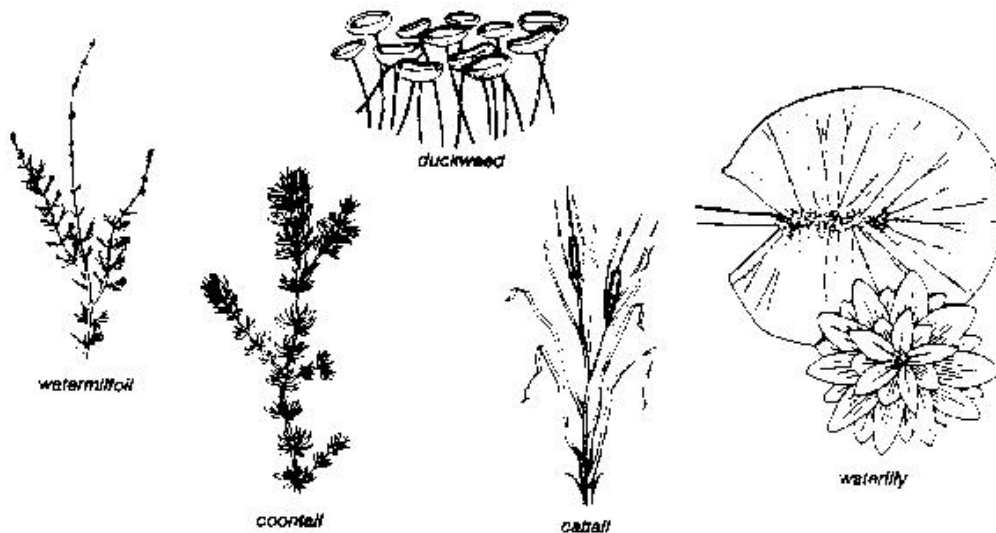


Figure 12 - Common aquatic vascular plants.

Perhaps more importantly, this type of vegetation acts as a buffer to wave action against shorelines and can have tremendous value in preventing shoreline erosion. As a buffer strip, emergent vegetation along a shoreline also has value in its ability to utilize nutrients present in surface runoff as it enters the lake (Figure 12).

Weeds that grow in deeper water and do not stand up from the water are called submergent aquatic vegetation. These plants provide shade and cover for bait fish and game fish, as well as providing food for many waterfowl. One of the major benefits of submergent weeds is the oxygen that they supply to the water. As all green plants do, weeds photosynthesize and give off oxygen into the water, providing much of the dissolved oxygen that fish require.

It is very important to try to maintain the lake's natural vegetation because of its value to the overall health of the system. A lake should display a rich community of aquatic plants throughout its littoral area. Frequently, people feel that weeds are merely a nuisance and will go to great lengths to remove them. Removal may actually cause other problems in the lake to develop. Removal of aquatic plants leaves more nutrients available in the lake for algae to use and may cause a decline in water quality, as algal blooms can occur.

Please be very careful before you decide to implement a program of weed removal on your lake. What may appear to be a nuisance situation may in reality be a natural situation in the lake. Excess plant growth may be the result of overnutrification of the lake due to poor development and land use activities and removal is only mowing the grass in the sense that excess weeds are merely a symptom of the problem of overfertilization of a lake. Any removal of aquatic vegetation from a lake or shoreline requires a permit from MNDNR, so check with them before you begin any weed removal project.

## **FISHERIES**

One of the first questions asked when talking about a lake is, "How's the fishing?" The answer depends on water quality and the perception of what good fishing should be. Just as each lake is distinct in terms of its physical characteristics, so, too, is every lake as individual as a fishery. Most lakes fall within the limits of a particular fisheries classification and this usually corresponds to the trophic status of the lake.

Generally, lakes that are very clear, deep, and well-oxygenated with a low trophic status index will have a fishery consisting of a few species of forage fish (Figure 13), and a few species of predator fish (Figure 14), such as walleye and northern pike. The overall number of fish will be fairly low because of the infertile nature of these lakes. This may be a case for good fishing, but for only one or two desirable species.

Then there are lakes that are relatively shallow, less clear, possess a healthy amount of weeds, and are more nutrient-rich, with a higher trophic status index. These waters usually will have a large number of forage species and many species of game fish such as walleye, northern pike, bass, and panfish. They also may have large populations of rough fish. The overall number of fish will be high because of the lake's more fertile nature.

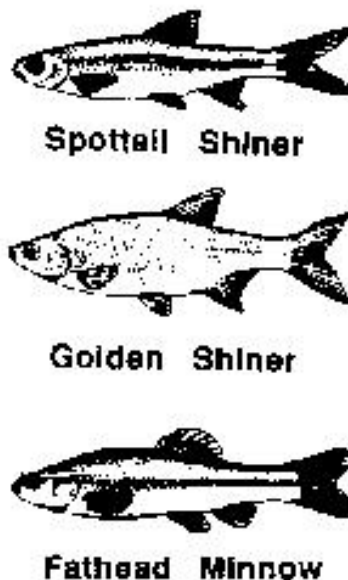


Figure 13 - Common forage fish. Top to bottom: spottail shiner, golden shiner, and fathead minnow.

Changes in the fishery follow changes in water quality and can, at times, be drastic. One of the major problems associated with shallow, very productive lakes is winterkill. This condition exists in late winter as the dissolved oxygen in the lake is depleted. Game fish die from insufficient dissolved oxygen, while rough fish may survive because their dissolved oxygen requirements are lower. The result is a lake with very few desirable fish and a large population of rough fish. Most people would say that a lake such as this is a poor fishery.

Winterkill is caused by decaying organic matter and respiration of aquatic plants. Very fertile, nutrient-rich waters are highly productive and produce large amounts of algae and weeds, and, while this is good for sustaining large populations of fish, it can also be dangerous during winterkill situations. As the algae die and the weeds fragment and die back during fall and winter, they settle to the bottom and decay. The decay is brought about by the action of bacteria, which consume large amounts of oxygen during the process. Also, when dissolved oxygen levels become low enough, the weeds will stop producing oxygen and start using the dissolved oxygen in the water to stay alive. This dual problem of decay and respiration results in a rapid depletion of the available oxygen (Figure 15).

Winterkill generally happens during winters with heavy snowfall. Deep snow stops sunlight from penetrating the ice, severely reducing the ability of algae and aquatic plants to photosynthesize and produce oxygen.

## TOP PREDATORS

At the top of the aquatic food chain are a variety of birds and mammals including humans. Many valuable birds such as loons, eagles, herons, pelicans, and cormorants depend on healthy lakes for their survival, and, although they usually benefit from fertile, eutrophic lakes, they can be negatively affected by poor water quality when it involves pesticide or heavy metal contamination.

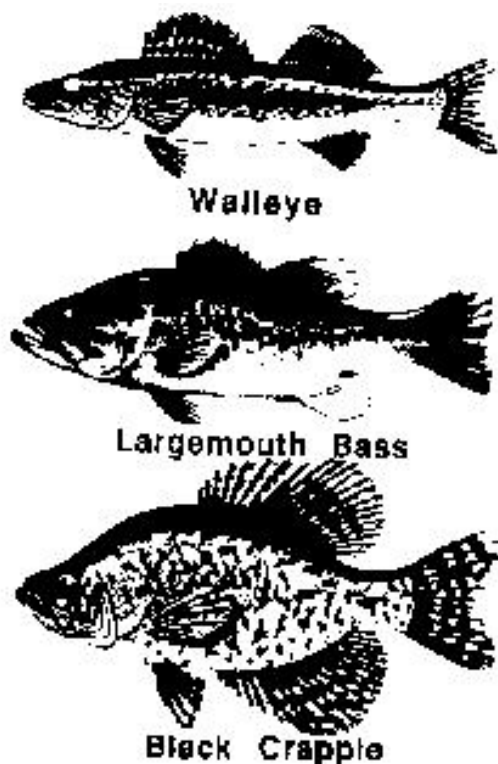


Figure 14 - Common predator fish. Top to bottom: walleye, largemouth bass, black crappie.

People play an important role in the food chain of lakes. Our activities on the land are responsible for the overall water quality and our behavior in and on the lake can have serious long-term effects on the health of the aquatic environment. Development, poor land use practices, overfishing, unwise use of chemicals, and other short-sighted activities can all have harmful effects on our surface water resource. Remember that everything is connected in nature, and, as a part of it, we have the power to create or destroy based on our perception of the problems that affect us.

This has been a general overview of lake systems and the functions that drive them. A lake is a complex living system that is constantly changing and in transition from stage to stage. For more information on lakes, please refer to the appendices.

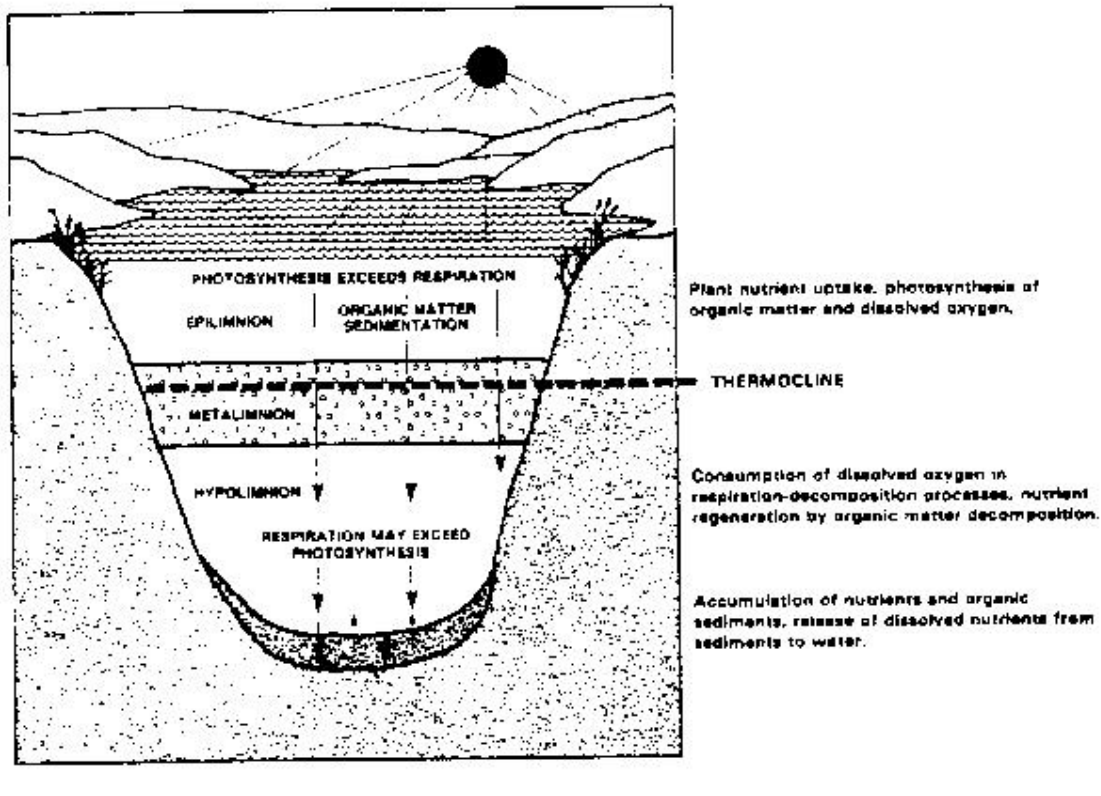


Figure 15 - Respiration and decomposition process. Influence of photosynthesis and respiration-decomposition processes and organic matter sedimentation on the distribution of nutrients, organic matter, and dissolved oxygen in a stratified lake.

### LAND USE ACTIVITIES

Where do we fit into the functions of a lake system? Everywhere! Human activity can have effects in all areas of a lake system. What we create, modify, or destroy in our development and land use practices within the watershed will have consequences that will be felt throughout the whole aquatic system.

We can impact many parts of a lake system, but the area of greatest concern and potential for the greatest overall change in water quality is where we get involved in the nutrient cycle. Development of shoreland and changes to the land surface within the watershed always change the original nutrient load to the lake. Farming, forestry, residential development, industry, and road building all have an effect on changing the nutrient load. With increased human activity within the watershed, there will be an increased amount of nutrients entering the lake. Primarily, nutrient increases will come by two different means. The first is by direct input, point source pollution, and the second is by increased surface runoff, nonpoint source pollution (Figure 16).

Direct inputs of nutrients come from phosphorous being concentrated and injected directly into the lake. These direct inputs may be from storm sewer discharges, effluents from wastewater treatment systems, and individual septic systems. Although storm sewers and septic systems are classified as nonpoint sources by state agencies, you may want to view them as direct inputs to the lake because they are easily located in the watershed and around the shoreline.

Whether these discharges are directly into the lake or into the river upstream of the lake, their effects will be realized in the lake in a negative way by providing more fertilizer for algae and aquatic vascular plants.

Increased surface runoff is the result of changes to the slope of the land, disturbance of the soil, removal of original vegetation, and draining or filling of wetlands. These changes increase the amount of surface runoff and the speed at which this runoff comes off the land. Increased surface runoff may also lead to erosion, which increases the rate of sedimentation and nutrient loading (Figure 17).

Most of the phosphorous entering Minnesota's lakes is carried to the lake by water running over the ground's surface following rainfall or snowmelt. In addition to the small amounts of phosphorous present in rainwater, the runoff picks up more phosphorous from the material it comes in contact with as it flows. Much of this phosphorous is transported directly to the lake unless the water is absorbed into the ground first. Although water which enters the ground may eventually enter the lake through groundwater flow, most of the phosphorous it contains will either be filtered out at the soil surface or will adhere to small soil particles as it moves through the ground.



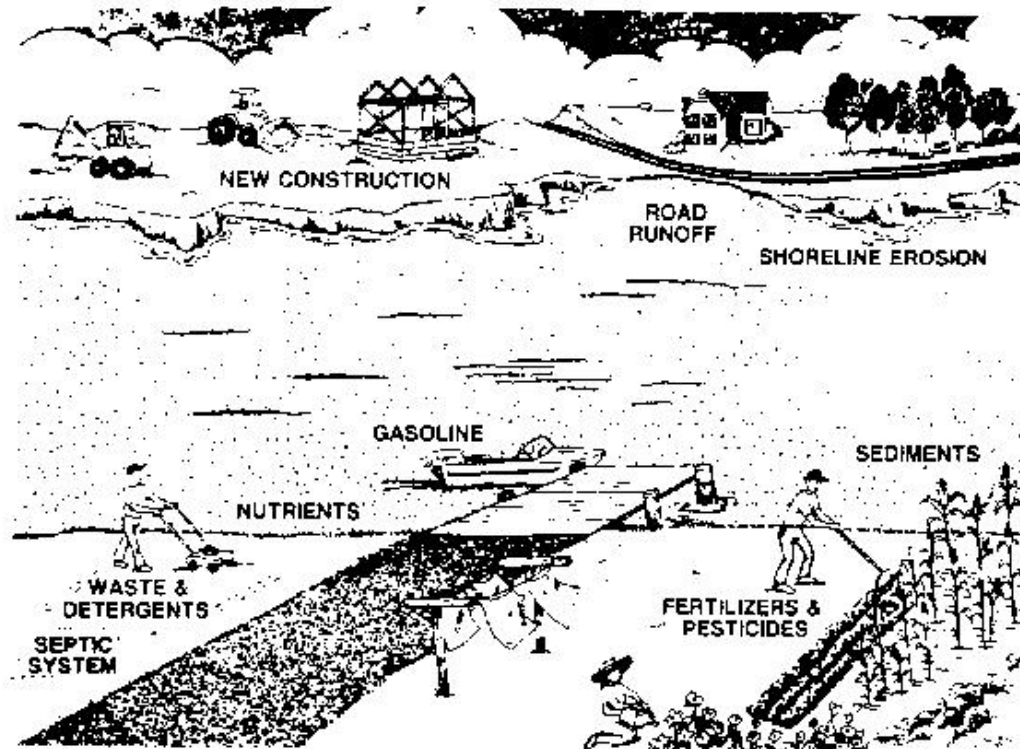


Figure 16 - The impacts of lakeshore-related activities on a lake.

Surface runoff transports phosphorous to a lake not only from near shore areas but from the entire lake watershed, which may include areas many miles from the lake.

Any increase of nutrients into the lake is just like adding fertilizer to a lawn or garden. The result is a stimulation of the plants in the lake, especially algae. Algal blooms turn water green, reduce water transparency, deplete the oxygen supply, and smell terrible. Ultimately, these blooms alter wildlife habitat, impair scenic views, reduce recreational appeal, and reduce property values.

Once polluted, recovery of a lake is a very slow process. Unlike rivers and streams, lakes are slow to exchange their water and have flush rates up to several years. Water quality will not improve until specific action is taken to reduce the source of nutrients within the watershed.

It is not realistic to think that all watersheds can be maintained in pristine condition, but it is very possible to begin to change some of the land use practices that lead to the problem of cultural eutrophication.

Overfertilization of the lake is the cumulative effect of many people working, living, and playing within the watershed, contributing to changes in water quality over time. Therefore, only by changing or breaking old, bad habits can we lessen our impact on water quality by learning to live in a more equal partnership with the environment around us.

A realistic and effective means of tackling the problems of lake management and land use is to organize at the local level by forming a lake association.

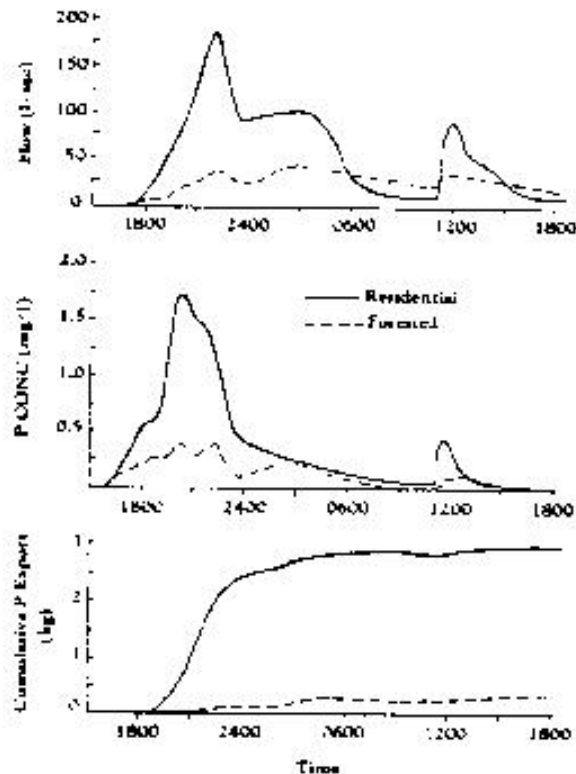


Figure 17 - Sedimentation and nutrient loading. Comparisons of runoff after an April rainstorm in two neighboring watersheds near August, Maine. Top: volume of immediate runoff over a 12-hour period. Middle: phosphorus concentration in the runoff. Bottom: total amount of phosphorus exported into local streams and lakes from the storm.

## II. Lake Association Organization

One of the most valuable and productive things that lakeshore residents can do for protecting or preserving their lake's water quality is to form an effective lake association. By becoming organized, you create the ability to initiate projects and programs of long-term significance that will lead to a healthier lake. An organized group can have more credibility and clout than any one individual and, as a group, there are more opportunities for education, information, and, ultimately, power.

While there is no perfect way to do this, there is one basic rule behind forming a lake association: if you and others who utilize the lake resource don't take action to protect your lake, no one else will! The resources which state and local agencies have available are limited. Although they can be effective in some areas of water quality protection, it is unlikely they will have adequate resources to provide the comprehensive protection your lake needs. You also need to know that the longer you wait to take action, the harder your task will be. The worst thing that you as a lakeshore resident can do, is to simply do nothing. Here are some options for getting started:

- 1) Hold a public meeting for anyone interested in protecting the water quality of your lake. Invite lakeshore residents, local social groups, sportsmen's clubs, and anyone you know who may be interested in the lake. It is also helpful to enlist the help of members of other lake associations in your area, as these people can provide you with invaluable information based on their own experiences. Discuss the ideas that are important to the group about the lake in general and then focus in on the issues that are common to all of the participants. Try to find a consensus that will become the foundation from which you can proceed.
- 2) Now that you've decided to form an association, get down to the business of organization by electing officers for a one-year term. You will need a president, vice president, secretary, and treasurer. You should also form a board of directors consisting of from five to nine individuals, depending on the size of your lake community. Think of your lake as a community that includes both full-time and seasonal residents. Many lake associations choose their boards based on geographic areas of the lake. This can be a real time saver when manning membership drives and getting out information.
- 3) Next, draw up a set of bylaws for your group, including a mission statement or statement of purpose. This will allow for smoother operation as the association becomes involved in important issues and meaningful projects. Sample bylaws are listed on page B-1.
- 4) Decide on and institute a membership dues structure. You may want to have several types of memberships available for different groups of people such as individual, family, user groups, and others, but you should try to get paid memberships from everyone on the lake. Memberships among associations in Minnesota range from \$2 to \$60 per year, but most people are willing to pay at least \$10 to get started. After that, about \$20 per year

is the standard rate.

5) File the necessary papers required for a non-profit organization, as this will allow you to become involved in fund-raising activities and be eligible for grants and other funding opportunities. Money is a necessity to be a really effective group, but volunteerism and commitment to a task are your most valuable assets. Don't be afraid to ask assistance from the membership on any activity. You will probably find a wealth of knowledge and expertise in areas that will be of invaluable benefit to your cause. You should use an attorney for writing bylaws and filing for non-profit status. Look at your membership - you may have legal services available from one of your members, possibly at a reduced rate.

6) Form committees to attack the various functions, goals, and projects that are important to your association. Most lake associations will have committees dealing with membership, social activities, projects,

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water quality, and education. Committees may be headed by either board members or individual members, but they need to be committed people who will get the job done.

7) Start a newsletter. It is very important to communicate with every member of the association in some manner; a newsletter is the best method for accomplishing this task. It need not be anything fancy and may be only necessary once a year, but it keeps everyone informed about issues and topics that are of importance to the whole group, as well as informing the members of meetings, activities, and other important events. It is also a great way to educate the association on lake management concerns.

8) Educate, educate, educate! You can never get too much information on the many areas of concern that relate to your lake. Educational materials are available from such a wide variety of sources that it is difficult to know where to begin, but a good way to start looking is by contacting the many state agencies that deal with the water resource. Each agency has its own area of responsibility, but they do overlap their efforts somewhat in water quality. The Minnesota Pollution Control Agency (MPCA) has many good publications on water quality and how you can help protect it. The Minnesota Department of Natural Resources (MNDNR) has material relating to fisheries, aquatic plant management, and shoreline regulations, as well as information concerning permits, non-game wildlife, and landscaping. The Department of Health (MNDOH) can provide assistance with drinking water standards and hazardous chemicals. Information on development, permits, and ordinances may be obtained from your local county planning and zoning office.

Appropriate agencies that deal with lake management problems are listed in the appendices.

#### 9) Projects

##### A) Watershed mapping

To be able to identify potential sources of nutrient loading and pollution, it is vital to have a good watershed map. A map of your particular watershed may be obtained with assistance from the local county Soil and Water Conservation District (SWCD). Additional assistance and information may be obtained from the Land Management Information Center (LMIC). Generally, these maps will be created from topographic maps that show the contours of the land and the presence of wetlands, lakes, and streams, as well as roads, ditches, and dwellings. The map should be large enough to read easily and durable enough to draw and write on. It will become an invaluable tool as you identify and investigate the land use activities and changes within the watershed.

Once you have obtained the completed map, it is important to then go out in the field and verify its important features. This is termed ground truthing and is an excellent activity for getting association members involved in meaningful and enjoyable projects.

##### B) Land use inventory

Using the watershed map, check the different types of land use on the map. A basic, easily understandable color coding system for different land uses is usually helpful. Your local SWCD office can assist in the development of this type of inventory. Other sources of this information are your local county planning and zoning office, LMIC, and the Association of Counties.

Also make note of important sources of direct and indirect surface runoff and nutrient loading such as wastewater treatment plants, septic systems, storm sewers, drainage ditches, agricultural drain tiles, parking lots, new construction, road building, and feedlots. Your county planning and zoning office can provide information to help you with this effort also.

##### C) Development survey

It is also very helpful to perform a specific survey of the developments that directly affect the shoreline of the lake. This can include the number of year-round and seasonal dwellings, boathouses, age of buildings, number of household members, etc. This information is useful in determining the potential or lack of potential for future development on the lake and is also very helpful for membership information.

##### D) Lakeshore assessment

This assessment will consist of identifying those areas of special concern around the shoreline that will need remedial action.

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Items to list include areas of eroding shoreline, straight pipes into the lake, areas of dense vegetation, or areas devoid of vegetation. Also make note of well-manicured lawns that may be heavily fertilized and areas of greenness that may reveal failing septic systems. Ongoing construction, dumps,

livestock access to the water, open burning, and any other activity associated with nutrient loading should be noted in this assessment.

This assessment can best be accomplished by two methods. The first is by traveling around the shore of the lake in a boat, noting all of the above listed items, their locations and the date on which the assessment was performed. Spring or fall are the best times to look for problems, as the absence of leaves makes everything much more visible. The second method of assessment is a drive-around using roads nearest to the lakeshore.

During either assessment, don't be afraid to get out of your vehicle or watercraft and have a closer look at suspect areas. If residents of these areas are home, take the time to gather as much information as you can.

Remember, you are not necessarily looking for one large nutrient source, but rather a large number of smaller sources.

#### E) Septic system survey

The septic system survey is an involved process that will require commitment from several individuals and a good deal of time. The object is to determine which septic systems around the lake function properly and comply with shoreland regulations. It will also point out those systems that do not.

The most successful way to accomplish this task is a door-to-door survey of each household or commercial operation on the lake. Survey all who live on the lake, whether or not they are members of the association, and ask for voluntary compliance in completing this effort. By making it a voluntary program, you will generally get an excellent response from those folks who are either certain about the status of their system or genuinely concerned about its condition. Those who do not respond are probably those who are not in compliance.

Work with your municipal or county planning and zoning office throughout this process and make sure they receive a copy of the completed survey. Generally, local government units do not have the resources to do this type of inventory themselves, so in doing most of the work for them, you may be able to leverage some assistance for dealing with the nonrespondents to your survey. A sample septic system survey is listed on page E-1. Some ideas about individual septic system maintenance are discussed in Appendix D.

This effort should lead to a larger project of upgrading failing systems.

#### F) Secchi disc monitoring program

A very simple and enjoyable means of assessing the health of your lake's water quality is by monitoring the water clarity with a Secchi disc. All lake associations should start this monitoring activity immediately and continue it every year. Over a period of years, trends will develop from each year's results that will reflect changes in water quality over time. These results, coupled with the personal observations and perceptions of the lake residents, will become a sound basis for further study and monitoring programs if the association's future plans call for more detailed studies of the lake.

Secchi depth is probably the most frequently used parameter in limnology. The Secchi disc is an 8-inch plastic or metal disc that is either painted entirely white or divided into alternating quadrants of white and black. The disc is lowered into the water and the observer measures the depth at which it disappears. This depth is recorded and referred to as the Secchi transparency or Secchi depth of the lake (Figure 18).

The assumption is that the greater the Secchi depth, the better the water quality of the lake. The transparency is based on the transmission of light through the water and is related, in part, to the natural light attenuation of the water, the amount of suspended solids, and the amount of suspended organic material (algae cells). Basically stated, the more algae present in the water, the greener the water will

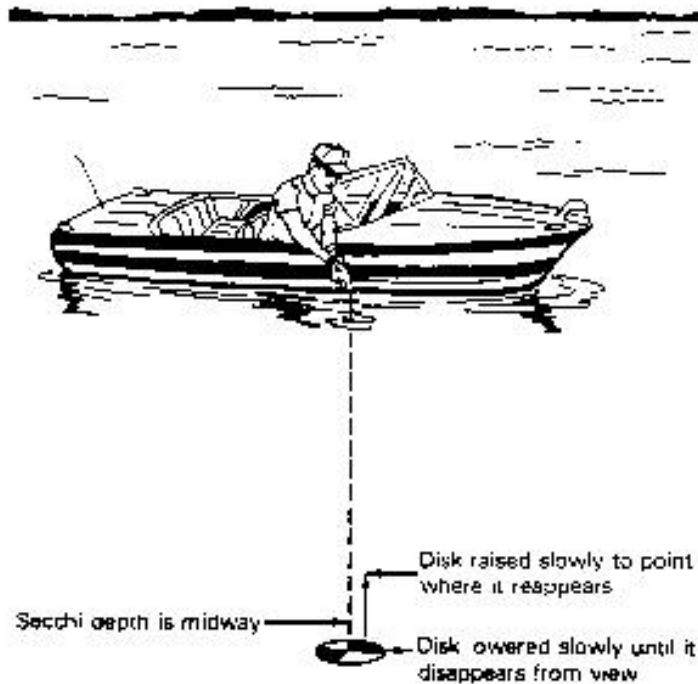


Figure 18 - Secchi disc monitoring. The Secchi disc is a simple and extremely useful tool for tracking long-term trends in lake water quality.

appear, and a lower water clarity value will be observed with the Secchi disc.

The Minnesota Pollution Control Agency (MPCA) can provide detailed information on Secchi disc monitoring programs, exact details for the monitoring itself, and process the results of your efforts in a yearly report. Secchi discs are available for \$10. This program is called the Citizens Lake Monitoring Program (CLMP) and is available whether or not there is an association in place.

This is one of the most important projects that a lake association can be involved in and is both a valuable and enjoyable means of helping to protect your lake.

#### G) Water quality monitoring

Water quality monitoring is a major scientific task that requires effort, energy, and money, as well as long-term commitment from all individuals involved. Before starting a monitoring project, it is essential to recruit the assistance of a water quality expert who is familiar with the many important elements necessary for a successful study. By utilizing the experience of a professional, you will avoid many mistakes and save precious time and money that can be lost as a result of poor planning and lack of scientific understanding.

If you do decide to implement a water quality monitoring program, the first and most important thing to consider is very basic and central to a meaningful project. Simply ask yourself several questions. What do we want to know? What are we monitoring? What will we do with the results? These three questions need discussion and agreement from the association membership before you can proceed, or the results of your efforts will be meaningless.

Because lakes and watersheds are dynamic systems, i.e., constantly changing, any monitoring program of a year or less will give you only a snapshot of the conditions at that brief time you conducted the study, and as such may not be a highly accurate assessment of the situation.

A clear and comprehensive approach to monitoring should consider all nutrient and pollution sources within the watershed as well as the conditions that exist in the lake itself. Generally, it is too expensive and time-consuming to pursue detailed monitoring in all these areas, so it becomes necessary to trim the design to meet your resources while still ensuring that you collect enough significant information to make the project meaningful. Again, a water quality professional is vital to help you surmount these challenging problems.

Help with deciding on how to proceed is available from a wide variety of sources, some of it nearly free and much of it quite expensive, so consider several options before taking the plunge. MPCA has experts in their regional offices and in St. Paul who can assist you in the development of monitoring strategies and also has several water quality programs in which you may be able to enroll. The competition for acceptance in these programs is fierce, however, and it

may be several years before your lake becomes eligible, but advice and assistance is always available. Colleges and universities may also be able to advise you on some projects. Your local SWCD office may also be a resource for helping you initiate a water quality monitoring program.

Private environmental consultants are also available for this type of water quality project. Whatever option you choose, be sure you decide to get guidance from someone who is very knowledgeable about lake systems and water quality projects.

You must be very aware that monitoring alone will do nothing to prevent eutrophication of the lake. It will, however, provide you with defensible information that can lead you to a decision-making process resulting in water quality protection. A well-thought-out, comprehensive program of survey, assessment, and education, followed by projects relating to them, will do much to protect your resource and prevent its degradation.

#### H) Management plan

Develop a long-term management plan with realistic goals and time lines in which to achieve your objectives.

This plan should address all of the elements that were discussed earlier and lay out a strategy to deal with each of them. This plan should not be set in concrete, but should be a working document that can be modified as you learn more about lake management. As time goes on, it is important that a well-thought-out plan is in place, because as your association grows and changes, the management plan will keep you focused on accomplishing your lake protection efforts.

Now that you have established a management plan and a list of realistic projects, you are ready to go to work. Here is a handy list of do s and don'ts that will get you headed in the right direction toward protecting your lake s water quality.

Everyone can contribute by following the suggestions listed below. The goal is to preserve or mimic as many natural processes in the watershed as possible; let nature do the purification that it does so well. For example, leave buffer strips along the edges of lakes, tributary streams, and seasonal, intermittent streams, or plant vegetation that will slow surface runoff. Minimize disturbance of natural

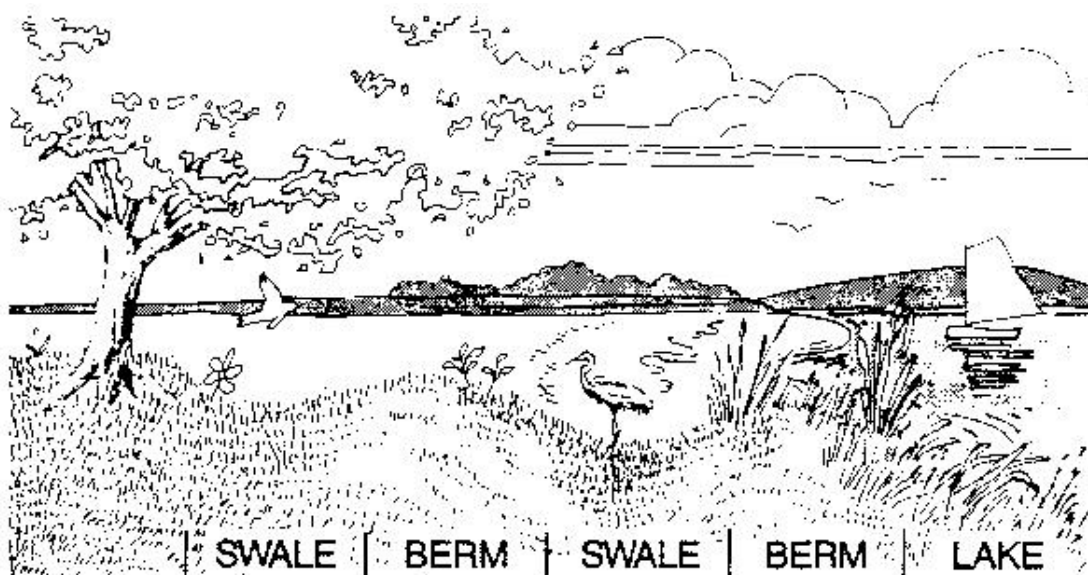


Figure 19 - A swale around the lake perimeter can be an effective final barrier for slowing surface runoff. Since the shoreline area is extremely sensitive to erosion, this method can help reduce erosion pressures significantly.

soils, direct surface runoff into natural depressions where the water can seep slowly into the ground, and keep the use of chemicals and other harmful substances that cannot be removed by nature to a minimum.

#### **A Basic Guide to Organizing**

If your area doesn't have a lake (or river) association, you can easily start one. Follow these step-by-step guidelines to create a strong new organization.

With a friend, or on your own:

1. List a few reasons why an association is needed. This will help later on with the mission statement.
2. Are there any other lake associations in your area that would give you some advice or support?
3. Estimate the total number of possible members (shoreland area property owners). Write down other individuals, groups, and businesses in your area that benefit from the existence of your lake. Consider the entire watershed ... including other connecting lakes, streams, or wetlands.
4. Check with your county land records department (usually the assessors' office) to find out if there is a list available of shoreland addresses/owners.

5. Hold a public meeting for anyone interested in protecting the water quality of your lake. Invite any individuals, groups, or business owners who care about or depend upon your lake environment ... or use it as a recreational resource. Decide who will lead the meeting. Ask someone to act as recording secretary. It may also help to have large paper pad or marker board for the leader to write down the main points of discussion. At the meeting, try to find a consensus that will become the foundation from which you can proceed. Invite participation in a steering committee to set up the association.

Steering Committee discussion points:

1. Review all reasons, and needs, for setting up this association. Agree together on a mission statement; it is usually best when written in one or two sentences.
2. An association name (example: Lake Beauty Area Association). Keep your membership appeal as wide as possible with the name of your new association.
3. Committees that will be needed to support future action. Base the committees on your agreed reasons why an association is needed. warning: If there is just a single strong issue or concern, it is unlikely that your new association will survive long-term. Some committee examples are: membership, water quality, tax, safety & recreation, communications & public relations, etc.
4. A permanent mailing address for the association. A post office box works best because association officers will change over time. A local post office box makes it convenient and consistent for anyone to send in their dues, and to communicate with the association.
5. Who has a fax (and e-mail) to send and receive important association communications?
6. Decide who will be in charge of future communications, including newsletters. Send out agendas in advance of the meetings.
7. Remember, the very best way to build membership is by making person-to-person networking in the community.
8. Set up a preliminary budget for at least one year of association activity. Base it on the annual membership fee, plus donations. The average starting association membership dues now range from \$10 to \$20 per year. Annual expenses to be considered will relate to your proposed projects, newsletter costs, membership materials, mailing, executive secretary expenses, etc.
9. Contact the administrative office of the Minnesota Secretary of State, (612) 296-2803, and request Non-Profit Articles of Incorporation forms. Establish a fiscal year, and procedures for anniversary date membership renewals. You may also wish to get advice from an accountant or attorney regarding establishing tax exempt status under IRS Chapter 501(c)(3).

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Allocate funds within your annual budget to join with Minnesota Lakes Association. The cost is only \$2 or \$10 per member per year. A group membership includes a *Guidebook for Lake Associations*, and regular communications and support on statewide issues. Also, you get access to state educational conferences, legislative information, and more!

For the first official board meeting of your association:

1. Try to find an area restaurant or meeting room facility (school, library, motel, etc.) that will help by hosting your board meetings. They may offer space at no cost, or at a reduced rate.
2. Adopt recommendations of the steering committee, including the mission statement.
3. Approve by-laws, elect officers, and establish a committee structure. Request regular progress reports from all committees to be made to the board of directors.
4. Agree to run all meetings by proper parliamentary procedures see Robert's Rules of Order.
5. Establish a regular date and time for meetings of the board of directors (example: board meets on the first Thursday, every other month, at 7 p.m.) Decide when the annual business meeting of the membership is to be held. What social or fundraising events (if any) will take place?

Suggestions for the first year:

6. Do a press release bulletin on the new association. Follow up with personal contacts.
7. Get to know the locally-elected government officials, and the agency staff people assigned to your lake area. Let them know about your association's goals. Ask for their help. Keep them informed by sending them your newsletter. Invite them to attend a meeting to acquaint your board members with their activities (as they are related to your lake or river area).
8. Keep the board and committees focused on the agreed upon goals, actions and results. And be sure to let the members know about what is going on in your newsletter; go ahead and brag a little!
9. Run the association in a responsible business-like manner, with care to try serving all your members ... and have some fun while doing it.

If you follow these general guidelines, you will be off to a good start. Mix in your own ideas and strategies to make your association a real winner.

Good luck!

Please let us know how you re doing. Send along copies of your newsletter to the Minnesota Lakes Association.

10. Schedule next meeting date, time and location. important! Before adjourning any committee meeting:

Review agreements that the group has made.

Be sure individual assignments and responsibilities for follow-up are clear.

Agree on reasonable due dates for work to be done.

11. Members of the steering committee will become the board of directors for the new association.

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### III. NETWORKING AND POLITICAL ACTIVITIES

Sooner or later it is necessary for every lake association to become politically active to achieve its goals and objectives. Political activity will follow a course of networking with a variety of people who are involved with land use management and water quality issues.

There are many people working in state, county, and township government and state and federal agencies who can be important resources for your lake management efforts. Getting to know these people, sorting through who can provide the most assistance, and developing relationships with key players is a job that will require much time, so be prepared to attend meetings, go to conferences, and spend time on the phone. It will be time well invested.

Areas where you need to make connections include, but are not limited to, the following organizations:

- Township
- County
- Soil and Water Conservation District
- Watershed District
- Joint Powers Boards
- Minnesota Department of Natural Resources
- Minnesota Pollution Control Agency
- Minnesota Lakes Association
- Coalition of Lake Associations
- The Freshwater Foundation
- The International Coalition
- Board of Water and Soil Resources
- Agricultural Stabilization and Conservation Service
- Soil Conservation Service

Perhaps the best place to start your networking activity is at the county level. The first task is to introduce your organization to the county commissioner within whose district the lake falls. Invite the commissioner to attend either your annual meeting or one of the regularly scheduled monthly board meetings. Commissioners are usually quite busy and in demand, so you may need to extend the invitation over a period of time to insure that he or she is able to attend. Once you have secured a meeting date, design your agenda to inform the commissioner about all the important aspects of the association: its history, membership, goals and objectives, and current issues. Make this initial meeting as cordial and open as possible because you want to establish an honest and relaxed working relationship with the commissioner. Don t get involved at this stage with controversial issues that may make waves or create a defensive response. Ask the commissioner to speak freely about his feelings toward your lake association effort. By reaching out to a local official, you have already begun to form an alliance with your local government.

Once you have established contact with this person, keep him/her updated on the progress of the lake association s work and include him/her in all of the mailings that go out to your regular membership. Invite him/her back to subsequent meetings where he/she can provide input to important topics.

The next step is to ask if you can get on the agenda of a regular meeting of both the commissioners and the county planning commission. This gives you the opportunity to share your views about your lake and the land use that affects it with the county decision makers. At this time, you can bring up important issues and concerns and find out what role the county can play in helping you address them.

It is always better to be proactive than reactive to any situation. By making your topics of concern known to these county managers, you will be a benefit to both the county and your lake association. During these meetings, you need to ask the planning commission to place you on their mailing list so you are notified about permits and variance proceedings within the watershed of your lake.

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This notification allows you to make informed investigations about land use activities and development and give input to the public review process.



Follow up by thanking the planning commission for their support and continue to provide them with information regarding your lake resource.

The county planning and zoning administrator is the next person to become acquainted with. As with the other county officials, get to know this person well and make him/her aware of your serious intentions to protect the water quality of your lake.

Townships do not generally become very involved in lake management activities. However, they do perform regular schedules of some things such as road maintenance and weed control that can have some impact to a lake s water quality. Here again, as with the county, you need to make the association and its agenda known to the town board, and be willing to ask for assistance or provide information on issues and projects that have the potential to affect the water quality of your lake.

Next, you should talk to the manager of your county Soil and Water Conservation District (SWCD). Many land use programs and water quality activities are administered through this office, such as agricultural set-aside programs, annual tree planting, and CLMP (Citizens Lake Monitoring Program). In some counties, the SWCD is becoming the lead agency, responsible for coordinating large scale lake research and restoration, so it is important to build a good working relationship with this valuable local resource.

The trend in some counties is to form coalitions of lake associations (COLA). This has been a successful strategy for dealing with lake management issues on a variety of fronts. COLAs have been successful in organizing lake associations where they formerly did not exist, organizing county-wide lake management conferences, networking with state and local agencies, and raising the awareness of the values of good water quality.

A county COLA can be, above anything else, an open forum where people from individual lake associations can share their successes, lend support to their neighbors, and, finally, help their members to avoid the mistakes and pitfalls that have been encountered in past projects.

Finally, then, all the networking activities you become involved in should be viewed as fact-finding missions and calls for assistance. Whether you work through a state agency, local unit of government, academic institution, consulting firm, or any other resource group, your goal should be a creative approach toward a program of mutual benefits for all the users of our surface water resource.

## Appendix A - GLOSSARY

**Algae** - Microscopic aquatic plants. May be single cells or colonial forms, either free-floating or attached to substrates.

**Algal Bloom** - An unusual or excessive abundance of algae.

**Aquatic Vascular Plant** - Plants that grow and live in water. They possess roots, stems, leaves, flowers, and a vascular system.

**Blue-Green Algae** - Algal form that may cause water to turn green, gray, or brown during late summer periods. Some forms may be toxic in large concentrations.

**Dissolved Oxygen** - State of oxygen that is available to fish and other aquatic life. Produced by aquatic vascular plants and algae.

**Ecoregion** - An area with similar soils, land surface, natural vegetation, and current land use.

**Emergent Vegetation** - Aquatic vegetation growing in shallow water, standing up and above the surface: e.g., bulrush, tule grass, cattail.

**Eutrophication** - The aging process by which lakes are fertilized with nutrients. Natural eutrophication will very gradually change the character of the lake. Cultural eutrophication is the accelerated aging of a lake as the result of human activities.

**Feedlot** - Any area where livestock are fed that concentrates manure and prevents vegetation from growing.

**Filamentous Green Algae** - Algal form that in severe bloom conditions creates long strings or floating mats.

**Flushing Rate** - Time required for a lake to exchange its water; may be days, months, or years.

**Forage Fish** - Minnows and other small fish that are food for larger predator fish.

**Geologic Time** - Scale of time from formation of the earth to the present.

**Ground Truthing** - On-site inspection of features located on a map.

**Heavy Metals** - Toxic metals that accumulate in the tissues of animals: e.g., lead, cadmium, mercury.

**Invertebrate** - Animals without backbones: e.g., insects, mollusks, crustaceans, etc.

**Light Attenuation** - Absorption of light by water.

**Limnology** - Scientific study of the physical, chemical, and biological factors that influence the productivity of fresh waters.

**Littoral Area** - The shallow areas around a lake's shoreline where light can penetrate the water to the bottom.

**Maximum Depth** - Deepest point of a lake basin.

**Median Depth** - Average depth of a lake basin.

**Morphometry** - Physical features of a lake basin, e.g., surface area, shape of basin, maximum depth, etc.

**Nitrogen** - A nutrient essential to plant growth. It is very abundant in the environment in several forms. Heavily used as an agricultural fertilizer.

**Nitrogen to Phosphorus Ratio (N:P)** - Comparison of the concentrations of nitrogen and phosphorus in lake water.

**Nonpoint Source Pollution** - Polluted runoff-nutrients and pollution sources not discharged from a single point: e.g., runoff from agricultural lands, feedlots, construction zones.

**Nutrient** - An element or compound essential to growth and development of living things: e.g., nitrogen, phosphorus, potassium.

**Nutrient Loading** - Input of nutrients to a lake from all natural and man-made sources.

**Pesticides** - Chemicals used to destroy or control animal, insect, or plant pests.

**Phosphorus** - A nutrient essential to plant growth. It is abundant in the environment and is usually the limiting nutrient in lakes.

**Phytoplankton** - Algae the base of the lake's food chain, it also produces oxygen.

**Plankton** - Free-floating and swimming microscopic aquatic plants and animals.

**Point Source Pollution** - Specific sources of nutrients or polluted discharges to a lake: e.g., storm water outlets, wastewater treatment discharges.

**Predator Fish** - Generally, game fish that prey on other smaller fish: walleyes, northerns, bass.

**Productivity** - Measure of the relative fertility of a lake.

**Remedial Action** - Corrective measures to actively deal with a problem area, e.g., rip rap, chemical treatments, dredging, etc.

**Secchi Disc** - A simple device to measure the depth of light penetration in the water.

**Sediment** - Fine particles of soil and organic material which are easily transported by water.

**Submergent Vegetation** - Aquatic plants growing below or up to the surface of the water: e.g., coontail, pondweed, milfoil.

**Surface Runoff** - Water that flows over the surface of the land during storm events and spring snowmelt.

**Surface to Volume Ratio** - Comparison of the surface area of a lake to its volume of water.

**Suspended Solids** - Small particles that hang in the water column and create turbid, or cloudy, conditions.

**Terrestrial** - Things that are on the land. In the case of plants, those that are not aquatic.

**Topographic Map** - A map that displays elevations by means of contour lines.

**Trophic Status** - The level of growth or productivity of a lake as measured by phosphorus content, algae abundance, and depth of light penetration.

**Trophic Status Index** - A numerical scale from 1 to 100 covering the full range of possible lake conditions.

**Watershed** - The surrounding land area that drains into a lake, river, or river system.

**Winterkill** - A condition of low dissolved oxygen in the water which causes fish to die. Usually associated with shallow lakes during winters of heavy snow accumulation.

**Zooplankton** - Microscopic aquatic animals.

## **Appendix B - BYLAWS OF THE ABC LAKE AREA ASSOCIATION**

### **ARTICLE I: NAME**

Section 1. The name of this organization shall be the ABC Lake Area Association. (See Appendix P.)

### **ARTICLE II: PURPOSE**

Section 1. The Association shall promote and maintain the environmental, economic, and recreational protection of ABC Lake and vicinity.

Section 2. The Association shall work in conjunction with federal, state, and local agencies, public and private, to maintain the quality of the lake.

Section 3. The Association shall develop a program for the promotion of stocking ABC Lake.

Section 4. The Association shall provide educational resources relating to the protection and quality of ABC Lake area and its wildlife.

Section 5. The Association shall inform the general membership of civil concerns relating to the purposes of the Association.

Section 6. The Association shall be a nonprofit, nonstock organization.

### **ARTICLE III: MEMBERSHIP**

Section 1. Membership shall be open to all interested parties who share a concern for the purposes of the Association.

### **ARTICLE IV: DUES**

Section 1. Initial membership fee:

A. Initial membership shall be \$25 for resorts and businesses.

B. Initial membership shall be \$10 for general membership.

Section 2. Annual dues:

A. Annual dues shall be \$10 for resorts and businesses.

B. Annual dues shall be \$5 for general membership.

C. Annual dues shall be payable no later than July 31st of the current fiscal year to remain a voting member in good standing with the Association.

### **ARTICLE V: OFFICERS**

Section 1. The officers of the Association shall be a President, Vice President, Secretary, and Treasurer, and one (1) Board Member to represent each twenty-five (25) members.

Section 2. The immediate Past President shall serve on the Board of Directors as a voting member and to advise the Board.

Section 3. Duties:

A. The President shall preside at all annual, board, and special meetings of the Association and shall represent the Association at all official functions.

B. The Vice President shall, in the absence of the President, fulfill the duties of the President. Further, the Vice President shall fulfill other duties as designated by the President, the Board, or the general membership.

C. The Secretary shall record and maintain minutes of all annual, board, and special meetings of the Association and shall manage all routine correspondence of the Association.

D. The Treasurer shall maintain all revenues of the Association and shall disperse expenditures as designated by the Board or the general membership.

(1) The Treasurer shall be bonded at the expense of the Association.

(2) The Treasurer shall present a yearly report of income and expenditures at the annual meeting of the Association.

E. Board members shall fulfill all duties as directed by the President, Board of Directors, or the general membership. Section

4. Term of office:

A. Officers and Board Members shall serve a term of one year and shall be elected at the annual meeting by a simple majority.

B. An individual may not serve more than two consecutive terms in the same office.

**ARTICLE VI: MEETINGS**

Section 1. The Association shall meet annually in June with the date and place set no later than May 15th.

Section 2. The Board of Directors shall meet quarterly, with the spring meeting prior to the annual meeting to set the agenda.

Section 3. Special meetings may be called at the discretion of the Board of Directors or at the request of the general membership.

**ARTICLE VII: ADDRESS**

Section 1. The Association shall maintain a post office box in City, State Zip.

**ARTICLE VIII: VOTING AND QUORUM**

Section 1. Each paid membership is entitled to one (1) vote.

Section 2. Proxy votes, in writing or preauthorized, shall be allowed.

Section 3. A quorum shall consist of twenty-five percent (25%) of the general membership in attendance and voting, including allowable proxy votes.

**ARTICLE IX: PARLIAMENTARY PROCEDURE**

Section 1. All meetings of the Association and the Board of Directors shall be conducted in accordance with *Roberts Rules of Order*, unless otherwise specified by these bylaws.

**ARTICLE X: SUSPENSION OF THE BYLAWS**

Section 1. These bylaws may be suspended by a two-thirds vote of the majority, present and voting, for emergency situations only.

**ARTICLE XI: AMENDMENTS TO THE BYLAWS**

Section 1. These bylaws may be amended at any meeting of the Association, provided that written notice is given to the general membership at least fifteen (15) days in advance of the meeting at which action is to be taken.

**ADOPTED: (date)**

**Appendix C  
REQUESTING LAKE INFORMATION  
FROM MINNESOTA STATE AGENCIES  
Department of Natural Resources**

**Minnesota Pollution Control Agency**

- Citizens Lake Monitoring Program (CLMP)
- Jennifer Klang - (612) 282-2618
- Lake Assessment Program (LAP)
- Steve Heiskary - (612) 296-7217
- Toxic Monitoring in Fish
- Patty King - (612) 296-8723
- Clean Lakes Program
- Mark Tomasek - (612) 296-6062
- Clean Water Partnership Program
- Gaylen Reetz - (612) 296-8856
- Lake Complaints & Fish Kills
- Will Munson - (612) 297-8218
- Water Quality Information
- Steve Heiskary - (612) 296-7217
- Jennifer Klang - (612) 282-2618

- Shoreland Management
- Ed Fick - (612) 296-0508
- Water Appropriation
- Jim Japs - (612) 297-2835
- Lake Aeration
- Marilyn Danks - (612) 296-0777
- Aquatic Nuisance Control
- Steve Enger - (612) 296-0782
- Fisheries Management
- Jack Skypek - (612) 296-0792
- Fish Kill Investigations
- Marilyn Danks - (612) 296-0777
- Water Surface Use Zoning
- Maureen Janke - (612) 297-5708
- Lake Level Management
- Bruce Gerbig - (612) 296-0515
- Ordinary High Determination
- Glen Yackel - (612) 296-4805

**Minnesota Pollution Control Agency  
Regional Offices**

Northeast Regional Office  
Duluth Govt. Service Center, Rm. 704  
320 West Second Street  
Duluth, MN 55802  
(218) 723-4660

North Central Regional Office  
1601 Minnesota Drive  
Brainerd, MN 56401  
(218) 828-2492

Northwest Regional Office  
Lake Avenue Plaza  
714 Lake Avenue, Suite 220  
Detroit Lakes, MN 56501  
(218) 847-1519

Southwest Regional Office  
700 North Seventh Street  
Marshall, MN 56258  
(507) 537-7146

Southeast Regional Office  
2116 Campus Drive S.E.  
Rochester, MN 55904  
(507) 285-7343

Central Office  
Minnesota Pollution Control Agency  
520 Lafayette Road N.  
St. Paul, MN 55155-4194  
(800) 657-3864  
(612) 296-6300

**Information as of 8/97**

**Statewide toll-free number - (800) 766-6000.  
Ask operator for Pollution Control Agency or Department of Natural Resources.**

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**Appendix D - THE CARE AND FEEDING OF SEPTIC SYSTEMS**

Many lakeshore houses or cabins have septic tanks and drainfields. These systems use naturally occurring biological processes to treat household wastewater cheaply and efficiently and recharge groundwater supplies with the treated water.

They can also pollute lakes and drinking water.

What makes the difference? Good design, proper siting and construction, and regular maintenance. In the case of septic systems, if out-of-sight also means out-of-mind, trouble is guaranteed.

A little understanding of how a septic system works makes it easy to understand what kind of siting and upkeep it needs to operate well. In the most commonly used septic system, household wastewater goes to a septic tank, where gravity and bacterial action breaks it into sludge, scum, gas and liquid. The sludge settles at the bottom of the tank, scum rises to the top, gas is vented to the outside, and the liquid flows through closed pipes and a drop box to perforated pipes laid in a drainfield.

At this point, the liquid contains disease-bearing bacteria, nutrients, and organic matter. As it slowly moves through the drainfield, microorganisms and oxygen remove the bacteria and decompose the organic material. Soil particles filter out some of the nutrients primarily phosphorus. Nitrates are inorganic and move through the soil into the groundwater, where they are diluted.

Since nitrates can create a health hazard if they are present above 10 parts per million in drinking water, the siting of a septic system is critical. The drainfield must be a sufficient distance from wells to allow for adequate dilution of nitrates. A high water table, ponds or marshy areas will cause construction or drainage problems.

Phosphorus can be very damaging to lakes. One pound of phosphorus can stimulate the growth of about 500 pounds of weeds and algae. A properly designed and installed septic system will effectively remove phosphorus from wastewater. However, old-fashioned systems, such as cesspools or leaching pits, can put phosphorus directly into the groundwater. From there, it can easily move into nearby lakes.

The soil itself must also be suitable for a drainfield to work well. You can contact your local Soil and Water Conservation District for help in evaluating soils on your property.

Once a system is in place, the critical factor in good treatment is regular maintenance and care of the system. A short memory jog for good maintenance is watch what goes in, out and on your system.

**What goes in:** Don't clog your drainfield by overloading the system. Use water-saving devices; don't connect roof drains or basement sump pumps to the system; avoid using garbage disposals; don't throw coffee grounds, cooking fats, disposable diapers, sanitary napkins, facial tissues, cigarette butts, antifreeze, paint, solvents or other household hazardous waste down the drains. Don't use additives that are advertised as either starting the system or eliminating the need for pumpouts. They are not needed and can harm the system. Some additives are suspected to be carcinogenic and will flow directly into your groundwater.

**What goes out:** Have your septic tank pumped out every two or three years. If it is not pumped, the tank fills and lets solids reach the drainfield, clogging it and causing a failure of the system.

**What goes on:** Don't damage the system by driving heavy vehicles over the drainfield. This is especially true in winter, when the vehicle's weight can drive down the frost and prevent effective treatment in the drainfield.

**Why worry?** Sewage should be considered infectious. Allowing untreated sewage to reach a lake, stream or groundwater cannot only cause significant environmental damage, it can also create severe public health problems.

If you belong to a lake association, make sure that homeowners around the lake know how to maintain their systems. Failing septic systems can be detected by analyzing lake water near shore. Your association may want to contact your county zoning officials to work on a survey of septic systems around your lake.

If you would like more information on septic system installation requirements and maintenance, call Larry Zdon (WQNS) at 612-297-8219. If you would like to discuss projects that your lake association might develop with county officials to identify failing systems, contact Bruce Paakh at the MPCA Northwest Regional Office in Detroit Lakes, 218-896-0747.

**Appendix E - QUESTIONNAIRE SURVEY**  
**SURVEY OF INDIVIDUAL SEPTIC SYSTEMS**  
**ABC LAKE**  
**BY THE**  
**ABC LAKE ASSOCIATION**

**1. Name:** \_\_\_\_\_  
last first mi

**2. Phone:**  
Residence \_\_\_\_\_  
Lake \_\_\_\_\_

**3. What type of wastewater disposal system do you have?**  
A B C D E F G H  
Describe (other): \_\_\_\_\_

**4. Do you have any problems with your system?**  
Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, indicate problem. If no, proceed to #5.

Spring Summer Fall Winter

Ground wet over system  
Sewage backs up into dwelling  
Sewage surfaces near system  
Toilets won't flush

Other: \_\_\_\_\_

**5. What is the approximate age of your system?**  
Less than 2 years  
2-5 years  
6-10 years  
11-20 years  
More than 20 years  
Don't know

**6. Type of dwelling:**  
Seasonal \_\_\_\_\_  
Permanent \_\_\_\_\_  
Other \_\_\_\_\_

**7. Number of weeks per year dwelling is occupied:** \_\_\_\_\_ Weekends only: \_\_\_\_\_

**8. Average number of occupants at residence:** \_\_\_\_\_

**9. Does dwelling have a well?**  
Yes \_\_\_\_\_ No \_\_\_\_\_  
Type \_\_\_\_\_

**10. How far is the well from the septic system?** \_\_\_\_\_ feet

**11. How far is the drainfield of the septic system from the lake?** \_\_\_\_\_ feet

**12. Do you suspect any septic systems on the lake that might cause a pollution or health problem?**  
If so, please describe.

**13. Are you willing to have your system inspected?**  
Yes \_\_\_\_\_ No \_\_\_\_\_ Any other comments:

**14. Has your septic tank been pumped?**  
Yes \_\_\_\_\_ No \_\_\_\_\_ If yes, when?

**Appendix F - MINNESOTA  
BACKGROUND INFORMATION**

Population 1990 - 4,375,099

State Surface Area - 85,447 square miles

Number of Water Basins - 9 major water basins

Total River Miles - 91,944 miles

Number of Lakes and Reservoirs

12,034 total lakes

> 5000 acres - 62 lakes

< 5000 acres - 11,972 lakes

Acres of Lakes and Reservoirs - 3,411,200 acres

Acres of Marsh or Wetlands - Approximately 6,000,000 acres

Source: Minnesota Pollution Control Agency

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**Appendix G - MINNESOTA POLLUTION CONTROL AGENCY  
DIVISION OF WATER QUALITY  
WATER MONITORING PROGRAMS**

**LAKES**

Citizens Lake Monitoring Program (CLMP)

Lake Assessment Program (LAP)

Clean Water Partnership (CWP) studies

Ecoregion Trend Monitoring

Trent Assessment

Point Source Studies

Local Water Plan Monitoring Assistance

Lake-Sediment Assessment

Special Studies (Includes LCMR studies)

**GROUND WATER**

Nonpoint Source Monitoring (e.g.

CWP Projects)

Routine Monitoring Network

Special Studies

**STREAMS**

Milestone Sites (Routine Monitoring Program)

Longitudinal Surveys

Load Allocation Studies

Biological Monitoring

Compliance Monitoring

Citizen Volunteer Monitoring (new in 1997)

Special Basin-Oriented Studies (e.g.,

Minnesota River Basin)

**OTHER**

Wetland Assessment

Toxic Surveys (sediments and biota)

**Requesting Lake-Related Information**

• Citizens Lake Monitoring Program

• Lake Assessment Program

• Fish Tissue and Advisory Info

• Clean Lakes Program (Federal)

• Clean Water Partnership (State)

• Lake Water-Quality Complaints

• Lake Quality Information

• Lake/Stream Quality Information

• Acidification or Mercury

• Revolving Loan Fund

Jennifer Klang

(612) 282-2618

Steven Heiskary

(612) 296-7217

Patty King

(612) 296-8723

Mark Tomasek

(612) 296-6062

Gaylen Reetz

(612) 296-8856

Willis Munson

(612) 297-8218

Jennifer Klang

(612) 282-2618

Steven Heiskary

(612) 296-7217

Jim Porter

(612) 296-8859

Ed Swain

(612) 296-7800

Marge Velky

(612) 296-8834

Note: All of the above may be contacted via e-mail as well. The format for most addresses is:

first name.last name@pca.state.mn.us

For example: steven.heiskary@pca.state.mn.us

\* Lake summary data and related information may also be obtained from the MPCA Web page at the address: <http://www.pca.state.mn.us>

Lake information will be located within the "Water" subheading.

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## Appendix H - WATER MANAGEMENT IN MINNESOTA

### Health Department

- Public Health Issues
- Drinking Water
  - well testing
  - municipal water supplies

### Department of Natural Resources

- Water Levels
- Water Use Appropriations
- Recreational Uses of Lakes and Streams
- Fish and Wildlife
- Shoreline Management

### Pollution Control Agency

- Identifying and Regulating Pollution- development of water quality standards
  - monitoring programs
  - control of dischargers

### Local Units of Government

- Well Testing
- Shoreline and Floodplain Management
- Zoning
- Permitting

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## Appendix I -

### FREQUENTLY USED TELEPHONE NUMBERS AND ADDRESSES

#### U.S. DEPARTMENT OF AGRICULTURE

##### NATURAL RESOURCE CONSERVATION SERVICE

600 Farm Credit Services Bldg.  
375 Jackson Street  
St. Paul MN 55101-1854  
612-290-3675

##### AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE

400 Agri-Bank Bldg.  
375 Jackson Street  
St. Paul MN 55101-1852  
612-290-3651

#### U.S. DEPARTMENT OF DEFENSE DEPARTMENT OF THE ARMY

##### CORPS OF ENGINEERS

190 East Fifth Street  
St Paul MN 55101-1638  
612-290-5690

#### U.S. DEPARTMENT OF THE INTERIOR

##### U.S. GEOLOGICAL SURVEY

St. Paul District Office  
2280 Woodale Drive  
Mounds View, MN 55112  
612-783-3100

##### U.S. FISH AND WILDLIFE SERVICE

4101 East 80th Street  
St. Paul MN 55425-1665  
612-725-3548

#### STATE OF MINNESOTA

##### DEPARTMENT OF AGRICULTURE

90 West Plato Boulevard  
St. Paul MN 55107  
612-297-2200

##### DEPARTMENT OF HEALTH

717 Delaware Street SE  
Minneapolis MN 55414  
612-623-5000

##### DEPARTMENT OF NATURAL RESOURCES

500 Lafayette Road  
St. Paul MN 55155-4001  
612-296-6157

##### POLLUTION CONTROL AGENCY

520 Lafayette Road  
St. Paul MN 55155-3898  
612-296-6300

##### UNIVERSITY OF MINNESOTA

Information - 612-625-5000

##### STATE OF MINNESOTA

Information - 612-296-6013

##### BOARD OF WATER & SOIL RESOURCES

One West Water Street, Suite 200  
St. Paul, MN 55107  
612-296-3767

Information as of 8/97

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**Appendix J - DIRECTORY OF MINNESOTA COLAs**

<b>COLA</b>	<b>President</b>	<b>Address</b>	<b>Phone (Fax)</b>	<b>Permanent COLA Address</b>
<b>ARROWHEAD DISTRICT</b>				
Carlton County	Brian Hayden	PO Box 220 Carlton, MN 55718	218-384-9178 218-384-9123 (Fax)	No
Cook County	Phil Serrin	PO Box 327 Grand Marais, MN 55604	218-388-9933 520-625-8413 (Winter)	Yes
<b>EASTERN DISTRICT</b>				
Chisago County East Central	Clair Frable	RR 2 Box 84F Pine City, MN 55063	320-629-7979	No
<b>METRO DISTRICT</b>				
Washington County	Bob Hult	21360 Fondant Ave N Forest Lake, MN 55025	612-464-4240	No
<b>NORTH CENTRAL DISTRICT</b>				
Aitkin County	Leroy Stunek	PO Box 343 Aitkin, MN 56431	218-927-6666	Yes
Cass County	Doug Ryden	HC 3 Box 2800 Remer, MN 56672	218-566-3050	No
Crow Wing County (LARA)	Terri Rossi	1930 Westwood Circle Roseville, MN 55113	612-631-0316(Home) 218-825-9600 (Office)	No
Hubbard County	Frank T. Smith	RR 3 Park Rapids, MN 56470	218-732-3703	No
Wadena County	Russell Commick	RR 4 Box 394A Menagha, MN 56464	218-564-5069	No
<b>NORTHERN DISTRICT</b>				
Itasca County	Richard Libbey	6230 Wendigo Park Road Grand Rapids, MN 55744	218-326-1874	No

November, 1997

**DIRECTORY OF MINNESOTA COLAs**

<b>COLA</b>	<b>President</b>	<b>Address</b>	<b>Phone (Fax)</b>	<b>Permanent COLA Address</b>
-------------	------------------	----------------	--------------------	-------------------------------

**SOUTHERN DISTRICT**

Rice County	Bill Saufferer	6400 French Lake Trail Faribault, MN 55021	507-334-6044	Yes
Nobles County	Jerry Raedeke	1435 So Shore Drive Worthington, MN 56187	607-372-5646	No
Southwest COLA	Lars Johansson	RR 1 Ghent, MN 56239	607-532-9745	No

**WEST CENTRAL DISTRICT**

Douglas County	Lisa Lofquist	11902 Cty Rd 12 NW Garfield, MN 56332	320-834-0316	No
Kandiyohi County	Ron Dilley	PO Box 1881 Willmar, MN 56201	320-354-4266	Yes
Meeker County	Jeff Halbert	PO Box 547 Litchfield, MN 55355	320-693-5781	Yes
McLeod County	Robert Bergren	830 11 Street E Glencoe, MN 55336	320-864-5551 ext. 1218	No
Pope County	Richard Heimkes	3318 Wren Lake Eagan, MN 55121	320-454-5996	No
Sherburne County	Terry Polsfus	5314 114th Ave Clear Lake, MN 55319	320-743-2714	No
Todd County	Collette Peterson	RR 1 Box 153A Long Prairie, MN 56347	320-732-3503	No
Wright				

**WESTERN DISTRICT**

Becker County	Ruth Bergquist	PO Box 1553 Detroit Lakes, MN	218-573-3862	Yes
Ottertail County	John Matteson	PO Box 443 Battle Lake, MN 56515	218-864-8113	Yes

November, 1997

**Appendix K - SPECIAL PURPOSE DISTRICTS  
AND ORGANIZATIONS**

**Lake Conservation Districts, Joint Powers Organizations,  
and Public Water and Sewer Districts**

Minnesota has two lake conservation districts, the Lake Minnetonka Conservation District and the White Bear Lake Conservation District. A district's goal is generally to maintain or improve the quality of its lakes. Their duties might include regulating docks on the lakes, hiring out for extra water patrol, licensing marinas, and setting speed limits. Both lake conservation districts are governed by voluntary boards of directors.

The joint powers organizations given here are two or more local units of government that have decided to cooperate to provide some type of soil or water conservation services for their constituencies. For example, the Redwood-Cottonwood Rivers Control Area was originally formed largely for flood control purposes. More recently, it has been helping its eight member counties develop 103B comprehensive water plans. Joint powers organizations' authority comes from Minnesota Statutes Section 471.59.

Public water and sewer districts, authorized under Minnesota Statutes 115.18, 115.37, 115.61, 115.67, and Chapter 116A, are formed to serve a given area's water and sanitation needs. Individual districts may be formed to answer either sewage concerns or water concerns, or one district may be formed as a combined sewer and water district.

For more information, contact the Minnesota Board of Water and Soil Resources, One West Water Street, Suite 200, St. Paul, MN 55107, (612) 296-3767

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**Appendix L - MINNESOTA BOARD OF  
WATER AND SOIL RESOURCES**

**One West Water Street, Suite 200  
St. Paul, MN 55107  
(612) 296-3767  
Fax: (612) 297-5615**

**CENTRAL OFFICE**

Bryan Alpaugh	Information System Specialist	(612)297-4735	Bryan.Alpaugh@bwsr.state.mn.us
Mary Jo Anderson	Executive Assistant	(612)297-4290	MaryJo.Anderson@bwsr.state.mn.us
Lorrie Bauers	Receptionist/Secretary	(612)296-3767	Lorrie.Bauers@bwsr.state.mn.us
Jim Birkholz	Assistant Director	(621)296-0879	James.Birkholz@bwsr.state.mn.us
Marybeth Block	Special Projects Coordinator	(621)297-7965	Marybeth.Block@bwsr.state.mn.us
Helen Bohrer	Accounting Clerk	(612)282-2600	Helen.Bohrer@bwsr.state.mn.us
Tim Fredbo	Easement Program Manager	(612)296-0880	Tim.Fredbo@bwsr.state.mn.us
Ron Harnack	Executive Director	(612)296-0878	Ronald.Harnack@bwsr.state.mn.us
Jim Haertel	Board Conservationist	(612)297-2906	James.Haertel@bwsr.state.mn.us
John Jaschke	Wetland Management Specialist	(612)297-3432	John.Jaschke@bwsr.state.mn.us
Al Kean	Chief Engineer	(612)297-2907	Al.Kean@bwsr.state.mn.us
Greg Larson	Admin. Water and Land Sec.	(612)296-0882	Greg.Larson@bwsr.state.mn.us
Mary Miller	Accounting Coordinator	(612)296-0873	Mary.Miller@bwsr.state.mn.us
Steve Miller	Senior Realty Specialist	(612)296-6908	Steve.Miller@bwsr.state.mn.us
Eric Mohring	Hydrogeologist	(612)297-7360	Eric.Mohring@bwsr.state.mn.us
Robyn Molina	Secretary	(612)296-2840	Robyn.Molina@bwsr.state.mn.us
Matt Moore	Engineering Aide	(612)297-2622	Matt.Moore@bwsr.state.mn.us
Barbara Ohman	Board Conservationist	(612)297-1894	Barbara.Ohman@bwsr.state.mn.us
Bruce Sandstrom	Regional Supervisor	(612)297-4958	Bruce.Sandstrom@bwsr.state.mn.us

Tom Schwanke	Business Manager	(612)297-5616	Tom.Schwanke@bwsr.state.mn.us
Debbie Singer	Metro Secretary	(612)282-9969	Debbie.Singer@bwsr.state.mn.us
Doug Thomas	Water Planning Coordinator	(612)297-5617	Doug.Thomas@bwsr.state.mn.us
Susan Tsakakis	Communications Directors	(612)297-1893	Susan.Tsakakis@bwsr.state.mn.us
Tom Wenzel	Design Engineer	(612)296-0883	Tom.Wenzel@bwsr.state.mn.us
Wayne Zellmer	Grants Coordinator	(612)297-7361	Wayne.Zellmer@bwsr.state.mn.us

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## REGIONAL OFFICE STAFF

### METRO REGION (Area Code - 612)

#### METRO OFFICE

**Phone: 282-9969 Fax: 297-5615**  
One West Water Street, Suite 200  
St. Paul, MN 55107

Bruce Sandstrom, Regional Supervisor - 297-4958 - Bruce.Sandstrom@bwsr.state.mn.us

Barbara Ohman, Board Conservationist - 297-1894 - Barbara.Ohman@bwsr.state.mn.us

Jim Haertel, Board Conservationist - 297-2906 - Jim.Haertel@bwsr.state.mn.us

Debbie Singer, Secretary - 282-9969 - Debbie.Singer@bwsr.state.mn.us

### NORTHERN REGION (Area Code - 218)

#### DULUTH OFFICE

**FAX: 723-4794**  
394 South Lake Avenue, Room 403  
Duluth, MN 55802

Mark Nelson, Board Cons. - 723-4923  
Jim Lemmerman, Forester - 723-4996  
Barb Liukkonen, Ed. Coord. - 723-2350  
Gene Clark, Lakeshore Eng. - 723-2351  
Gail Watzcak, Secretary - 723-4752

#### BEMIDJI OFFICE

**FAX: 755-4201**  
3217 Bemidji Avenue North  
Bemidji, MN 56601

Brian Dwight, Board Conservationist - 755-3963  
Bill Best, Board Conservationist - 755-4176  
Dale Krystosek, Board Cons. - 755-4236  
Karen Johannsen, Secretary - 755-4235

#### BRAINERD OFFICE

**FAX: 828-6036**  
217 South Seventh Street  
Brainerd, MN 56401

Ron Shelito, Regional Supervisor - 828-2604  
Dan Steward, Board Conservationist - 828-2598  
Keith Grow, Board Conservationist - 828-6035  
Pete Waller, Board Conservationist - 828-2564  
Vicky Erbele, Secretary - 828-2383

### SOUTHERN REGION (Area Code - 507)

#### NEW ULM OFFICE

**FAX: 359-6018**  
Highway 15 South, Box 756  
New Ulm, MN 56073-0756

Jeff Nielson, Reg. Supervisor - 359-6075  
Tom Fischer, Board Conservationist - 359-6091  
Chris Hughes, Board Conservationist - 359-6076  
Sara Johnson, SWCD Accounting - 359-6077  
Carla Swanson, Secretary - 359-6075  
Jeff Hedtke, Wetland Rest. Tech. - 359-6092

#### MARSHALL OFFICE

**FAX: 537-6368**  
1400 East Lyon Street, Box 267  
Marshall, MN 56258

Tabor Hoek, Board Conservationist - 537-7260  
David Sill, Board Conservationist - 537-6374  
Darrell Apelgrain, Area Engineer - 537-6125  
VACANT - Feedlot Specialist - 537-6067  
Roxie Serreyn, Secretary - 537-6060

#### ROCHESTER OFFICE

**FAX: 280-2875**  
40 - 16th Street, SE, Suite A  
Rochester, MN 55904

Dave Peterson, Board Cons. - 280-2874  
Mary Kells, Board Conservationist - 280-2873  
Jolaine Bowman, Secretary - 285-7458

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**Appendix N - WATERSHED DISTRICTS  
CHAPTER 103D**

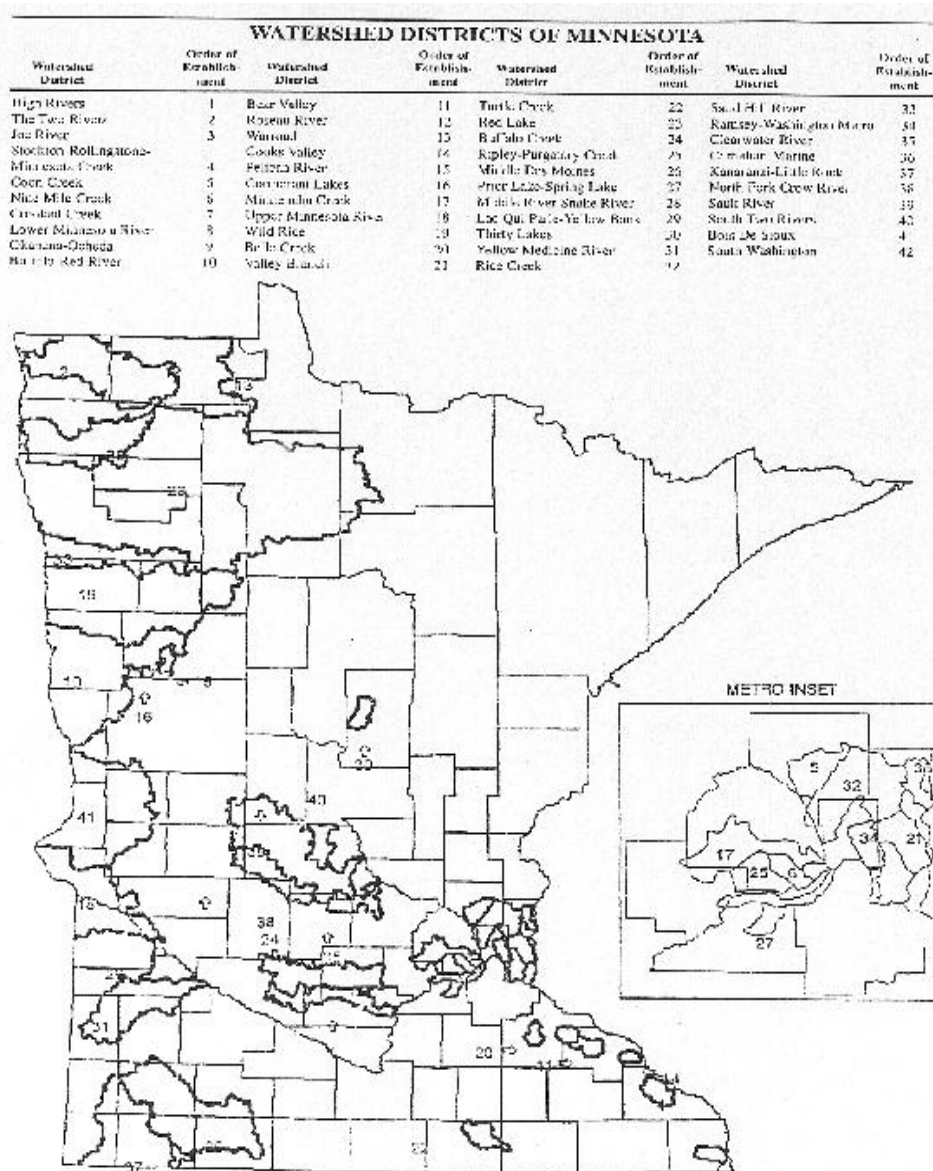
Watershed districts are local units of government that work to solve and prevent water-related problems. The boundaries of the districts follow those of a natural watershed, and the districts are usually named after that watershed.

Because water does not follow political boundaries, it makes sense to manage natural resources on a watershed basis. This type of management allows for an overall, holistic approach to resource conservation.

Minnesota's 42 watershed districts are each governed by a board of managers appointed by the boards of commissioners of the counties that have land in the district. Chapter 103D of Minnesota Statutes is the enabling statute for watershed districts.

To form a watershed district, local residents, cities, or county boards may petition the Board of Water and Soil Resources (BWSR). Watershed districts are formed for reasons ranging from flood control to water quality protection.

For more information, contact the Board of Water and Soil Resources (BWSR), One West Water Street, Suite 200, St. Paul, MN 55107, (612) 296-3767.



## **Appendix O - STATE OF MINNESOTA LAKE IMPROVEMENT DISTRICTS**

### **AUTHORIZATION/FORMATION**

Minnesota Statutes, Chapter 378, provides a set of procedures whereby a lake improvement district (LID) may be established by petition to or resolution of the county board. A LID is a local unit of government which provides the opportunity for greater landowner involvement in lake management activities.

### **SIZE LIMITATION**

Proposed LID boundaries should include a sufficient area of the lake's watershed in order for the LID to develop and implement solutions to identified problems. Minnesota Statutes, Section 378.43 states that district boundaries shall be encouraged to be as consistent as practical with natural hydrologic boundaries.

### **LID AUTHORITY**

Under Minnesota Statutes, Section 378.51, a county board may grant powers to a LID to, among other things:

- Acquire, construct, and operate a dam or other water level control structure;
- Undertake research projects;
- Conduct projects of water improvement and conservation;
- Construct and maintain water and sewer systems;
- Serve as local sponsors for state and federal projects or grants;
- Provide and finance governmental services; and
- Regulate water surface use as provided in Section 378.32.

Projects and activities undertaken by a LID must comply with all local, state, and federal regulations. Additionally, a LID may not undertake improvement projects on any body of water unless public access is available to that lake.

### **FINANCING**

Financing LID projects, services, and general administration requires the county board to provide funds through any combination of the following (378.52):

- Assess costs to benefited properties;
- Impose service charges;
- Issue general obligation bonds;
- Levy an ad valorem tax on property within the district; or
- Any combination of the above.

### **INITIATION OF PROPOSED LID BY PETITION**

A lake improvement district may be initiated by a petition to the county board. The petition must be signed by at least 26 percent of the proposed district property owners and must include the following (378.43):

- Name of the proposed district;
- The necessity of the proposed district to promote public health or public welfare;
- The benefits to property from the establishment of the LID;
- A map of the proposed district;
- A description of the boundaries of the proposed district;
- The number (5-9) of directors proposed for the district; they must be district property owners, and the majority must be district residents; and
- A request for establishing the district as proposed.

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The petition must be filed with the county auditor and addressed to the county board requesting the board to establish the district to develop and provide a program of water and related land resources management.

The county board shall, at least 30 days before it acts on a petition, send the town board of a town wholly or partially within the boundaries of a proposed district a copy of the petition submitted and encourage the town board to respond to the proposed creation of the district. The county board shall also send a copy of the completed petition to the DNR and PCA for review and comment at least 21 days, but preferably, 30 days prior to the public hearing.

### **PROPOSED LID PUBLIC HEARING**

After receiving the petition, the county auditor must verify the signatures and notify the county board. Within 30 days after being notified of the petition, the county board must hold a public hearing on whether the requested LID should be established. Landowners and various other units of government, corporations, utilities, etc., shall be notified of and prior to the public hearing.

### **ESTABLISHMENT OF PROPOSED LID**

Within 30 days after holding the public hearing, the county board shall, by order, establish or deny the establishment of the petitioned LID. An order establishing a district must conform to Section 378.455 and may modify the petition relating to the district's boundaries, functions, financing, or organization.



## NOTE

This synopsis is not to be used in lieu of Minnesota Statutes, Chapter 378, and Minnesota Department of Natural Resources Agency Rules 6115.0900 through 6115.0980. Please be sure to follow all requirements of Chapter 378 and DNR agency rules when considering the formation of a LID.

Specific questions pertaining to lake improvement districts can be directed to the regional office or to:

LID Coordinator  
Department of Natural Resources  
Division of Waters  
500 Lafayette Road  
St. Paul, MN 55155-4032  
Phone: 612-296-4800

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## Appendix P - BUSINESS NAME FILING INFORMATION

### **SPECIFICALLY, WHO HAS TO FILE?**

Anyone operating a commercial business in the state of Minnesota under a name other than their own true name or legal corporate name. Example: John Smith s Realty would not have to file, Smith s Realty would. Dayton Hudson Corporation is doing business under several other business names (e.g., Target, Daytonics, Dayton s Travel Service); they would have to file for each business name.

### **WHAT IS THE REASON FOR FILING?**

For the consumer to have access to the name(s) of the person(s) conducting or transacting a business under a name other than their own true name or other than their legal corporate name.

### **IS MY NAME PROTECTED?**

The law does not provide for protection against someone else filing the same business name. The first person filing any given name will be informed if someone else files the same or similar name. It is up to the individual to take whatever legal action they wish. The common law factor could possibly prevail.

### **HOW DO I FILE?**

After obtaining a Certificate of Assumed Name, it must be filled out and notarized. Your certificate and any amendments must be published in a qualified newspaper in the county in which the principal place of business is located for two successive issues. The newspaper will take the information off of the Certification of Assumed Name and publish it; they will then give you proof of the publication and an affidavit of publication, which is needed for filing. Then send the Secretary of State s office the Certificate of Assumed Name, the affidavit of publication (with proof of publication attached), and a fee of \$15.

### **WHERE CAN I OBTAIN COPIES OF THE CERTIFICATE?**

Certificates are available in the Secretary of State s office, Room 180, State Office Building, St. Paul 55155. Additional copies are available at any printing company.

### **HOW LONG IS MY FILING GOOD FOR?**

Ten years from the date of filing. You will be notified by the Secretary of State s office 6 months prior to the expiration date of your certificate.

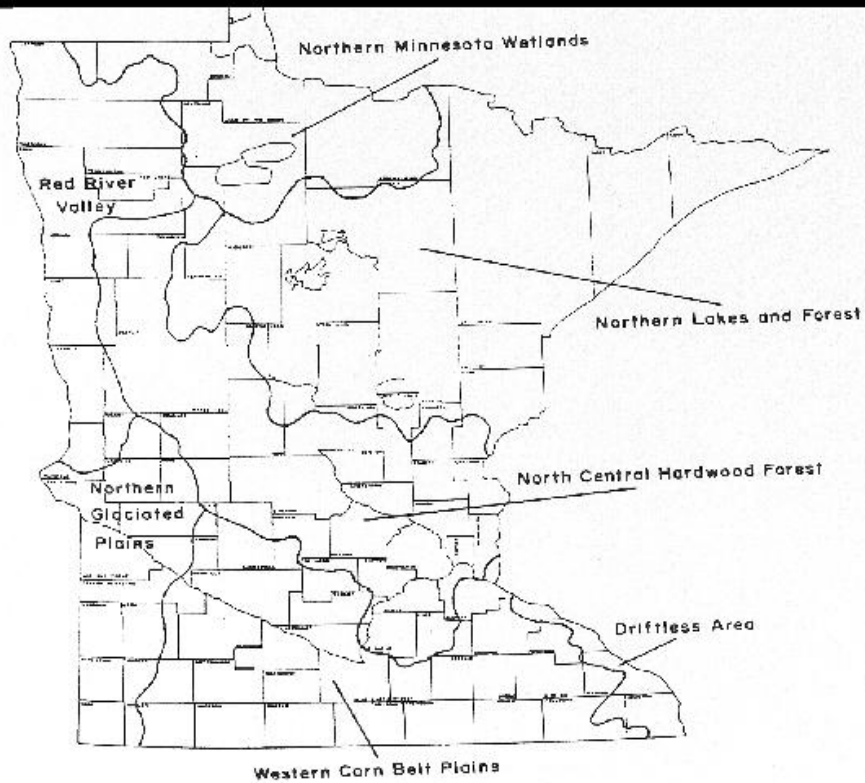
### **WHAT IF I HAVE BEEN IN BUSINESS FOR MANY YEARS AND NEVER KNEW ABOUT FILING MY BUSINESS NAME?**

You should still file your business name as soon as possible to stay within the requirements of the law.

### **WHAT IF I PREVIOUSLY FILED WITH THE COUNTY?**

The law provided for a six-month grace period to renew your county filing, which expired July 31, 1979; therefore, you must file an original certificate with the Secretary of State s office.

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**BOUNDARIES OF THE SEVEN  
ECOREGIONS IN MINNESOTA**

**Appendix R - BIBLIOGRAPHICAL SOURCES OF FIGURES**

A Citizen's Guide to Lake Protection. 1985. The Freshwater Foundation, Navarre, MN. Figure 2: p. 14.

Eddy, Samuel and James C. Underhill. How to Know the Freshwater Fishes, 3rd Ed. Pictured Key Nature Series. Copyright (c) 1978. Wm. C. Brown Publishers, Dubuque, IA. All rights reserved. Reprinted by special permission. Figure 13: p. 76, 82, 109.

Lagler, Karl F. 1952. Freshwater Fishery Biology, 2nd Ed., W. C. Brown Publishers, Dubuque, IA. Figure 14: p. 52, 55, 58.

Moore, M. Lynn for North American Lake Management Society. 1987. NALMS Management Guide for Lakes and Reservoirs. 1989 (Reprint). North American Lake Management Society, Washington, D.C. Figure 1: p. 11, Figure 12: p. 19, 20, 21, Figure 19: p. 37.

Pennak, Robert W. 1978. Freshwater Invertebrates of the United States, 2nd Ed. John Wiley & Sons, New York. Figure 11: p. 369, 389.

Prescott, G.W. 1975. Algae of the Western Great Lakes Area. Wm. C. Brown Publishers, Dubuque, IA. Figure 10: p. 665, 757, 861, 845, 893, 805, 795.

The Lake & Reservoir Restoration Guidance Manual. 1988. EPA-440/5-88-002. Corvallis Environ. Res. Lab. U.S. Environ. Prot. Agency, Washington, D.C. Figure 3: p. 2-20, Figure 4: p. 2-21, Figure 6: p. 2-2, Figure 7: p. 2-9, Figure 8: p. 2-5, Figure 15: p. 2-19, Figure 16: p. 5-14, Figure 18: p. 3-17.

Tietjen, Elaine. Avoiding the China Lake Syndrome. Maine Audubon Society. Figure 17: p. 4.

### Supplement 1 - The Public Management Team for Your County

Natural resource management is divided among state agencies and local governments. To enable your association to better access the proper public servant when information and assistance is needed, you should develop the following information for your county.

<b>Example, Using Pine County 1997 Information</b>					
	<b>Agency/LGU</b>	<b>Individual</b>	<b>Location</b>	<b>Phone</b>	
DNR	Enforcement	Pete Jensen	Hinckley	612/384-7581	
		Vacant	Pine City (Pete Jensen will cover) Willow River		
			Curt Rossow		218/372-3694
		Fisheries	Roger Hugill	Hinckley	612/384-7721
		Forestry	Brian Garvey	Moose Lake	218/485-5400
			Jerry Langworthy	Hinckley	612/384-6146
		State Parks	Randy Gordon	Banning St. Park	612/245-2668
			Jack Nelson	St. Croix St. Park	612/384-6951
		Trails & Waterways	Kevin Arends	Moose Lake	218/485-5410
		Waters	Mike Mueller	Cambridge	612/689-7100
	Wildlife	Lee Hemness	Hinckley	612/384-6148	

MPCA: Currently covered by Brainerd (North Central Region), Linda Ulland, Regional Manager, 218/828-2492.

BWSR: Board Conservationist, Mark Nelson, Duluth, 218/723-4923

SWCD: Manager, Mary Ann Mills, Hinckley, 320/384-7431

Local Water Plan Coordinator: Dick Noyes, Hinkley, 320/384-7431

County Zoning: Shirley Basta, Pine City, 320/629-6781

Snake River Watershed/Joint Powers Board: Wes Cashman, Mora, 320-679-2921

For assistance in completing any of the above information for your county, consult the following MLA liaison officers:

DNR: Bill Becker, Office of Planning, Box 10, Minnesota Department of Natural Resources, 500 Lafayette Road, St. Paul, MN 55155 (612/296-3093).

MPCA: Linda Ulland, Minnesota Pollution Control Agency, 1601 Minnesota Drive, Brainerd, MN 56401 (218/828-2492).

BWSR/SWCD: Doug Thomas, Minnesota Board of Water & Soil Resources, One West Water Street, Suite 200, St. Paul, MN 55107 (612/297-5617).

Dan Steward, Minnesota Board of Water & Soil Resources, 217 South 7th Street, Suite 202, Brainerd, MN 56401 (218/828-2598).

November, 1997

## Supplement 2-DEVELOPMENT OF A LONG-RANGE LAKE DEVELOPMENT PLAN

### THE NEED/DEVELOPMENT TRENDS

Chances are the development around your lake has changed much in the past 20 years. Lakeshore development statewide has more than doubled since 1970 when the shoreland zoning program was started.

Between 1980 and 1990, Minnesota's lake regions all were centers of permanent population growth. In fact, they were the only rural areas of Minnesota outside the commuter zone of the twin cities to add population. They have joined the larger urban centers of the state (Twin Cities, St. Cloud, Rochester, and Fargo/Moorhead) as the primary growth areas of Minnesota.

This growth is built around the natural resources base of the lake regions and increasingly by the level and quality of the private and public services provided to serve the seasonal and permanent populations of these areas.

The lake regions are fast becoming a new form of urban area. The settlements are concentrating on the lakeshores, and services are concentrating in the existing trade centers or at intersections in the highway systems.

As a result you need to ask the question ***“What do you want your lake and shoreline to look like in 20 years?”***

To help you begin to answer this question, we have projected ahead present trends so you can compare them to what is happening on your lake. It is possible to do many jobs from remote locations. The lake regions are likely to be impacted by this trend because many people would live there if they were able to find employment.

### PROJECTIONS:

#### MOST OF THE UNDEVELOPED LAKESHORE WILL BE DEVELOPED

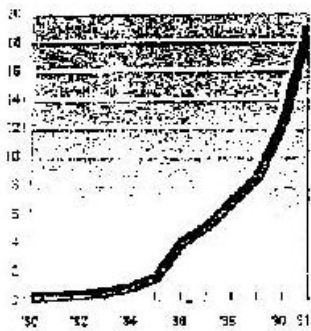
There are more people to buy lakeshore.

Indications are strong that growth in the lake regions will continue, and may even accelerate, as the baby boom generation reaches their forties, the age at which the past two generations have acquired lake property in the greatest numbers.

#### ***Change in employment location.***

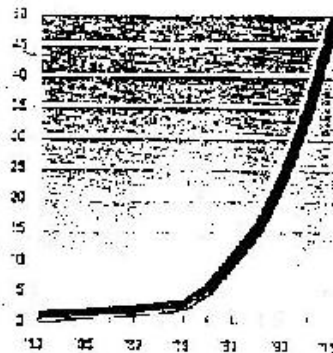
The development of the personal computer, fax machines, e-mail, and fiber optics has made it possible to do many jobs from remote locations. The lake regions are likely to be impacted by this trend because many people would live there if they were able to find employment.

Page S(2)-1



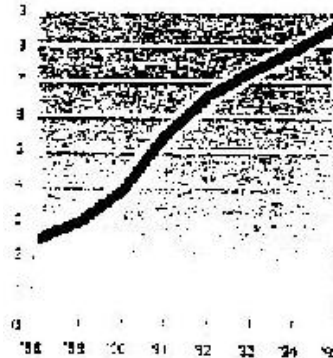
**E-Mailing**

Millions of electronic mail users



**Faxing**

Millions of fax machines



**Telecommunicating**

Millions of telecommuters

Projections from Forbes November 23, 1992.

## RESORT SITE CHANGES:

The best sites on most lakes are occupied by resorts, because they preceded other lakeshore development. Because of their value, these sites will be in high demand. This demand is likely to take three approaches.

1. Expansion of the current resorts into large, more capital-intensive facilities offering varied types of recreation opportunities and convention facilities.
2. Expansion and partial or full conversion to recreational vehicle (RV) parks to accommodate the increasing number of RVs owned by able-bodied retirees.
3. Conversion of resort sites to townhouse and condominium developments.

### **Demolition or Conversion and Expansion of Older Second Homes into Higher Value Year-Round or Second Homes.**

Many of the older cabins occupy high quality lakeshore and will become prime candidates for redevelopment and upgrading. One of the major responsibilities of local zoning authorities may be to organize and regulate this redevelopment effort so it doesn't leave pockets of old and blighted lakeshore development on lots too small to redevelop.

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## MORE INTENSIVELY USED PUBLIC LAKESHORE

As populations in the lake regions rise, the use of the publicly-owned lakeshore will intensify. This use will fall increasingly on lakeshore parks and public accesses on the major lakes. The majority of the users will come from residents living in the local area in two types of locations:

1. From off-lake seasonal and permanent home development oriented to the public road system near the lakes.
2. On sites near the lakes with lake views.

These patterns are now occurring in the most developed lake regions of Minnesota and have occurred in other states. One by-product of this development pattern is that the landscape visible from the lakeshore and water becomes very urban and the road systems near the lakes become urban streets.

## INCREASE IN WATER SURFACE USE

Our lake resource will be much more intensively used. More people with access to existing and new forms of water surface craft will compete for use of the existing resource. Per acre pressure from fishing, boating, personal watercraft, and sailing are projected to continue increasing. There will be an increasing need to ration and more intensively manage water surface use.

### *The Need to Build Management Plans to Control and Manage Future Development and Use Increases*

The increasing development and use pressures described, combined with the potential pollution threats, are challenging problems. An effective long range lake development plan needs to address these trends and others better known to each local unit of government and lake association.

The continued growth and development of the lake regions will make necessary higher levels of public and private management to maintain the quality of lake resources. What is needed is more emphasis on total lake management, and the development of strategic plans for lakes and for whole lake regions.

How best can we preserve some wild lakeshore and spawning areas? Is it through the acquisition of development right easements? Can we regulate off lake development through better management of driveway access to high speed local roads. Can we promote cluster development to protect scenic vistas and provide alternate non-water recreation opportunities for the future residents of our lake areas? How do we manage our water surface before it becomes a crisis?

There are many alternatives available to develop lake management plans. For example local comprehensive plans and county water plans are useful. Watershed districts and lake associations are also useful organizations. In reality all of these tools working together in various circumstances will be needed. Strong support from the state is also important. George W. Orning 6/93

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## Supplement 3 -The Need to Plan for Lake Level Fluctuation

Fluctuation in lake levels is a natural process. The water levels of Minnesota lakes rise and fall constantly in response to annual fluctuation in rainfall. In the 1930s, during a series of years with below average rainfall, most lake levels dropped. Conversely, above average rainfall during the 1960s filled

lake basins, some for the first time since the 1930s. These levels have been maintained through the 1970s and 1980s.

Because drought is a natural part of our climate, we need to plan our lake management to include periods of below average rainfall as part of each long term lake management plan.

Lake level variation is greatest in western and southern Minnesota which includes the Red River Basin where average annual runoff totals less than 4 inches (Figure one). This difference is progressively less to the north and east where average runoff is greater then 8 inches per year a much larger water surplus to compensate for fluctuations in rainfall.

The variation in lake levels also reflects the fact that during major droughts, rainfall is nearer normal in the northeast (over 90 percent of normal amount) than in the south and west (less than 70 percent).

These variations in runoff and rainfall patterns show that in western and southern Minnesota many lakes, especially those with small watersheds, operate on delicately balanced water budgets. Dams would not help maintain levels in these lakes except during periods of above average rainfall. This is because after a few years of below average rainfall the lakes are low and their outlets dry.

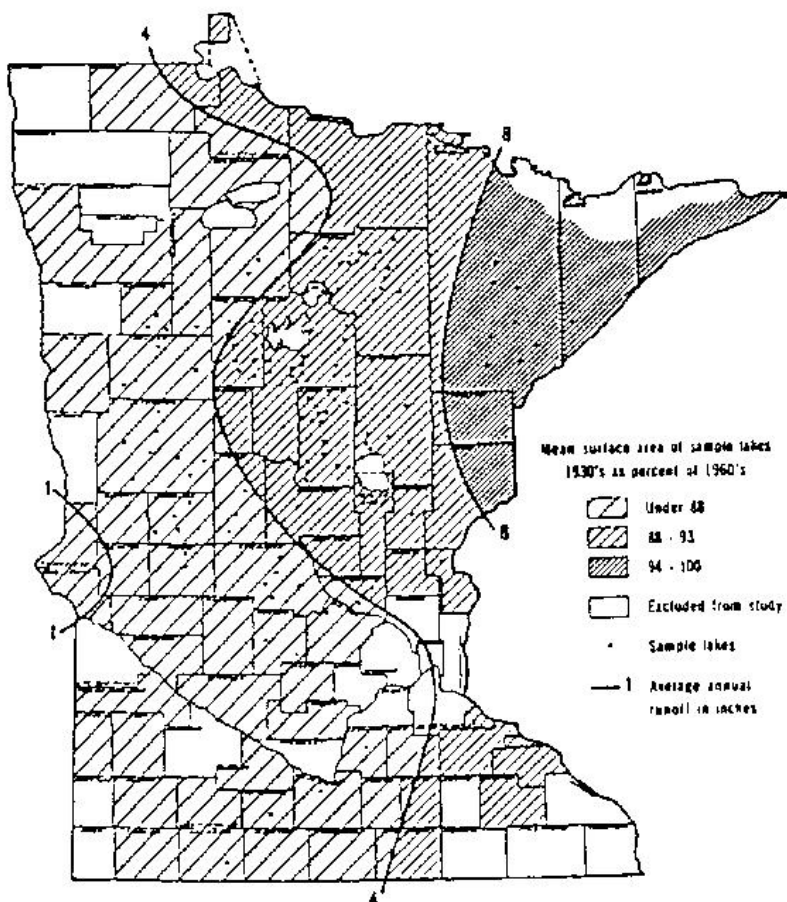
### MANAGEMENT

Management problems result from obvious differences in water area and shoreline characteristics of lakes between high and low water levels. Cormorant Lake in Becker County illustrates many of these problems (Figure two).

1. Desirable shoreline at current high-water levels often ceases to be shoreline or changes from sand beach to swampy beach when water levels are low.
2. Decreased surface area when lake levels are low leaves less lake area for the same number of users hence more potential crowding for water users.
3. Values of developed shoreline property can change with changes in water level. Prime weedless sand beach shoreline can become marsh.

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FIGURE ONE

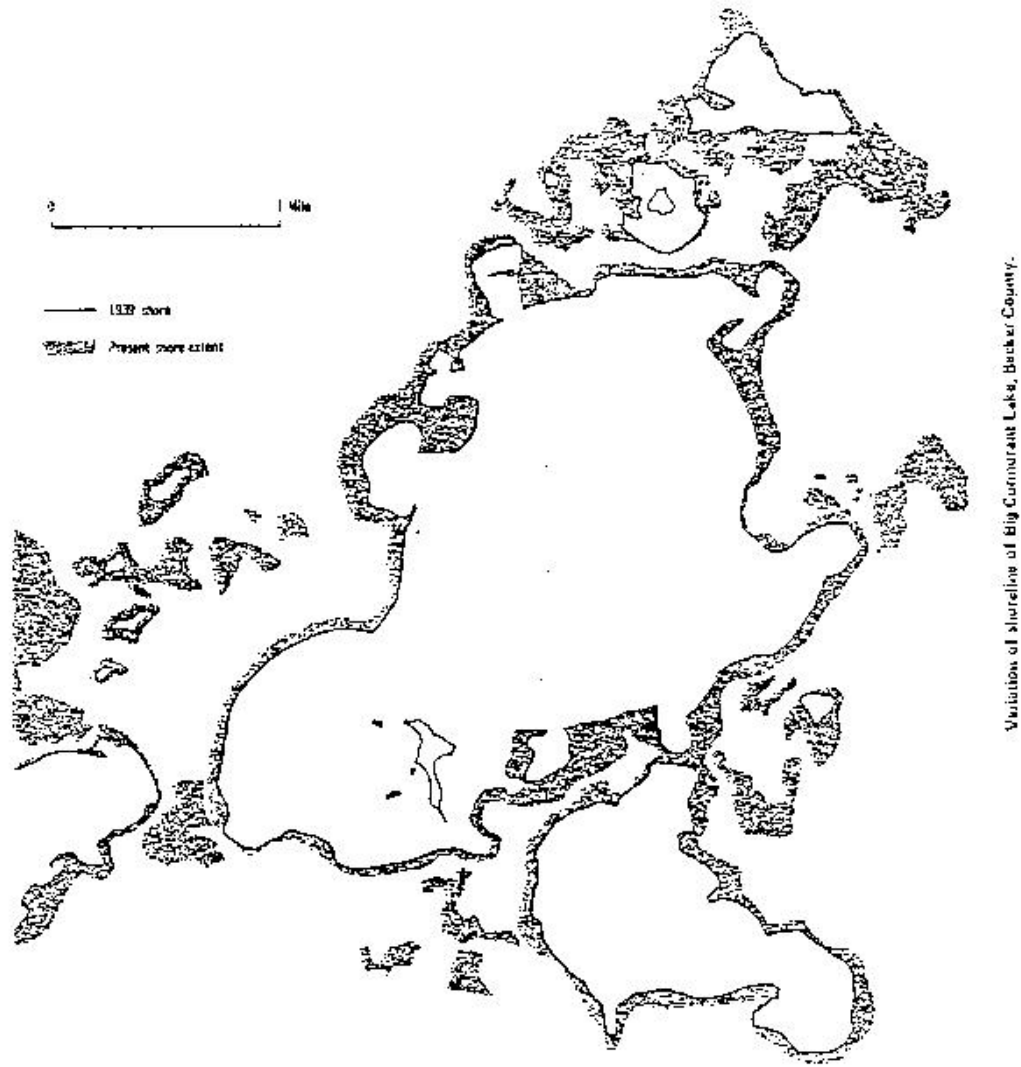


Lake shrinkage in dry years.

Source: *Minnesota's Lakeshore: Resources, Development, Policy Needs, Part I*, John Borchert, George W. Orning, University of Minnesota, 1970, pp.7

Page S(3)-2

FIGURE TWO



Source: *Minnesota's Lakeshore: Resources, Development, Policy Needs, Part I*, John Borchert, George W. Orning, University of Minnesota, 1970, pp. 9.

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**HOW TO DETERMINE WHAT YOUR LAKE LOOKS LIKE IN PERIODS OF LOW WATER LEVELS.**

The first air photo coverage of Minnesota was flown in the late 1930s when lake levels were at historic lows. This photography is available at the John R. Borchert Map Library at the University of Minnesota, West Bank Campus in Minneapolis. Individuals can trace the shoreline of an individual lake off these photos and compare them to present higher water levels maps and photographs.

This information can be valuable in many ways. Each lake parcel can be evaluated for high and low water physical characteristics, and areas of large change can be identified. Another possible use of this information is to pin-point lake shore areas where natural shoreline preservation efforts can be targeted.

Much of the background material for this article was taken from: *Minnesota's Lakeshore Resources, Development, Policy Needs, Part I*, John Borchert, George Orning, University of Minnesota 1970.

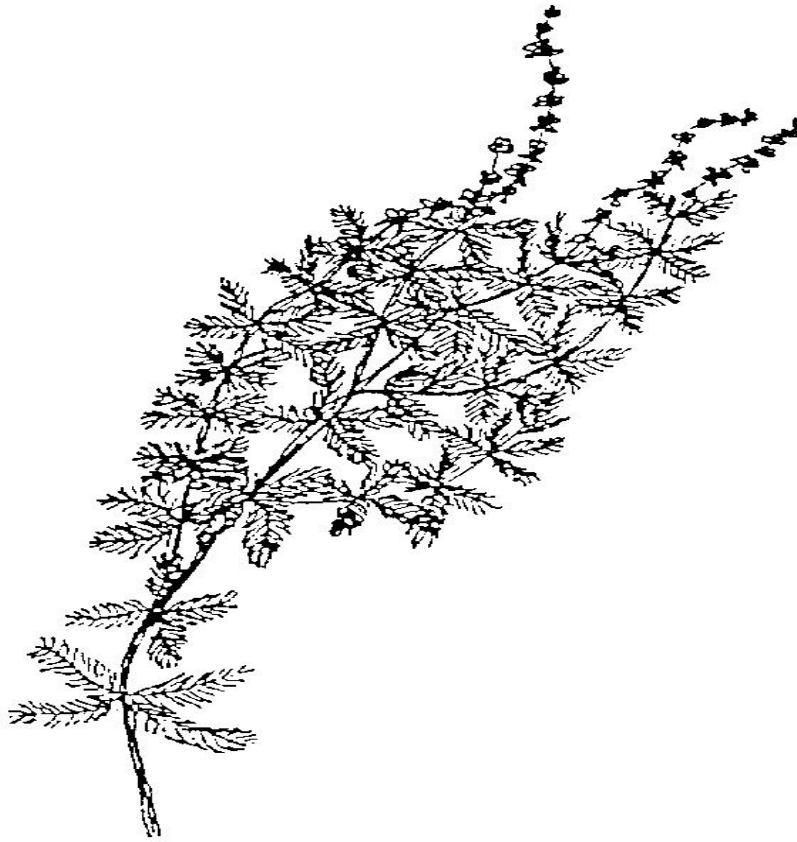
*Climates of Hunger*, Reid A. Bryson, Thomas J Murray, University of Wisconsin Press.

*Atlas of Minnesota Resources and Settlement*. John R. Borchert, Donald P. Yaeger, Minnesota State Planning Agency, 1968, pp. 19.

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## Supplement 4 -Results of Management Workshop

"Eurasian Watermilfoil in Northern Latitudes"



### SPONSORS

The Freshwater Foundation Institute for Lake and Wetland Management  
Minnesota Department of Natural Resources

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## THE EURASIAN WATERMILFOIL WORKSHOP REPORT

### OVERVIEW OF THE WORKSHOP

Eurasian watermilfoil is a recent unwelcome visitor to Minnesota which has quickly become one of the major problems affecting the lakes and other water bodies in the state. Eurasian watermilfoil grows at an extremely fast pace and can create dramatic changes in water bodies where conditions are right for its spread. While this prolific exotic plant is new to Minnesota, it is no stranger to many parts of the United States and Canada, or to the people who work to control it in those places where it has become established.

The mounting concern about this problem in Minnesota led the Freshwater Foundation to convene a conference to look for present and future solutions. The workshop was set on the shores of Lake Minnetonka, the largest lake in the Minneapolis-St. Paul metropolitan area and one of the state's most important recreational resources. Eurasian watermilfoil (EWM) was found there in 1987 and has spread to encompass large areas of the lake in just three years. More than two dozen other lakes in or near the Twin Cities have EWM infestations and many people are concerned this problem could become widespread in this Land of 10,000 Lakes.

Experts from around North America came together with Minnesotans involved in various aspects of lake and river management to devise strategies for meeting this challenge. The broad cross-section of professionals included the chiefs of aquatic weed control programs; academic and research experts; federal, state, provincial and local water resources managers; and experts in biological, chemical and mechanical control technologies. Minnesotans participating in the workshop included state and local water resource managers, fisheries managers, researchers, aquatic plant management experts, business people, lake association representatives, and concerned citizens.



The workshop began with a sharing session. Experts from Oklahoma, Washington, Massachusetts, Mississippi, and Florida discussed the situation across the North American continent and reviewed contemporary management strategies. In turn, Minnesota experts discussed the state's water resources and their experience with EWM. Armed with those overviews, the participants went to work in small groups to design model strategies for:

- 1) prevention of the spread of EWM;
- 2) monitoring and assessment of EWM infestations; and
- 3) control of EWM infestations.

The result of their work fills the remainder of this report.

### **Workshop Resolution**

The Workshop Adopted the following resolution on March 1, 1990

**Whereas**, Eurasian watermilfoil (*Myrio-phylum spicatum*) has become a major noxious aquatic weed in northern temperate latitudes, and;

**Whereas**, Eurasian watermilfoil has out-competed most native flora when introduced into a waterbody, and;

**Whereas**, Eurasian watermilfoil has aggressively spread throughout waterbodies after introduction, and;

**Whereas**, Eurasian watermilfoil has become established at nuisance densities in waterbodies covering a range of trophic conditions, and;

**Whereas**, Eurasian watermilfoil in high densities has adverse economic impacts through its interference with recreation, flood control, water supply and delivery, navigations, fisheries and wildlife habitat, and;

**Whereas**, established populations of Eurasian watermilfoil will not necessarily decline in response to reduction of nutrient inputs, and;

**Whereas**, existing and excessive populations of Eurasian watermilfoil accelerate material deposition, and;

**Whereas**, existing populations of Eurasian watermilfoil also pose a threat to uninfested waters ...

**Therefore**, the Eurasian watermilfoil workshop strongly recommends eradication and control through well-coordinated programs conducted by appropriate governmental agencies which utilize the approaches and methodologies recommended by this workshop.

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### **A Perspective on Eurasian Watermilfoil**

M.G. Halverson and R.J. Walsh  
MN DNR Fisheries - Metro Region

abstract

To date, public and professional perceptions of Eurasian watermilfoil (*Myriophyllum spicatum*) (EWM) have been based largely on worst case scenario information. Natural resource professionals need to view the presence of EWM objectively in order to plan appropriate lake management. Exotic species generally run a course of expansion and subsequent decline. However, repeated habitat disturbance will tend to perpetuate the expansion phase. The degree of EWM infestation (i.e. nuisance potential) is also dependent on the physical and chemical characteristics of a waterbody. Thus, impacts on recreation, aesthetics, and property values will be variable. The relationship between fish and EWM needs further investigation. It is known however, that vegetation biomass and density influence fish populations by altering prey availability and foraging success. Significant changes in vegetation could also influence the harvest vulnerability of fish. Prevention is the best control method for EWM. Once it has invaded a waterbody, maintenance control (chemical and/or mechanical) is widely accepted.

Biological control organisms are being researched and show promise in providing control without causing negative impacts to the ecosystem. Achieving long-term eradication is improbable. Eradication attempts are expensive, ecological impacts are unpredictable and probability of reinfestation may be high. Advantages, disadvantages, and experiences with some control methods will be highlighted.

Aquatic plant management specialists are constantly dealing with people's perceptions. Plants that one riparian owner perceives as undesirable are often appealing to his or her neighbor. Many people's perception of an ideal lake is one that has a weed free lake-front, white sand beaches and crystal clear water. On the other hand, fishermen rely on weed lines as attractors for gamefish and ecologically minded people recognize that plant diversity is the basis for a healthy ecosystem. Enter Eurasian watermilfoil! The dream of having a weed free lakefront with that white sand beach is gone forever, fishermen can't fish because of a solid weed mat, and plant diversity is lost forever.

At least this is what we have been led to believe will happen. Much of the information that causes anxiety about Eurasian watermilfoil (EWM) comes from aquatic herbicide manufacturers or has been influenced by them. Consequently we have all been exposed to the worst case scenario and many of our expectations reflect this. As a result, there are user groups that want to close access on all lakes that have EWM, and some that want to risk killing the entire submerged macrophyte community in lakes having EWM in an attempt to save the rest of the state's lakes from dying. EWM does not kill lakes, but people are scared to death that it might.

What are some of the impacts EWM is causing in Minnesota?

1. It definitely has caused a great deal of anxiety among riparian owners and user groups.
2. Under ideal growing conditions it can affect recreational boating.
3. Under ideal growing conditions it can displace native plant species and reduce diversity within the aquatic plant community. However, even in areas of matted EWM, considerable diversity was found on Lake Minnetonka, Hennepin County (W. Crowell, personal communication) and on Zumbra Lake, Carver County (J. Barten, personal communication), and EWM has been found to invade previously unvegetated or denuded areas rather than areas supporting native submerged plants (Lillie 1990; Keast 1984).
4. Changes in the aquatic plant community can be expected to affect invertebrate populations. Interestingly, milfoil showed a positive relationship between plant biomass and invertebrate abundance for more invertebrate taxa than any other plant examined by Cyr and Downing (1988). Studies have also shown that, in general, the greater the leaf dissection of a submerged aquatic plant, the larger and more varied the animal population associated with it (Rosine 1955); EWM leaves, of course, are highly dissected.
5. It has been hypothesized that in dense vegetation, predator fish cannot feed efficiently (Crowder and Cooper 1979). Figure 1 illustrates that predator fish production responds positively to increased plant biomass up to a point. After that it declines despite continued increase in forage fish and invertebrate production, presumably because the vegetation becomes too thick for predators to efficiently capture prey. Viewed in this context, the effect of EWM on fish production will depend on the biomass it attains. Grace and Wetzel (1978) found that compared to other submerged plants, EWM does not attain unusually high levels of biomass. Another theory is that predator fish may be more vulnerable to fishing in lakes infested with EWM due to their numbers being concentrated along the mat edges. This could likely happen in the worst case scenario situation, but it is our experience that more often milfoil provides highly variable vegetation densities and associated edge/pocket effects that would prevent this. Preliminary indications from a 1992 MN

DNR population assessment on Lake Minnetonka are that panfish and gamefish populations are improved, both in quality and quantity (R. Ramsell, personal communication).

What is the status of EWM to date in Minnesota? EWM has been discovered in 64 lakes, streams, and Mississippi River pools. Figure 2 shows the number of new infestations detected each year since the first one in 1987.

The number of new discoveries has been relatively stable during the last four years. However, EWM is usually not detected until after it has been in a lake 3-4 years or longer. Usually there is an area of well established EWM, often near an access where fragmentation has been occurring due to boating and autofragmentation, allowing EWM to get a foothold throughout the basin. In some lakes EWM does not cause a noticeable change in the macrophyte community and therefore is not detected unless an EWM search is conducted. Through education efforts, people are more aware of the plant and are on the lookout for it. A possible explanation for the lack of an increase in the number of lakes discovered with EWM is that lakes with EWM are being located sooner, and the stockpile of lakes with undetected populations has been reduced.

A couple of questions that seem to be on a lot of people's minds are In what types of lakes is EWM most likely to get introduced? and What types of lakes are likely to experience the worst problems with EWM?

Figure 3 separates known EWM lakes by lake class, following the classification scheme developed by Dennis Schupp (1992). Not all known EWM lakes are represented here because some lakes and streams containing EWM have not been assigned a Schupp classification. It appears that there is something about class 24 lakes that make them particularly vulnerable to EWM infestation. Two possible explanations for this are that: 1) lakes of this class have some characteristic(s) that lead to a higher likelihood of EWM introduction than lakes of other classes, or 2) there are simply more class 24 lakes than lakes of other classes where EWM is prevalent (i.e. the metro region) and it has therefore invaded more lakes of this class due to random incidence.

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Figure 4 sheds some light on this by separating all lakes in the metro region, and all EWM lakes in the metro region, by lake class. Notice that there are nearly as many or more lakes of classes 30, 34, and 36 as there are of class 24 lakes in the metro region, but there is a far higher incidence of EWM among class 24 lakes. It appears that class 24 lakes possess some characteristic which makes them more susceptible to EWM than other lakes. The question is What is it about this type of lake that leads to such a high incidence of EWM infestation?

Figure 5 may help answer that question. The highlighted information is for lake classes 24, 30, 34, and 36. Contrast the class 24 information with the class 30 information. Eighteen out of the 27 class 24 lakes in the metro region (67 percent) have EWM. Whereas, only 3 out of 45 (7 percent) of class 30 lakes in the metro region have EWM. The most conspicuous difference between class 24 and class 30 parameters is mean lake area, and to a lesser extent, maximum depth and littoral percentage. Notice that class 34 (23 percent EWM infestation) and class 36 lakes (4 percent EWM infestation) show similar contrast. These two classes also differ mainly in lake area. This seems to suggest that relatively large, deep lakes have the highest incidence of EWM infestation. Intuitively this makes sense because large, deep lakes are likely to receive a greater amount of recreational use and therefore have a higher risk of EWM introduction via interlake boat movement than small or shallow lakes. In addition, notice that all five lakes of classes 22, 25, and 27 have EWM and that these are all relatively large, deep lakes.

It should be noted though, that large, relatively deep lakes do not necessarily provide the best growing conditions of EWM. As seen in Figure 6, it is the shallow, moderately turbid bodies of water with widespread areas of nutrient-rich sediments that are best suited for EWM growth (Smith and Barko 1990). The lake classes appearing at the bottom of Figure 5 might fall into this category. It is somewhat encouraging that the types of lakes

most heavily used for recreation may not support nuisance populations of EWM.

Public awareness and education have likely helped reduce the rate at which EWM is introduced via boat movement. In addition, strict monitoring of aquatic vegetation harvester movements has reduced the likelihood that they will transport fragments between lakes.

Control efforts for EWM have been extensive. During 1992, the MN DNR Eurasian Watermilfoil program participated in the treatment of 736 acres using approximately 92,000 pounds of 2,4-D. Much of the expense was cost shared, with the DNR paying just over half of the \$125,000 bill. Three lake basins (totalling 362 acres) were treated with a fluridone product (tradename SONAR) in an experimental attempt to eradicate EWM from the entire basin. First year results indicate that fluridone was not selective for EWM at the trial application rates and that most of the submerged macrophyte community had been impacted. As a result, DNR Ecological Services and DNR Fisheries have developed an Experimental Design to Evaluate Fluridone for Whole Lake Control of Eurasian watermilfoil. It will be initiated in 1993 with hopes of finding specific concentrations that will be selective for EWM.

Ultimately, where are control efforts going to lead us? In all likelihood, EWM is eventually going to reside in all lakes where it is capable of establishing a foothold. With control efforts it may take longer for this to happen, but at what expense? Since EWM appears to respond positively to disturbance, control techniques may actually promote expansion of plant populations or delay declines in abundance (Smith and Barko 1990; also see Lillie 1990). Furthermore, the effects of chemical treatments are unpredictable because of all the variables influencing concentration and exposure time. For example, some treatment areas show no effects from 2,4-D and others experience control of all rooted submerged macrophytes (J. Barten, personal communication). When control of EWM is obtained, it is usually short-lived and expensive (see Nichols and Shaw 1983; Andrews 1986; Nichols et al. 1988 for discussions of control techniques).

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On the other side of the coin, what happens if we don't attempt to control populations of EWM. Lake users do not want to end up with wall to wall EWM as they have been lead to believe will happen. Presently sociological demand is such that we simply aren't allowed to let EWM run its course, but what if we did?

Typically invasive species run a cycle of introduction, establishment, natural decline and stabilization. The EWM population in Lake Vadnais, Ramsey County, where there have been no macrophyte control efforts, has receded since its peak in 1989 and 1990 to the point that during a 1991 mid-summer survey, a MN DNR fisheries crew was not able to locate any EWM. Later in the year, and during 1992, only sparse EWM was found with little or no surface matting. In Lake Minnetonka we have seen dramatic declines in EWM during the last two years, and now there are only isolated areas where EWM is considered an extreme recreational nuisance and these are primarily shallower areas with a substrate that promotes plant growth. Similar declines have been observed in the Chesapeake Bay area (Bayley et al. 1968); Madison, WI area lakes (Carpenter 1980); southern Ontario lakes (Painter and McCabe 1988); and Okanagan Valley lakes of British Columbia (British Columbia Ministry of Environment 1981).

But, since we are under heavy pressure to do something, what do we do? There are three obvious strategies.

### **Prevention**

The most obvious strategy is prevention. One of the highlights of Minnesota's Exotic Species Program is a public education campaign geared toward preventing spread of exotics. However, prevention can mean a lot of things and only works to a point. After several years of major public education and quarantine programs in British Columbia, boaters continued to transport EWM fragments, and the spread of the plant into previously uncolonized lakes continued unabated (Newroth 1985).

### **Eradication**

Eradication is a strategy on the far end of the spectrum and may be possible on a given lake for a period of time. Sonar provides some hope for eradication, however, other northern states are experiencing a very low success rate and a high degree of ecological disturbance associated with its use (H. Wandell, personal communication; Thurston County, WA Public Works 1992). It is highly unlikely that eradication could be accomplished on a statewide basis, and at this time a successful attempt at eradication would require rapid action, which increases the chance for mistakes and unanticipated impacts.

### **Maintenance**

Maintenance is the current buzzword for vegetation control in an infested waterbody. Strategies include mechanical, chemical and biological methods. There are a number of important considerations before implementing a control program (also see Marsden 1993).

1. What is the cost of the control program and where will the funding come from?
2. What is the duration of the program? Will it have to continue on a repetitive basis, and if so, for how long?
3. What will it have accomplished in the end?
4. What are the expected ecological impacts of the control? Could it do more ecological harm than good? Could it delay a possible stabilization of the EWM population? Could it open up even more areas for establishment due to disturbance?
5. What are the expected environmental impacts? Could the control method result in the deposition of toxin in lake sediments?

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There are a number of methods for providing plant population maintenance.

### **Physical**

Advantages Relatively environmentally safe.

Disadvantages Can be expensive, and requires repeated use.

### **Chemical**

Advantages Can be selective for target species in some situations.

Disadvantages Experience shows that chemicals which are supposed to be selective for EWM are giving highly variable results, ranging from doing nothing at all, to killing the majority of the native submerged macrophyte community during the year of treatment. This also requires repeated use.

### **Biological**

Advantages Utilizes organisms that are known to control the exotic invader in its native habitat, or native or naturalized organisms already present in the environment. Once established, the biocontrol organism could provide continual control of EWM and reduce it to levels that are compatible with native populations. Some biocontrol agents may not require repeated introduction.

Disadvantages If verification of their impacts is not properly researched, there is a risk of introducing an organism that could become another exotic invader with accompanying negative impacts. Research is time consuming and costly.

## **Conclusions**

### **EWM Won't "Kill" Lakes**

Growing conditions are usually less than ideal for EWM to take over a whole lake and it certainly isn't going to snuff out all life in any waterbody. It definitely will change the appearance of some lakes, and it will have some impacts on plant and animal communities, and it is probably going to be in lakes near all of us sooner or later. However, not all of the impacts are going to be bad, and most of them we can live with.

Introduction

Establishment

Natural Decline

Stabilization

There are definite indications that EWM populations in Minnesota lakes might be going through these phases. The Lake Minnetonka population has shown very noticeable declines; Lake Vadnais, which has had no macrophyte control whatsoever, seems to have gone through these phases very quickly; and, for no explainable reason, the EWM population in Lake of the Isles, Hennepin County, crashed completely during 1992. Disturbances resulting from control efforts may increase EWM's competitive edge, delay stabilization, and open areas for further establishment. On the other hand, biocontrol methods may hasten stabilization.

## **Coexistence With EWM**

Once EWM is established in a lake and control efforts are exhausted, we are faced with developing new management goals. Reasonable management goals at this point could be focused on efforts that will produce the greatest benefits, such as keeping beaches free of plant growth, or in the worst case scenario, opening boat lanes from the shore to open water.

It is usually possible to find something good about anything that is widely perceived as bad, and so it is the case with EWM. In some lakes EWM will likely increase plant diversity and add cover to areas where none formerly existed. By doing so, it would provide additional habitat for associated epiphytes and therefore complement the food chain. With additional vegetation biomass tying up nutrients, secchi readings might also improve. The bottom line is that in some lakes EWM might actually improve fish production.

## **Positive Literature**

Lastly, it was not hard to find references in the literature to provide an optimistic outlook on living with EWM, and many of our experiences in the metro region reinforce this. In preparing any talk or paper, you can usually find information to lead the reader or listener in the direction you want, and one thing we can all be sure of, is that the media is going to pick up on MILFOIL KILLS much quicker than THERE IS LIFE AFTER MILFOIL.

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And then for a couple of quotes.

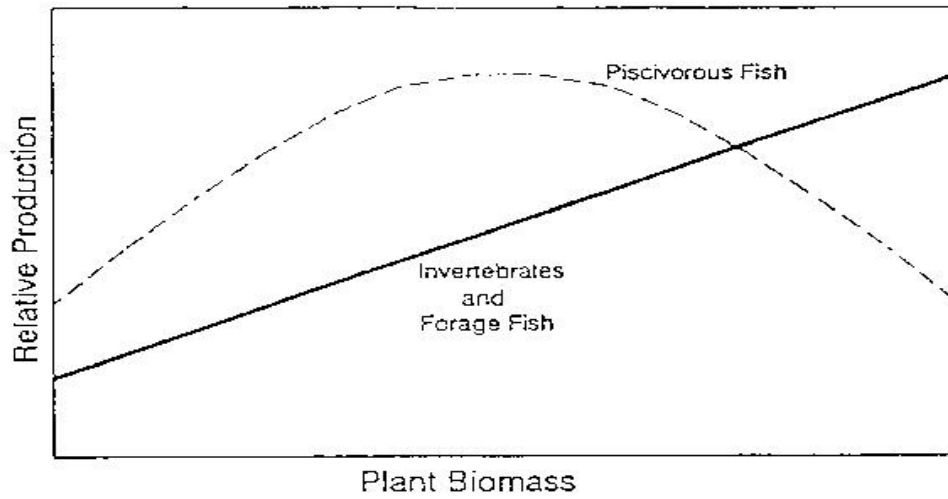
In western states brush eradication has been a goal for 50 years, during which time enough new brush has grown to insure a full century of similar effort. If your goal is to eliminate brush, you will be eradicating brush for the rest of your life. The cost in human and financial resources is staggering and will continue as long as brush eradication is the goal. (page 57f. Savoy. A. *Holistic Management*. Island Press. Washington DC).

Sound pest-management techniques which focus on long-term ecosystem stability in the presence of the new species must be developed. (Marsden 1993).

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Figure 1. Generalized relationship between plant biomass (not Eurasian watermilfoil specifically) and fish and invertebrate production.

Plant Biomass vs. Production



Smith and Barko (1990)

Figure 2. Numbers of confirmed Eurasian watermilfoil discoveries in Minnesota waterbodies by year.

Number of New EWM Discoveries  
(Lakes, Streams, and Miss. River Pools)

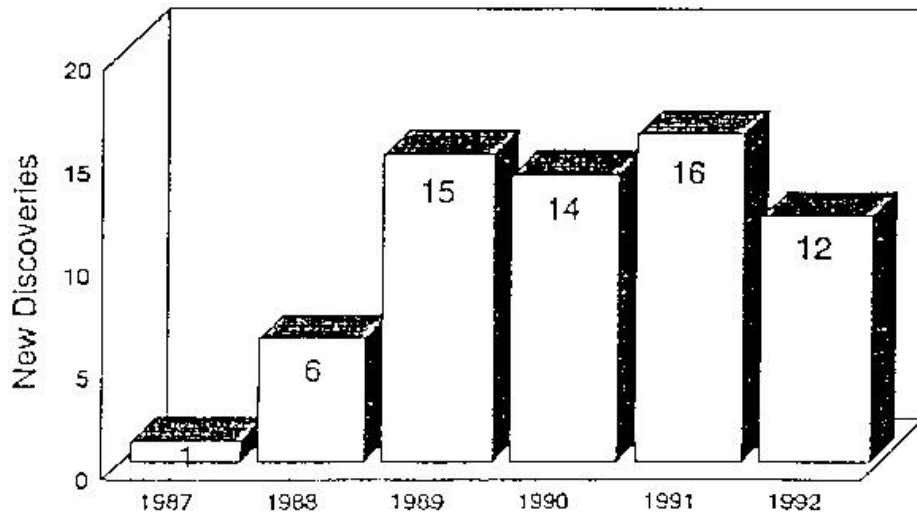


Figure 3. Segregation of Minnesota lakes containing Eurasian watermilfoil into the Schupp lake classification scheme.1

Classification of EWM Lakes

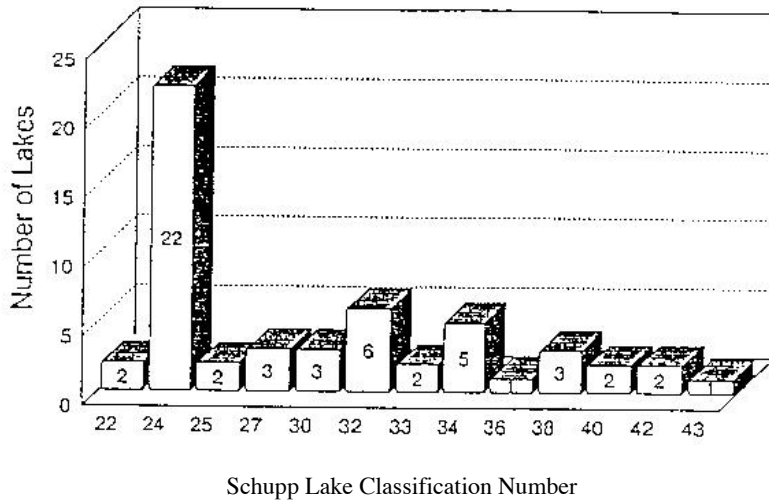


Figure 4. Segregation of select metro region lakes, and metro region lakes containing Eurasian watermilfoil, into the Schupp lake classification scheme.1

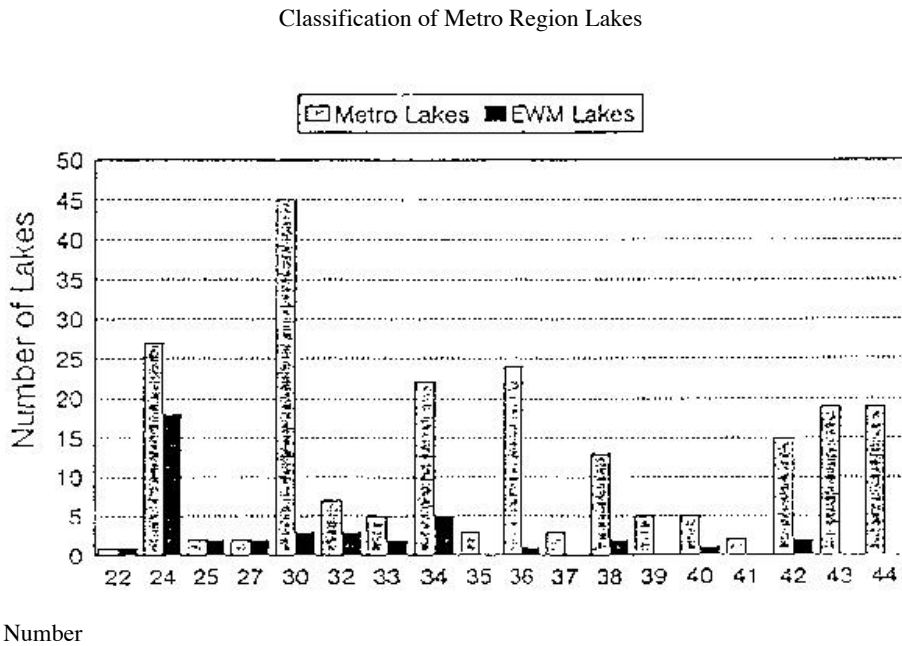


Figure 5. Schupp classification parameters1 of select metro region lake classes, including the total number of lakes within each class in the metro region and the number containing Eurasian watermilfoil.

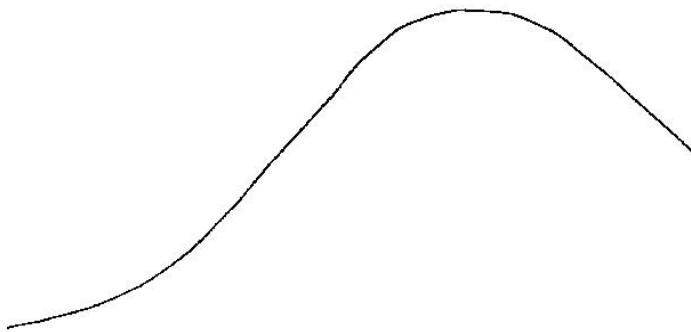
Schupp Classification Parameters

Lake Class	No. in Metro	No. With EWM	Lake Area	Max Depth	Littoral %	Total Alk	Secchi	SDF	MEI	TSI
22	1	1	3011	104.3	0.338	136.3	10.9	2.74	6.94	42.7
24	27	18	364	60.5	0.404	142.89	6.39	1.51	10.52	50.4
25	2	2	474	57.2	0.466	142.52	11.81	2.46	11.26	41.5
27	2	2	2230	60.9	0.445	161.97	8.47	1.49	12.42	46.3
30	45	3	43	41.7	0.53	141.48	5.4	1.35	15.65	52.8
32	7	3	547	34.9	0.633	45.88	4.33	2.31	19.23	56
34	22	5	222	27.5	0.634	146.27	4.29	1.3	23.4	45.1
36	24	1	52	25.5	0.869	93.03	6.91	1.52	17.56	49.3
38	13	2	276	27.5	0.863	154.48	5.34	1.41	26.54	53
40	5	1	830	14	0.99	153.54	4.81	1.57	51.5	54.5
42	15	2	238	12.8	0.991	145.46	3.6	2.67	59.45	58.7

Figure 6. Generalized relationship between lake trophic status and relative abundance of Eurasian watermilfoil.

**Influence of Trophic Status on EWM**

Relative Abundance



Oligotrophic

Hypereutrophic

Smith and Barko (1990)

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### **Supplement 5 -A Dozen Strategies to Grow Your Lake Association (By Don Germanson)**

Every lake or river association knows the one great achievement to being recognized in the community the size of your membership. The size of your membership says you accomplish a great deal. The size of your membership says you are the focal point for lake activities. The size of your membership says you are sought out for political advice.

40 Strategies to Grow Your Lake Association was originally presented at the 1993 Minnesota Lakes Conference where it received positive reviews. Some of these strategies are presented here.

#### **Tip #1 — Know the Profile of Your Potential Members**

Enough can't be said about this subject!

#### **What is the profile of your potential members?**

Stated another way, just how far could your membership reach? How far do you want your membership to reach? Is it just the lakeshore? Could your membership include people across the street from the lakeshore? Businesses in the local area? People who vacation there frequently?

Answers to these questions could mean your potential could be 50 members or 5,000 members. I chatted recently with the President of the Lake Oneida Association, from upstate New York, who stated that they have in excess of 10,000 members. However, their shoreline only supports 4,000 properties. It turns out the membership fee is \$3 per year and everybody in the area, both lake and off-lake, joins.



The straw poll taken at the 1993 Minnesota Lakes Conference showed that:

-60 percent of attendees felt they had potential of less than 250 members.

-30 percent of attendees felt they had potential of between 250 and 1,000 members.

-10 percent of attendees felt they had potential of over 1,000 members.

Do you know where your potential lake association membership profile falls in this list?

Do you know the age profile of your potential members? Older? Younger? Knowing this will tell you what kind of activities to conduct. Swimming parties and Progressive Dinners by Boat might cater to younger members, while ice cream socials and presentations might cater to older members.

Is your potential membership married? Married with children? Not married? If you have a high propensity of children, picnics might bring positive results. People who are not married might be more flexible with their time to help out with events.

One other big area to figure out is your seasonal/permanent resident mix. Obviously, if your potential membership is high-seasonal, hold your activities during weekends only.

I got involved with a fair amount of testing the potential membership on Lake Minnetonka when we mailed to the entire lakeshore. Most of the time we mailed to members only. However, several times we mailed to the entire lakeshore, both summer and winter. By printing Do Not Forward, Address Correction Requested on envelopes, we gained a picture (through the returned mail) of how many people were gone in the winter versus the summer. To our surprise, what we found was not that big a difference, unlike what most people believed!

You can obtain answers to what your potential membership is like by contacting city governments, chambers of commerce, conducting surveys, and just plain talking to people.

We all know the proverb, Knowledge is Power. Our next several tips continue with this theme of gathering information. Information tells you two things: how to serve your members, and how your membership can serve you.

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### **Tip #2 — Know the Profile of Your Current Members**

This tip is a lot of fun. This is where you ask a lot of questions using any information you gain for your plans and programs later. You can keep track of your information in a computer database or paper filing system.

*What members are interested in environmental issues? Taxes? Clean-up programs? Social events?* You can ask for this information on your membership forms and then pull these people together for activities or meetings based on these interests.

*Who donates the most money to your association?* This should be obvious; however, as boards of directors turn over, you want the ability to know who has been the most helpful during fundraising programs. As a minimum, any donation that is brought in deserves a thank you letter.

*Do you have any geographic concerns?* Memberships by bay or shoreline? Members by homeowner, business, home association, apartments, or condominiums? Keep track of it. This information will give you profiles from where your members are coming.

*Who paid their dues in the last month?* Immediate thank you letters for new and renewal memberships are a real plus. It tells that member you really appreciate their support. Send thank you letters out no later than 30 days if you cannot do it immediately.

*Whose membership is about to expire?* There are a couple of uses for this information. When there are three months left on a membership, send out a bragging letter telling this member all the things you are accomplishing. When there is one month left on a membership, then send out your dues and renewal notice.

*How many people with professional services are in your membership?* Do you know who can offer legal, accounting, or scientific expertise? Keeping track of this information allows yourself and future boards access to professional help that you may not have to pay for.

*Do you have any dignitaries or celebrities in your membership?* Put them on your board in an honorary fashion or advisory role and then promote the fact that you are doing this.

**Tip #3 — Survey, Survey,  
Survey Your Membership**

Surveying your membership tells you what is on their minds. You can do this informally by talking to people, or formally through the mail, phone or fax.

As an example, one membership survey on Minnetonka indicated the following interest areas and scores on a 1-10 scale. The top five topics were:

Topic	Points
Taxes	8.4
State Legislature	8.2
Milfoil/Zebra mussels	7.8
Local legislature	7.4
Clean-up projects	6.8

The tough part to surveys is getting a good enough return to validate the survey. Postage-paid (stamps or business reply permit) return cards or envelopes will increase your returns immensely. Also, try incentive returns, where each returned survey is eligible for a raffle item.

Lastly on surveys, try attendance gifts where you survey those members who show up at a membership meeting. Give them a novelty item like a bumper sticker or coffee cup if they fill out the survey you give them. I've seen this used to gain a lot of information.

**Tip #4 — Set Up Regular  
Memberships**

This is obvious however some organizations make it difficult. Make signing up for regular memberships EASY. I've seen many membership forms cluttered for all the membership exceptions.

*Fill in the blank, check the box, and bill me*, are all words to make bringing in memberships EASY.

Also, be as clear as you can on what a regular membership provides and who is eligible for it. Are regular memberships only available to shoreline property owners? Do regular members vote on association actions?

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**Tip #5 — Set Up Booster  
Memberships**

Boosters are typically members who support the association activities, but are not allowed to vote or hold office. This is especially useful for lake associations who have programs to Clean Up The Lake but require that anybody who serves on the board be a shoreline owner. Everybody is interested in cleaning up the lake, shoreline owner or not, so having booster members can provide needed enthusiasm to the lake association. Booster members receive newsletters, mailings, etc.

**Tip #6 — Set Up Contributor  
Memberships**

If regular memberships cost \$25, set up contributor membership levels of \$50, \$100, and \$250. If your lake association is registered with the state as a 501(c)(3) (nonprofit), these contributing levels are tax deductible. Most organizations publish regularly in their newsletter the list of contributing members. Some want privacy. Do what your members want (see tip #3, Surveys).

**Tip #7 — Set Up Student  
Memberships**

Student memberships are especially useful for those active in biology and environmental causes. There is not a lot of this type being used, but those who have student memberships have found students to be real helpful to the lake association.

**Tip #8 — Set Up Free  
Memberships**

To your dignitaries, politicians, and service clubs. Use this strictly to send out your newsletter. None of them will spring for a membership; however, you want to keep these people informed. Your newsletter is a great way to keep these people educated about the activities of your lake association. Include in the list: city councils, county boards, state legislators, chamber of commerce, American Legions, DNR & PCA personnel. Add other lake associations as free members. This is a great way to get into Newsletter Exchange.

**Tip #9 — Set Up  
Professional Memberships**

This is for your accountants, lawyers, scientists, and public relations kind of people who have professional services to offer. This could be used as a service-in-kind discounted membership for services rendered.

**Tip #10 — Say Thank You to Your  
Special Members**

Nothing can be said other than to say Thanks for all the help! Everyone appreciates being recognized for their efforts or support.

### **Tip #11 — Test, Test, Test Mailings**

Mailings are the most common way to reach your current and prospective members. You can learn from the mailings you send them. It's a contest to compete with the other mail your recipients sort through. The challenge is to find out what technique your readers respond to.

Most of us probably send mailings in white envelopes. Have you tried color? Color will make your mail stand out amongst the other white envelopes, the other half in a soft pastel color. See who responds to what. Next time, try a bright color.

If you are asking for return mail (bills, membership dues, renewal notices, etc.), insert a smaller, colored return envelope that is pre-addressed. Statistics show that using a colored return envelope, particularly blue or yellow, will have a higher return. These colors stand out in the typical bill-paying pile we all have. Think of your current utility bill envelopes.

How about postage First Class vs. bulk rate? Bulk rate savings can be significant; however, we all know people who automatically toss bulk mail. Your standard First Class stamp is 32¢ (today). In comparison, bulk rate postage for letters (assuming you have 200 pieces or more) can be approximately:

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- 20¢ each
- 16¢ each if you sort them by zip code
- 13¢ each if you put a postal carrier route code on your addresses
- 11¢ each if you do all the above plus take it to a major postal facility
- 6-11¢ each if you convince the Post Office you are a nonprofit organization (according to Post Office standards)

There are mailing companies who can help with bulk mailings, including use of bulk mail permits. Check the yellow pages under Mailing Services.

If you are not sure if First Class is better for you than bulk rate, try splitting your mail into these groups (assuming you have enough quantity) and see what happens.

Lastly, regarding mailings, try flyers versus personal letters. Personal letters tend to do better with fundraisers; however, flyers tend to do well for events and social gatherings. Try either of these and measure your results.

### **Tip #12 — Make Sure They Can Always Find You**

As an organization (and as your board changes) make it easy for members to communicate with your association. A good idea is renting a local post office box. Members will always know where to write and send their dues and donations.

Just be sure that someone regularly checks the mail delivered to the post office box!

Don Germanson has served as president of the Minnesota Lakes Association and chair of the Membership Committee. He was successful in expanding the Lake Minnetonka Lakeshore Owners Association by a factor over 400 percent. His professional career has been in sales of personal computers to large corporations and, more recently, the Marketing Database Manager for IBM. He now heads up Force-Eight, a print and data marketing firm in the Twin Cities.

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## Supplement 6 -Easy Dos and Don'ts for Lakeshore Users

Land Use/Land Area	Do's and Don'ts	Reason
1. Site disturbance, yardwork, clearing, landscaping	<b>Do</b> keep site disturbance to a minimum, especially removal of natural vegetation and exposure of bare soil.	Site disturbance dramatically increases surface runoff and erosion that contributes phosphorus to lakes.
	<b>Do</b> seed and mulch bare soil within two weeks of clearing and install hay bales downslope of cleared areas.	Hay bales trap sediments and the phosphorus they carry.
	<b>Do</b> leave naturally vegetated areas (buffer strips) along lake shores, streambeds, road ditches, intermittent streams. Leave at least 25 feet of undisturbed buffer, with more on poor soils or steep slopes.	Buffer strips intercept runoff and filter sediment and phosphorus from water before they reach the lake or stream.
	<b>Do</b> plant deep-rooted, woody vegetation along lake shores, streambeds, road ditches.	Plant roots stabilize shoreline, prevent erosion, and take up nutrients carried by water before they reach the lake.
	<b>Do</b> preserve natural topography and natural drainage systems.	Natural drainage systems evolve over years and effectively control sediment and phosphorus.
	<b>Do</b> use fertilizer sparingly and in multiple applications. Hay mulch is preferable.	Solid, inorganic fertilizers are readily dissolved by water and transported in runoff.
	<b>Don't</b> use herbicides and pesticides in excess on your garden and lawn. Avoid their use if possible.	Many of these products are toxic and can get into the water.
2. Shore frontage	<b>Don't</b> put leaves, branches or any kind of organic matter into the lake.	Plant debris adds phosphorus and other nutrients directly to the lake.
	<b>Do</b> leave existing rocks in place along shore. Add rip rap if erosion control is necessary (MNDNR permit necessary).	Large rocks are the most effective buffer against erosion because they diffuse wave action.
3. Tree cutting, forestry	<b>Do</b> minimize shoreline alteration, such as removal of vegetation, construction of piers, breakwaters, etc. (Shoreline alteration requires MNDNR permit.)	Shorelines are generally stable due to years of wind, wave, and ice action. Alteration of the natural shoreline destabilizes the shoreline, increases erosion, and impairs fish and wildlife habitat.
	<b>Do</b> leave trees along the shoreline or streamfront. Consult shoreland zoning laws before cutting-harvesting limitations may apply.	Trees and natural cover best protect against shoreline erosion and sedimentation of lakes. Trees take years to grow and only minutes to cut down.
4. Septic systems	<b>Do</b> check sludge level in septic tank every year. Pump when sludge fills half of the tank (average is every 2-3 years for year-round residents, 5-6 years for seasonal residents).	Septic systems must be maintained if they are to function properly. If settled solids are not removed from the tank, they will wash into and clog the leachfield.
	<b>Do</b> organize neighborhood septic tank pumping.	Pumpers usually reduce the price for large volume jobs.
	<b>Do</b> conserve water and give the septic system time to "rest" after heavy use.	The less water you use, the better your septic system will work.

Land Use/Land Area	Do's and Don'ts	Reason
5. Detergents	<b>Don't</b> flush strong cleaning agents (drain cleaner, bleach) into your septic system.	Septic tanks are living systems. Strong cleaners kill the microorganisms that break down the waste.
	<b>Don't</b> flush cigarette butts, paper towels, etc., down the toilet.	These items fill up the septic tank quickly and cannot be broken down by microorganisms.
	<b>Don't</b> install or use an in-sink garbage disposal.	Ground up garbage overburdens your septic tank and slows its functions.
	<b>Don't</b> use commercial products that claim to clean your septic tank without pumping.	These products can cause clogging of your leachfield and may contain chemicals that can contaminate groundwater.
	<b>Don't</b> put paint or chemicals into the septic system.	These hazardous products kill microorganisms in the septic tank and contaminate drinking and lake water.
5. Detergents	<b>Do</b> use nonphosphate detergents. (Products to use are available from some lake associations.)	Phosphate detergents add more phosphorus to the lake and, thus, contribute to algal growth.
	<b>Don't</b> wash cars near lakes, streams, or drainage ditches.	Runoff containing phosphorus will put phosphorus directly into the water. Runoff should be diverted to vegetated surfaces and allowed to seep into the ground, where phosphorus can be removed.
6. Surface runoff from developed areas (driveways, roofs, lawns)	<b>Do</b> prevent water from running directly into lakes and streams. Detain in depressions or divert flow to flat, wooded areas.	Flowing water contains sediment and phosphorus. Detaining or dispersing water allows it to filter into the soil, where sediment and phosphorus are filtered out.
7. Roads	<b>Do</b> plant vegetative buffer strips along roads and stabilize road ditches by seeding or rip rapping.	Plants slow runoff from roads and help to remove sediment and phosphorus before they reach lakes or streams.
	<b>Don't</b> allow water to run directly off roads into lakes or streams.	Water running off roads contains sediment, phosphorus, and pollutants from cars.
8. Structures (houses, decks, sheds)	<b>Don't</b> belong close to the water. All structures must meet the required setback from the water.	State shoreland zoning statute requires setback from shore because shoreline disturbance dramatically increases sedimentation of the lake.
9. Sand beaches	<b>Don't</b> build new beaches. (New beaches require MNDNR permit.)	Sand contains phosphorus. Sand which is not stabilized by vegetation washes into the lake, where it accelerates filling of the lake and provides poor bottom habitat for fish and wildlife.
10. Fill/dredge	<b>Don't</b> fill or dredge unless necessary. Both activities require a permit from MNDNR.	Fill and dredge stir up sediment and impair natural habitat.
11. Storage of hazardous materials	<b>Do</b> store hazardous materials in a contained area.	Containment prevents contamination of water supplies and lake waters by undetected leaks.
	<b>Don't</b> dispose of paint thinners or chemical products on the ground.	These products cannot be removed by soil and can contaminate groundwater and lake water.