

Protecting Our Lake Guide

Minnesota's lakes and rivers are the most vital resources to our state. They define our history, our livelihoods, and our future. This booklet is your guide to protecting your local lake or river with information on history, ecology, your local lake association, and lots of simple "everyday actions" you can practice to help improve water quality as well as quality of life on the shoreline.

While the legislators in St. Paul will determine policy for our state's water resources, it's citizens like you who will have a real impact on the future by changing your own behaviors, and educating others along the way. By making a personal choice each day to take actions that benefit your local water resources, you become a powerful force of change and an example of responsible stewardship.

Acknowledgements

This guide was developed by **Minnesota Waters**, a statewide 501(c) 3 non-profit organization dedicated to protecting and improving the health of our state's lakes and rivers, by engaging and empowering citizens, agencies and policymakers.

Minnesota Waters' programs who are passionate about resources. We provide the



to help you take action to protect and improve our lakes and rivers. We provide many opportunities for interactive volunteer training with our staff and other experts to teach skills for hands-on water monitoring activities, to create more effective community-based organizations, and to make connections with like-minded groups throughout the state to strengthen our efforts by working together.

support citizen volunteers like you protecting Minnesota's water training, connections and support

Minnesota Waters gratefully acknowledges the **Minnehaha Creek Watershed District (MCWD) Cynthia Krieg Stewardship Fund** which paid for development and distribution of this guide. Several sections in the Guide also contain text from MCWD and Minnesota Waters publications or presentations.



Gleason Lake Improvement Association customized and distributed this guide.

Table of Contents

Minnesota's Unique Landscape	Page 4
Our Lake Association	Page 5
Our Lake	Page 13
The Power of Citizen Action	Page 21
Watershed Ecology	Page 24
Protecting Our Shorelines	Page 29
Three Common Invasives	Page 35
History of Our Lakes	Page 47
About the Minnehaha Creek Watershed District	Page 52



Minnesota's Unique Landscape

Being Minnesotan undoubtedly means a heap of memories on the water. Ask anyone about their favorite lake or stream and you'll likely trigger a wave of nostalgia reflecting clear, cool waters, heavily wooded shorelines, abundant wildlife and the peace that only comes from a quiet moment on that beloved lake or stream. Are we blessed? You bet!

How did our state get its unique landscape? Around 2 million years ago, glaciers covered most of Minnesota. As the climate fluctuated, the great ice sheet advanced and retreated and glacial till (the material scraped up and carried by the ice), was deposited in distinct layers. Around 9,000 years ago, the ice sheets had melted completely from Minnesota but glacial lakes remained. Thus, most of the state's landscape was sculpted by glaciers.

As the 32nd state to enter the Union on May 11, 1858, *Minisota* borrowed its name from the Dakota word for "sky-tinted waters." Its statehood celebrates the pristine lakes, streams and woodlands as hallmarks of this region. Minnesotans proudly claim our state endowed with more than 10,000 lakes (11,842 to be exact) and a meandering 69,200 miles of natural rivers and streams. Minnesota's waters flow outward in three directions: north to Hudson Bay in Canada, east to the Atlantic Ocean, and south to the Gulf of Mexico.

Minnesota's water resources are part of a flowing organism, systems which extend across the continent and out to its ocean shores. Each raindrop into Minnesota's waterways has a final destination well beyond our human-imagined borders, carrying with it the footprint of our water resource protection, or lack thereof. Although our lakes and rivers are a great source of pride for us all, their existence has nothing to do with our actions today. But their ongoing health, and future existence, is *highly* dependent on our actions. No resource is permanent, and we have the power to protect them, or destroy them.

For example, in 1850, Minnesota documented 18.6 million acres of wetlands; by 2003, that number had been cut exactly in half to 9.3 million acres. The loss of wetlands is significant because they are the natural world's water-purification systems. Wetlands are the transitional zone between aquatic and terrestrial ecosystems, acting as the best natural defense for Minnesota's lakes and rivers.

In addition to impacting the ecosystem, there are even more pragmatic reasons for protecting our water resources. The sparkling, sky-blue waters of Minnesota lakes and rivers provide much of the recreational opportunity for which our state is famous. Minnesota is economically dependent on our healthy lakes and streams for tourism. For many people, Minnesota's fishing lakes are the primary attraction. There are hundreds of lake resorts in Minnesota that cater to the needs of fishermen and women, and offer guided trips to the best fishing spots. Other Minnesota lake cabin rentals and family oriented resorts cater to those who want to swim, boat, canoe, kayak lie in the sun or build sand castles on the beach.

Minnesota's abundant water resources are what make our state so attractive and so much fun. Protecting the ecological health and economic vitality of Minnesota's rivers, lakes and communities will ensure that our legacy of healthy waters continues for generations to come. 🌿

🌿 "A lake is the landscape's most beautiful and expressive feature. It is earth's eye; looking into which the beholder measures the depth of his own nature."
~Henry David Thoreau

Our Lake

Gleason Lake Assn.
formed in 1980
and by 2010 has



Association

Improvement
with 22 members
110+ members.

History of Lake

Gleason

In 1999 Gleason Lake initiated a lake management plan. Emmons Olivier Resources with input from Blue Water Science, Inc. determined there were 160.2 acres of water with 13.9 acres of adjacent wetlands for a total of 174.1 acres. The north bay has 31 acres and the south bay 129.2 acres. The watershed drains from 2,450 acres. The lake has 3.9 miles of shore with a volume of 390 million gallons. The maximum depth is 16' and the mean depth is 7.7'.

Gleason Lake is a “shallow lake” which means it has an average depth of 5-10 feet. With this shallow depth, vegetation rapidly grows with adequate sunlight and nutrients provided from the area runoff.

Organization History

In 1980 , due to concern of fish kill over the winter months, lack of oxygen and declining water quality on Gleason Lake, a concerned group of 22 homeowners came together and decided to form an association to help protect and steward the lake. After organizing, the group officially became a membership supported, 501.c.3 nonprofit entity, meaning that all donations are tax deductible. For 30 years, our association has retained the same mission and hundreds of individuals have contributed their time and financial resources to support it.

OUR MISSION STATEMENT

To improve and preserve the beauty and quality of Gleason Lake and its watershed for the present and future,
To promote education in best management practices, and
To work with other organizations and governmental agencies with similar objectives.

The mission of the association is to encourage the lake residents and their guests to:

- Use the natural resources of our lake conservatively
- Strive for improvement of its water quality
- Strive for improvement of its wildlife habitat and fishery.
- Promote water safety and courtesy
- Encourage a sense of community among the residents
- Actively participate in the gathering and sharing of lake conservation knowledge with neighboring lake associations, the Minnesota DNR, and other organizations that strive for better use and management of lake resources.

Our Bylaws and Articles of Incorporation are available on request to the board.

Newsletter and Lake Management Plans



The annual fall newsletter and lake management plans of 2003 and 2007 can be found on our Website: www.gleasonlake.org.

GLIA 2010 Board

- **President:** Donna Wolsted, 55447 ladykadonna522@aol.com
 - **1st Vice President:** Lee Keeley, 55447 lekelee@aol.com
 - **2nd Vice President:** Robert Peterson, 55391 robert_9@gmail.com
 - **Treasurer:** Jim Senger, 55447 jimsenger@comcast.net
 - **Secretary:** Position open *April 2010*
 - **Aquatic Invasives:** Marc Agar, 55391
magar@cacommunications.com
 - **Fundraising:** John Lettmann, 55391 john_lettmann@malt-o-meal.com
 - **Shores & Waters:** Lee Wallace, 55447 Lee.Wallace@qwest.com
- Auxiliary Members:**
Winter Aeration: Ken Campbell, 55447 jankencampbell@comcast.net
Graphic Artist Jim Jahoda
Lake Recordings: Don Patterson, 55447 dg.patterson@comcast.net

Association Goals and Projects

- Significantly reduce the amount of phosphorus that enters the waterways in order to sustain healthy water quality and native vegetation.

It has been estimated that one pound of phosphorus contributes to 500 pounds of algae growth in a lake, which deprives the lake of oxygen. We must reduce the phosphorus nutrient load if we want our lakes to be healthy.

In 2003 the phosphorus level of Gleason Lake was calculated to be 120 ppb; The TMDL (total maximum daily load) was set for 80 ppb in 5 years and the ultimate goal was set for 40 ppb. in 10 years.

- Restore desirable aquatic vegetation and prevent the presence and spread of undesirable exotic species.

Gleason Lake Improvement Association has treated the lake to control Eurasian water milfoil and curlyleaf pondweed since the late 1990s. In 2010, both of these invasives are minimal in the lake. We have also worked on control of purple loosestrife in our wetland areas with the City of Plymouth and Fortin Consulting. We have had an ongoing beetle release program as needed since 1997.

- Protect and enhance ground water quality and quantity.

GLIA is promoting rain barrels, rain gardens, native plants and shoreline planting to help prevent rapid runoff and to filter ground water for our aquifers. .

- Promote and encourage land use activities that prevent or minimize soil erosion.

GLIA encourages development on the lakeshore to include Best Management Practices's in the watershed and prevent soil erosion during and after construction

- Promote the wise and sustainable development and use of land in our watershed.

GLIA works with the City of Plymouth Environmental Education Coordinator and Engineering Department to monitor use of land and storm water ponds.

- Encourage better storm water management practices and restore critical wetlands.

GLIA consulted with the City of Plymouth to improve the storm water management in 2007 when the northwestern streets of our lake were improved. We worked with the City of Plymouth and Wayzata to improve two wetland areas near public schools.

- Protect and enhance the fish and wildlife resources.

GLIA has maintained a winter aeration system since 1984 after a harsh fish kill that winter due to lack of oxygen. At present we maintain 4 aerators in the deep hole (16') in the south bay.

- Promote the safe and wise recreational use of our surface water.

GLIA has set guidelines for boating and skiing on our lake. There is no public access but association members have access through private property. A close watch is kept to lessen the chance of aquatic invasives spreading to our lake.

These goals are attainable but will be accomplished only if we can muster the individual, political and collective will to do what is necessary to achieve them. This will be challenging because it will require some to change habitual patterns of behavior; and others in positions of authority will need to stand up to be counted and assume

responsibility for water quality results in ways that have not been required or expected in the past.

Meeting Schedule

The Gleason Lake Board meets the second Tuesday of each month.

To verify date and location, please contact a board member or email us at: gleasonlake.org.

Our Accomplishments Since 1980

□ Developed grants and collaborative partnerships with many individuals, agencies and organizations. Thousands of dollars have been raised and many cooperative water quality improvement activities and projects have been completed through these partnerships. Some specific projects include:

Wetland Restoration at the Wayzata Central Middle School,
Wetland Restoration at the Gleason Lake Elementary School, a new dam, a new bridge, a rain garden “zero runoff” demonstration at the Luce Line parking lot, and pond restoration and enlargement at the north end of Gleason Lake.

□ Initiated a number of studies through the years which have provided factual data and identified problems that needed attention.

Our first lake study and management plan began in 1999 with Emmons Olivier

Resources and the final plan was completed in 2003. Our last update was 2007.

□ Install and locate the buoys that mark the location of our aerators every fall and spring.

□ Supports educational sessions, workshops, curriculum materials in schools, water festivals and other educational activities.

GLIA participates in events with the city, schools and community to educate our residents and youth to promote water conservation and preservation.

□ Publishes an informative newsletter which is distributed to lakeshore owners, businesses and others.

GLIA prints and distributes “Gleason Lake Notes” a four page newsletter in the fall, with a followup letter in the spring informing members and partners of local water issues.

Become An Association Member

All Gleason Lake property owners and surrounding neighbors are eligible for membership. Donating members receive up-to-date information of lake activities, conditions and special mailings.

The major benefit of membership in the association is the sense of belonging in a community of residents who are continually striving for better use and management of Gleason Lake so that future generations will be able to enjoy this resource.

SUGGESTED ASSOCIATION DONATIONS:

*Creek \$25 – 99

*River \$100-299

*Lake \$300-499 All board members are asked to donate \$300 annually.

* Ocean \$500 +

Mail your donations to:

Gleason Lake Improvement Association
1030 Garland Lane N
Plymouth, MN 55447-3536

ANNUAL EVENTS

Check for updates on our website: gleasonlake.org.

- APRIL 9 and 10, 2010 Annual Lawn and Garden Expo
with City of Plymouth,
Held at Plymouth Creek Center
- MAY 13, 2010 Annual School Environmental Fair
Oakwood Elementary School
(Hwy 101 & 6) 5:30 pm
- June 12, 2010 Annual Day on the Lake 9:30 a.m.
Meet GLIA Board at the Waycliffe Docks
- June 30, 2010 Annual Music in Plymouth w/ fireworks.
Hilde Center by City Hall 5 pm.

Join a Committee

Public Awareness: Donna Wolsted
ladymadonna522@aol.com

Environmental Ed.: Lee Keeley lekelee@aol.com

Membership: Robert Peterson
robert_9@gmail.com

Aquatic Invasives: Marc Agar

magar@cacomunications.com Fundraising : John

Lettmann john_lettmann@malt-o-meal.com

Shores and Waters: Lee Wallace

Lee.Wallace@qwest.com

Winter Aeration: Ken Campbell
jankencampbell@comcast.net

Graphic Artist: Jim Jahoda
Lake Recordings: Don Patterson
dg.patterson@comcast.net

Volunteers needed for:
Luce Line Native Garden maintenance Formatting our
newsletter
and flyers Event planner Representative
for
Environmental Quality Committee and Watershed District
meetings
2011 Board Secretary and Treasurer

OUR LAKE : WATER QUALITY

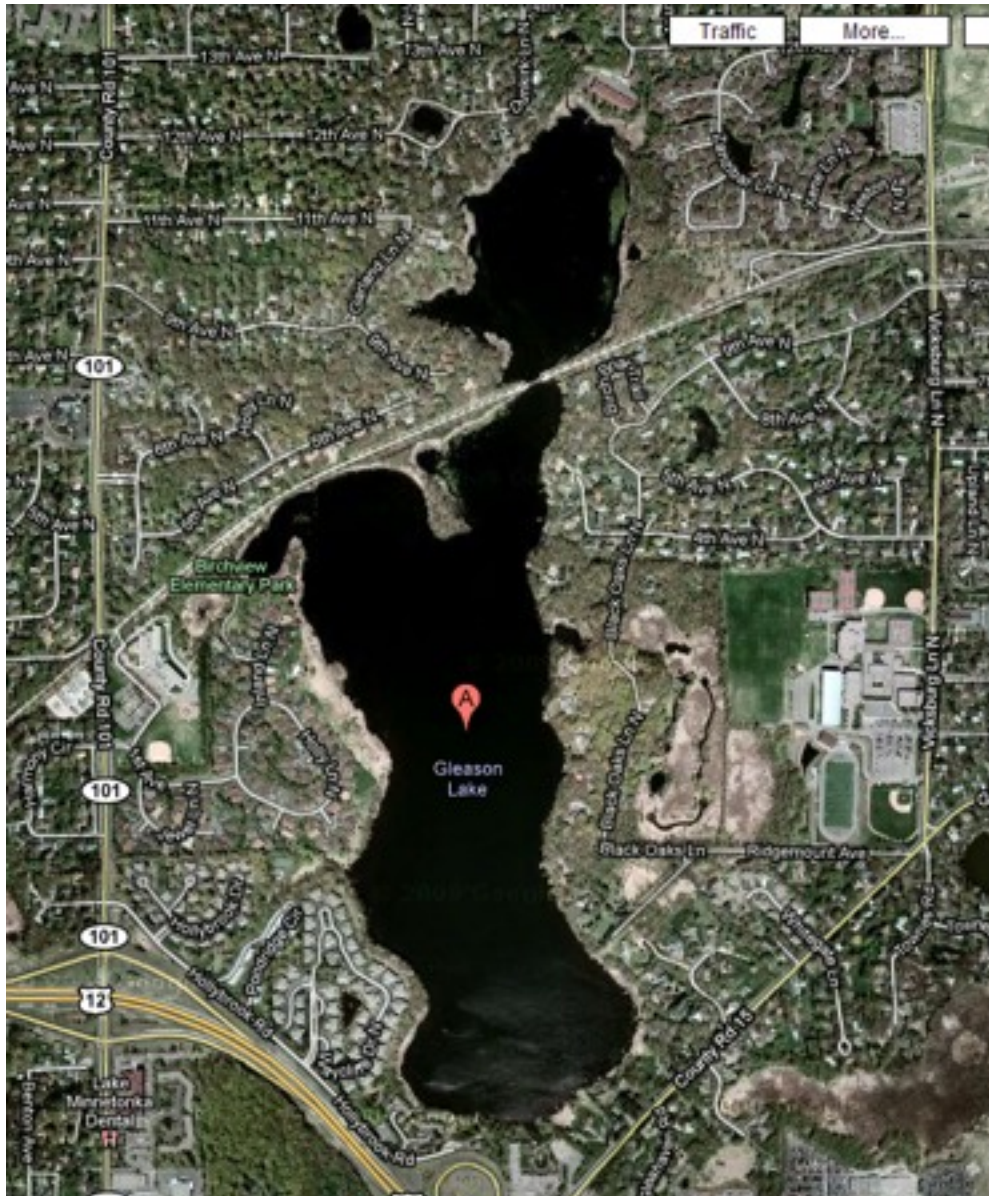


Lake Water Quality Grades

Lake Name	Watershed Location	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
Gleason Lake	Upper	C-	D+	D+	D	C-	C-	D	C-	D+	C-



1997: New Luce Line bridge installed



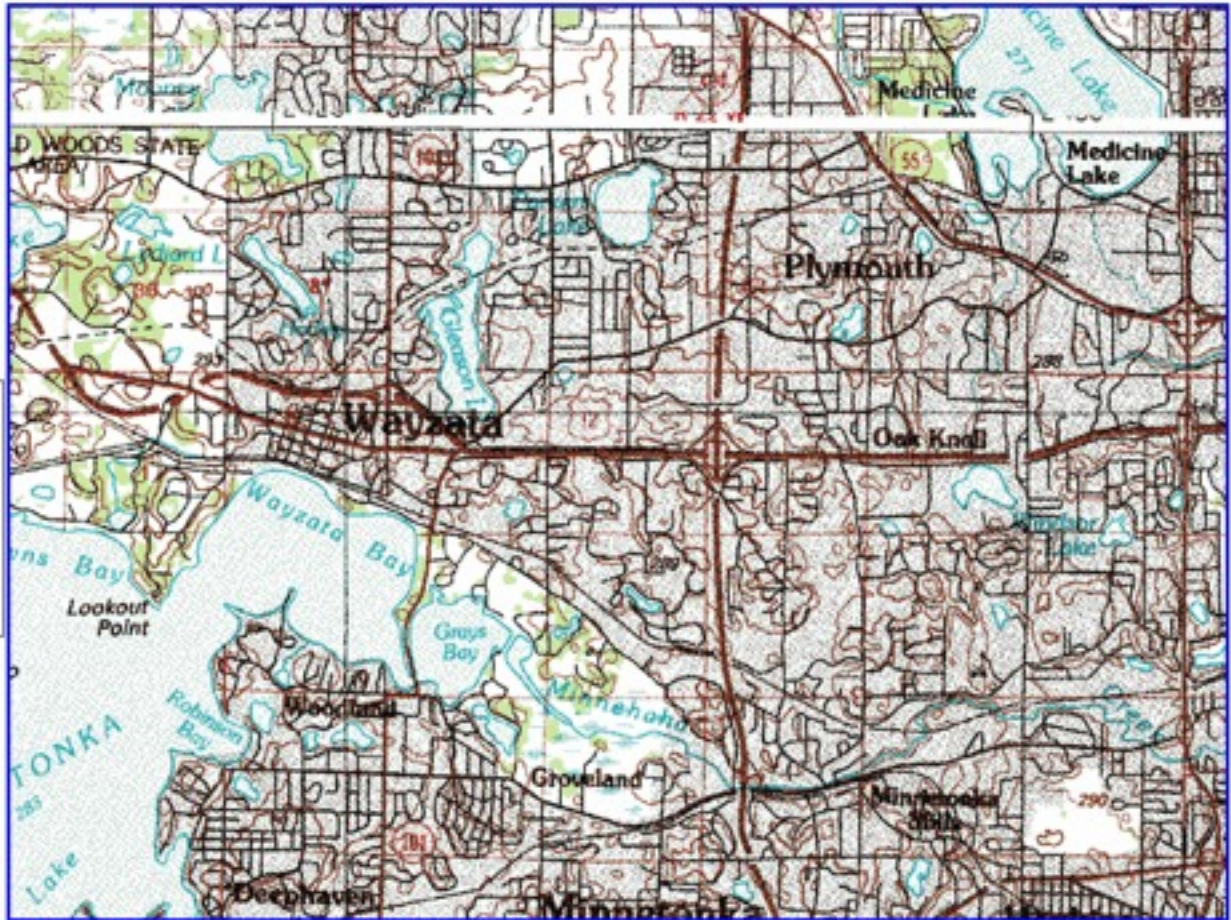
Topographic Map

Size of lake: 174.1 acres

North Bay 29.9 acres South Bay: 129.2 acres

Mean Depth: 7.7' with 16' maximum depth in south bay

Topographic Map of Gleason Lake



Gleason Lake Water Level Report

Period of record: 1980 to 2010

Highest recorded: 945.66 ft (on 04/30/2001)

Lowest recorded: 942.2 ft (on 10/28/1988)

Recorded range: 3.46 ft

Ordinary High Water Level (OHW) elevation: 944.5 ft

Water Quality

Gleason Lake was rated a C- the summer of 2009 in large part due to the heavy algae blooms.

The Minnehaha Creek Watershed District developed a lake grading method in 1989. The grade shows how your lake measures up compared with other area lakes. Grades are an indicator of the perceived condition of the open water. Three water quality measurements are combined to create each grade (see below). There are, of course, other factors that contribute to lake condition—for example, aquatic plants, fisheries, harmful chemicals, over-use, etc.

Understanding Your Grade

The grades consider what is average or normal for lakes in a given area. What is a “C” in one part of the country might not be a “C” elsewhere. But, within the seven-county metro area, grades can be compared.

Factors in Your Grade

- **TP is the total phosphorus measure. Increased phosphorus relates closely to increased algae, frequency of algae blooms and the increased quantity of blue-green algae.**
- **CLA is chlorophyll-a or the green pigment in plants. Chlorophyll-a is essential to photosynthesis. A measure of its presence in water estimates algae abundance.**
- **SD is the Secchi disk transparency. The lower the Secchi disk is visible, the clearer the water appears.**

A	90% and up	Crystal clear, beautiful. These lakes are exceptional and are enjoyed recreationally without question or hesitation.
B	70-90%	These lakes generally have good water quality but algae may limit swimming, particularly toward the end of summer.
C	30-70%	Average quality. Swimming, boating and fishing may be undesirable relatively early in the season. Algae blooms occasionally.
D	10-30%	These lakes have severe algae problems. People are generally not interested in recreation on these lakes.
F	Lowest 10%	Not enjoyable. Such a lake would have severe limitations to recreational use.

Water Clarity

Year	Average Secchi Reading (meters)
1988	0.5
1989	0.3
1990	0.7
1991	0.5
2006	0.9
2007	0.8
2008	1.1
2009	1.3

Animals and Birds Found in the Area

Loons, fox, coyote, deer, muskrats, minks, ferrets, night herons, egrets, eagles, owls, turtles, and a variety of birds and ducks.

Aquatic Invasive Species Found in Gleason Lake

Eurasian Watermilfoil

Curlyleaf pondweed

Purple Loosestrife

The Power of Citizen Action

Since Minnesota's lakes, rivers and streams are such vital components of our state's history and our daily lives, everyone can and should play a role in protecting them. The good news is that our water resources are in competent hands—the hands of citizens like you, and citizen-led groups comprised of folks who live and work in the communities that depend upon those water resources. These citizens best understand both the challenges and the opportunities for resource conservation, community enrichment and economic benefit. From the shorelines of the northwest corner to the meandering stream banks of the southeast, Minnesota's lakes and streams are being protected and improved by its citizens.

Fortunately, the threats now facing Minnesota's lakes and streams—pollution, aquatic invasive species, development—are paralleled by a mobilizing citizenry in communities across the state, poised for stewardship and rising to the challenge. And in today's climate of budget limitations, short-sighted land-use management and the subsequent lack of water-resource protection, it's time to go local, to focus on community values and citizen-led initiatives for long-term protection of Minnesota's lakes and streams.

At the heart of Minnesota Waters lie the grassroots conservation efforts of these citizen leaders. These leaders—lake and river associations, watershed groups, coalitions of associations and other like-minded partners—have long proven to be the most effective players in conservation. (Information follows on how to become involved in your local lake or river group.)

The following story outlines what can happen when organized and engaged groups set aside their frustrations and fears and take action for locally-led lake and stream protection. Ultimately, collectively, they will launch the wave of momentum needed for long-term, statewide action. 🌊

Lake Hallett Association: A Story of Passion, Persistence, and Protection



Lake Hallett at sunset

Lake Hallett is a beautiful 12-acre lake nestled within the city limits of St. Peter, MN. In a region where the typical clarity of a lake is 0.5 – 5 feet deep, Lake Hallett’s water clarity averages 12 feet and has earned this jewel its Department of Natural Resources ranking in the top 5% of cleanest lakes in southern Minnesota. The local lore holds that Lake Hallett was originally a gravel pit when the Hallett operation hit an artesian spring that filled the basin within 24 hours. Home to a diverse fish population, Great Blue and Green Herons, and the rare Blandings turtle this lake has inspired a group of concerned citizens to vigorously protect this natural resource for the enjoyment of future generations.

The main threat to the health of this lake has been the effects of stormwater runoff from the city of St. Peter. Starting in the mid-1960s St. Peter diverted 100 acres of stormwater into Lake Hallett. This type of stormwater diversion was not unusual at the time. In 1995, in response to a local development the City increased the amount of stormwater runoff from the original 100 acres to 390 acres. In 1996, the City of St. Peter proposed to increase the runoff to 700 acres and moved to designate Lake Hallett as a stormwater detention basin. Concerned citizens, led by Trudi Olmanson, then banded together to form the Lake Hallett Association (LHA).

One of the first goals of members was to educate effects of stormwater on from stormwater filled the lake from a in 1968 to the current 23 showing other signs of stormwater dumping.

The Lake Hallett concerted effort to the lake and reach out to LHA documented algal amount of stormwater



Stormwater runoff into Lake Hallett

the original 10 LHA the city council on the the lake. The sediment diversion had actually depth of 35 feet recorded feet and the lake was stress from the

Association started a document the health of the local community. blooms, fish kills, and the runoff that dumped

directly into the lake. They were able to record other effects of the stormwater runoff such as a 2005 drop in Secchi clarity readings as thousands of gallons of runoff from the adjacent stormwater detention basin poured into the lake. Every year LHA worked toward the ultimate goal of diverting stormwater away from the lake and into the existing storm sewer system. The Lake Hallett Association partnered with the St. Peter city council, city government officials, as well as the Minnesota Pollution Control Agency, and the Minnesota Department of Natural Resources to stop the stormwater. LHA was also instrumental in getting these agencies to communicate with each other to further the protection of Lake Hallett.

This increased communication led to the City of St. Peter, in accordance with a request from the MNDNR, halting the addition of silt into Lake Hallett. As the Lake Hallett Association president Trudi Olmanson says the key to their success was “Being persistent, making it public, trying to get other people from all walks of life involved ... plugging away to try to educate people and letting people know that they have to speak out.” Trudi pointed out that from an initial 10 members of the Lake Hallett Association they have now grown to 60 members. The lake has gone from an unknown resource to being regularly used by the community for

celebrations such as the Special Olympics Polar Plunge and an annual kid's fishing contest. The Lake Hallett Association along with Minnesota Waters also purchased textbooks and teachers' manuals to help start an ecology program targeted towards 7th and 8th graders that focuses on Minnesota lakes.

The job of protecting Lake Hallett is far from over for the Lake Hallett Association but their accomplishments are a great example to others. What advice does Trudi Olmanson have for other citizens concerned about their lakes or rivers? "Stay involved in local politics and keep your concerns in the public eye. Try to keep up communication. And get answers in writing." She also feels it's important to "Empower people to let them know that they can monitor their lake themselves and have the data to back up their concerns." From a group of 10 people that loved a lake to community-wide recognition of a valuable resource, the story of the Lake Hallett Association is an amazing journey and like all great journeys it is never really over. To learn more about Lake Hallett please visit: www.lakehallett.com/index.htm.

~By Courtney Kowalczak, Minnesota Waters 🐾

Our Success Story

Over the last 30 years Gleason Lake Improvement Association has had many success stories. Perhaps the greatest successes have been with the control of invasives. Since 2000 we have had minimal Eurasian water milfoil found in our lake. In 2007 we started a whole lake herbicide spraying program to eliminate curlyleaf pond weed. The first year we sprayed 145 acres and in 2010 we sprayed less than 30 acres. Since 1997 we have had an ongoing program using beetles to control purple loosestrife

Another success story has been with the aeration system to provide oxygen to the plants and fish during the winter months since 1984, after a harsh fish kill. Every winter the system must be started and the lake marked for open water area. Every spring the system must be collected and stored and repairs made for the next season. We have had a group of dedicated 4-5 men that have maintained this program for the past 26 years.

Join the Gleason Lake Improvement Association

We need your input, voice and hands to make future Gleason Lake projects a success. Please join us today.

The Top Ten Reasons to Join the Gleason Lake Improvement Association

- You will get to know the neighbors who share your values for protecting the lake.
- You will help guide association activities.
- You will be helping to protect all of our property values.
- You will be helping protect the native fish, wildlife and bird habitat.
- Your volunteer time will impact your quality of life everyday.
- Your financial support will contribute to activities that benefit a local community resource.
- You will have a chance to learn and share everyday actions to benefit the health of the lake.
- You will be playing a part to protect our lake from aquatic invasive species.
- You will strengthen the “collective” voice that gives our lake the strong representation needed for long term protection.
- You will be protecting Gleason Lake for generations to come.

Watershed Ecology

You've probably heard the rallying cries to let native plants grow by the shoreline or to install rain barrels around your property. But why? The following section will explain the ways you can take action to improve the water quality in your lake or river. But before diving into specific steps you can take, read this explanation as to why these practices will improve your water quality.

Lake Ecology

The term "ecosystem" refers to the combined physical and biological components of an environment. An ecosystem is generally an area within the natural environment in which physical (abiotic) factors of the environment, such as rocks and soil, function together along with interdependent (biotic) organisms, such as plants and animals, within the same habitat.

Ecosystems can be permanent or temporary. Ecosystems usually form a number of food webs (the predator-prey relationships between species within an ecosystem or habitat). ~ *Wikipedia*

Lake Ecosystems are affected by a number of factors including:

- The size and nature of the lake's watershed (soils, slopes, vegetation)
- What's happening on the land—both on the shoreline and in the watershed
- How "connected" the land and water are—stormwater, wastewater, and other inputs
- Climate and weather
- Intensity of surface use (fishing, boating, etc.)
- Makeup of the biotic community, including invasive species
- The physical characteristics of the lake itself (size, depth, etc.)

The important thing to remember about ecosystems is that if you manipulate one part, it can have far-reaching (and sometimes unpredictable) effects on the rest of the system.

Algae

Eutrophication—that leads to growth—occurs time on a lake. of algae lake's

The base of the algae. While they plants, algae feed grow by we can think of plants in the lake. make the water



excessive fertility excessive plant gradually over Excessive growth contributes to a eutrophication. food chain is are technically not on phosphorus and photosynthesis, so them as the tiniest Algae are what look green like pea

soup. Algae exist in different forms, but a common one is a filamentous form that grows in mats on top of the water. Some species of algae can be toxic.

Aquatic Plants

Aquatic plants play a key role in the lake ecosystem. They grow in the littoral zone—the area between the shore and where the water gets to be about 15 feet deep (where light can penetrate).

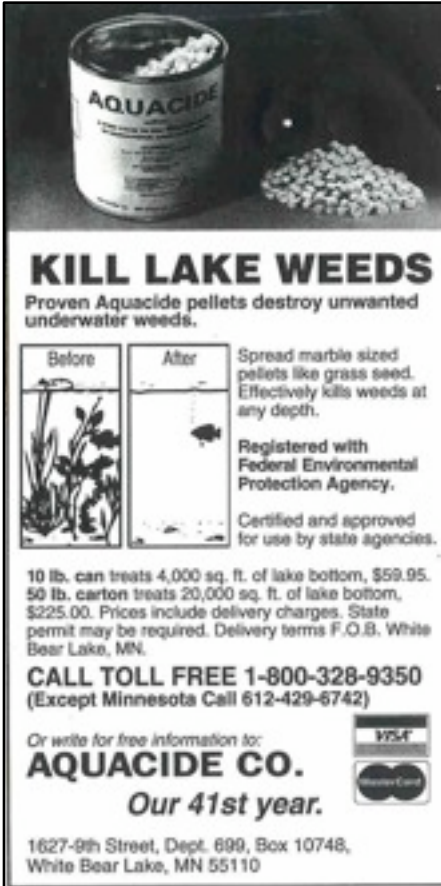
The littoral zone is home to lake ecosystem. They all need plankton rely on plants for spawning substrate and and places to find food. If we environment, the ecosystem

The main class of plants in macrophytes. These are be emergent—like bulrushes like lily pads; or submerged wide variety of native plants the infamous Eurasian water pondweeds, which are

It's important to note that and regulated by the DNR. you need a permit before www.dnr.state.mn.us/regulations.html for the regulations.

Even though we know that the ecosystem, many lake as “weeds.” However, it's important to remember a few things about plants:

- Like any plant, aquatic soil, nutrients, and light. If the you will have plants. If you back.
- Aquatic plants capture and otherwise be available to are removed, water clarity can all that phosphorus (food) is
- Protecting “good” (native keep out the “bad” (invasive) where there is the right



AQUACIDE

KILL LAKE WEEDS
Proven Aquacide pellets destroy unwanted underwater weeds.

Before	After
	

Spread marble sized pellets like grass seed. Effectively kills weeds at any depth.

Registered with Federal Environmental Protection Agency.

Certified and approved for use by state agencies.

10 lb. can treats 4,000 sq. ft. of lake bottom, \$59.95.
50 lb. carton treats 20,000 sq. ft. of lake bottom, \$225.00. Prices include delivery charges. State permit may be required. Delivery terms F.O.B. White Bear Lake, MN.

CALL TOLL FREE 1-800-328-9350
(Except Minnesota Call 612-429-6742)

Or write for free information to:
AQUACIDE CO.
Our 41st year.

1627-9th Street, Dept. 699, Box 10748,
White Bear Lake, MN 55110

This ad is from a lake management magazine. Do they expect us to believe that the bluegill will remain after we've taken away its shelter, food source, cover and nursery area? How do you think the ecology of the pictured lake would be affected?

the majority of critters in the homes, and all but the shelter, cover from predators, nursery areas, sunning areas, destroy this part of the lake no longer stays intact.

lakes is what we call aquatic rooted to the bottom and can and cattails; floating leaf—like coontail, elodea, and a we call pondweeds, as well as milfoil and curly leaf invasive species.

aquatic plants are protected You should check to see if removing aquatic plants. Visit shorelandmgmt/apg/ details on aquatic plant

aquatic plants are important to lovers refer to aquatic plants

plants grow in response to conditions are right for plants, remove them, they will grow

store nutrients that would algae. If enough aquatic plants decrease dramatically because available to algae. and non-invasive) plants helps ones. If there are no openings combination of soil, nutrients,

and light, it's more difficult for invasive plants to gain a foothold.

Each Lake is Different

Each lake has its own unique characteristics. Some are naturally clear and clean because they have small watersheds (few inputs), less erodible soils, and lots of vegetative cover. Some are naturally "fertile" (greener water and lower clarity) because they have larger land areas draining to them and the soils may erode more easily into them.

Add all the other factors, especially human land use and invasive species, and you start to see how challenging it can be to manage a lake.

Because lakes are so different, we cannot necessarily expect a strategy that worked in "clear lake" to work in "mud lake." So we need to be careful about our expectations. Reinhold Niebuhr wisely said, "Grant me the serenity to accept the things I cannot change, the courage to change the things I can, and the wisdom to know the difference."

Why do all actions we take in a watershed directly impact the health of our lakes and streams?

Following a raindrop can help us understand Minnesota's watersheds. As that single drop of rain falls onto the landscape it will either percolate into the ground, or if the ground is already saturated, it will flow downhill within its watershed. In fact, that raindrop will continue flowing through Minnesota's watersheds, ultimately fated for the ocean. The ocean it's destined for simply depends on which Minnesota watershed it fell into. Hudson Bay, the Atlantic Ocean and the Gulf of Mexico are the three major outlets or flow ways for that raindrop. Each rainfall or snowmelt falls into and travels through Minnesota's watersheds.

Nutrients and sediment that impact water quality have many sources throughout the lake's watershed.

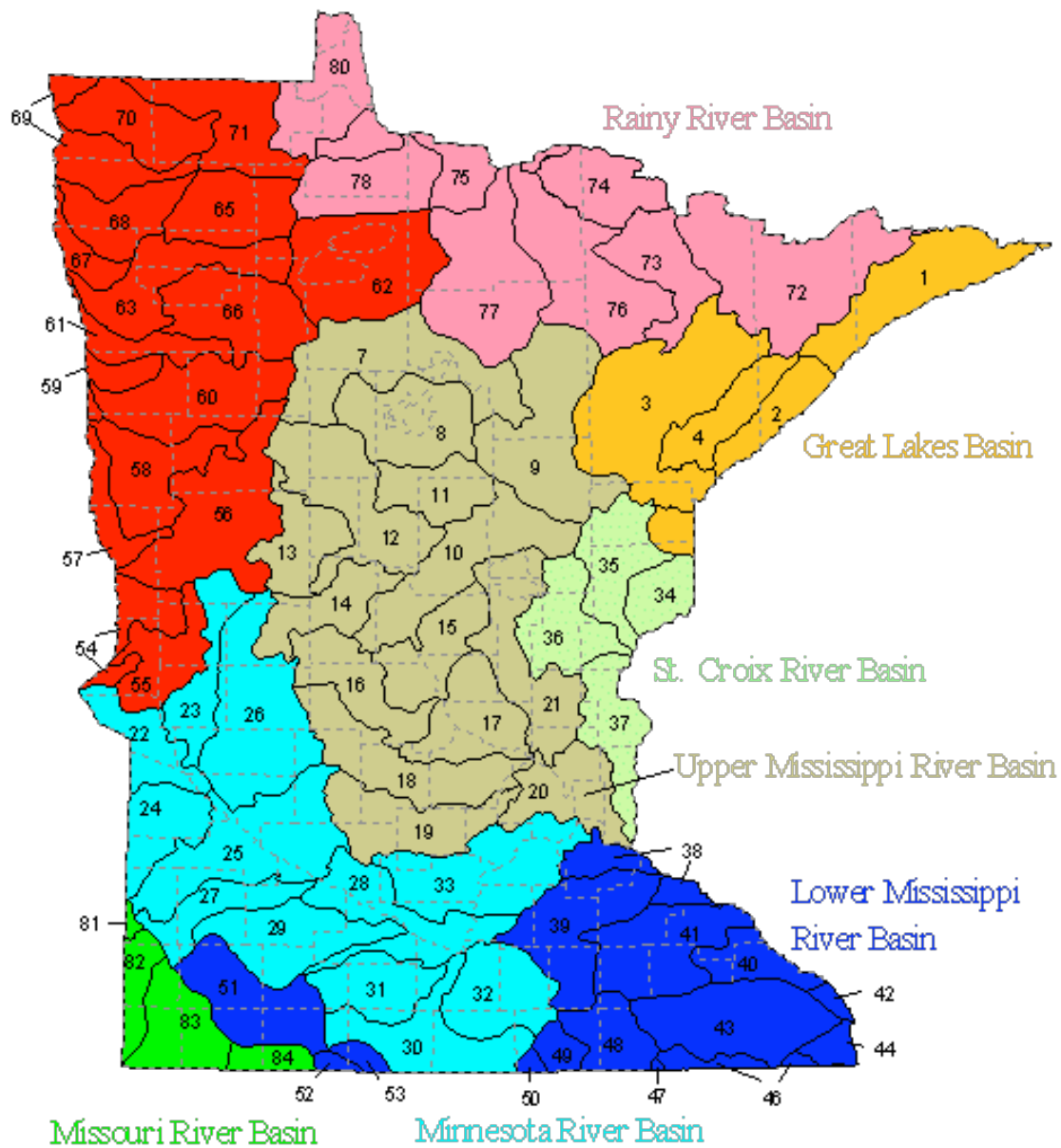
A watershed is the surrounding land flowing into a water body. The water body acts as a catch basin for the water flowing either off the surface of the land or from ground water systems. There are two primary factors defining the boundaries of watershed: gravity and landscape. Gravity simply pulls water downhill. And landscape is the shape of the hills or other features down which the water flows. For example, the tallest ridges of highlands in your area are the boundary for watersheds in your region. These highlands, being the highest elevation in a given locale, direct water flow downhill towards the valleys below. Each rivulet of rain or snowmelt follows its own unique course down the watershed, meandering into creeks, streams, or straight into a lake. Of course, some rain and snowmelt soaks into the ground, replenishing groundwater supplies, yet it is eventually headed for the same ultimate drainage basin. A watershed can be visualized as a large shallow bowl with an interconnected network of streams, both above and below ground, flowing towards a lake or river at the bottom. Watersheds can be considered on a variety of scales, and understanding them from the tiniest to the largest scale is essential to comprehending the significant impact our individual actions can have on a massive watershed system.

Eight major river basins comprise the three primary flow ways leaving the state (see map on next page). Taking a look at this map you can locate which river basin your home is within; yet, the state has been divided into far more watersheds. In 1979 the DNR developed a standardized set of Minnesota's watersheds. According to this model there are 81 major and 5,600 minor watersheds across the state. Therefore, your river basin might contain as many as 700 smaller watersheds. The rain and snowmelt leaving your land will travel through countless watersheds, starting with your nearest wetland, stream or lake.

Each watershed is defined by both its natural and artificial drainage systems, as well as all human-made infrastructures within that watershed. This is important to consider because our vast development of ditches, storm sewers and impervious surfaces significantly impact the

MAJOR BASINS AND WATERSHEDS OF MINNESOTA

Red River of the North Basin



flow, both quantity and quality, of water makeup of your watershed is paramount to system. While each small action might your most immediate watershed, and detriment of an immense system.

Understanding our watersheds is an natural resources. It provides us with the impacts. Many citizens and lake utilizing this tool as they develop effective management of their water management from a watershed perspective comprehensive approach for protecting

within each watershed. Understanding the understanding your role within that feel insignificant, it will quickly impact ultimately contributes to the health or

excellent tool for managing Minnesota's best model for input, output, and potential associations across the state have begun watershed associations and strive for more resources. Approaching water-resource is truly the most holistic and Minnesota's water resources.

Protecting Our Shorelines

Stormwater Runoff



Stormwater runoff is generally recognized as the single largest threat to water quality everywhere, whether in a rural or urban setting. Stormwater is the rain or snowmelt that doesn't percolate down into the ground, but runs across the surface and eventually ends up in lakes and rivers. The rain is not the problem—it's the pollution that rainwater picks up as it runs over manmade or paved (impervious) surfaces that eventually gets dumped into our lakes, streams and drinking water. Stormwater runoff alters the amount, quality and temperature of water in our rivers and creeks, and it fundamentally changes the natural circulation of water—the hydrologic cycle that most people learned in elementary school.

© Cate White 2005, Waterkeeper Alliance

Stormwater pollutants are as various as the properties from which they come. Ranging from soil sediment to thermal heat, runoff pollutants are the main cause of the decline of water quality in Minnesota's lakes and streams. Several common stormwater pollutants are found in Minnesota's water bodies—are any of these coming from your yard?

- **Sediment.** Sediment is considered everything from the soil dislodged by erosion, to metal or plastic particles from building materials collected by rain and snowmelt. Sediment runoff can be particularly prevalent near lake and stream banks experiencing significant development activity.
- **Nutrients,** such as phosphorus, often used to fertilize home gardens and lawns, are food for plants. But an over-abundance of nutrients in lakes promotes algae blooms and excessive weed growth, decreasing oxygen levels and impairing overall water quality. Nitrogen and other organic nutrients, such as grass clippings, leaf litter or landscaping materials, can also remove oxygen from lakes and streams as they decompose.
- **Hazardous chemicals** such as boat gasoline, motor oil, fertilizers, garden insecticides, paint, and pavement salts are poisonous for wildlife and aquatic vegetation.
- **Fecal bacteria.** Failing septic systems and pet waste from residential lawns contribute much of

the bacteria and viruses found in stormwater runoff.

- **Thermal pollution**, or increased water temperatures, causes significant harm in otherwise cold-water systems. Impervious (hard) surfaces absorb heat energy from the sun and transfer the warmer temperatures to water runoff entering nearby lakes and streams.
- **Trash**. Litter from the roads enters our creeks and streams.

Want to Know More?

- Minnesota Shoreland Resource Guide, “Minimizing Runoff From Shoreland Property”
www.shorelandmanagement.org/depth/bmp.pdf
- Minnesota Waters “Stormwater Runoff: Stop It From Reaching Our Lakes and Streams!”
www.minnesotawaters.org/documents/Stormwater%20Runoff.pdf

Everyday Actions

The following “Everyday Actions” are ways you can help reduce stormwater runoff into your lake. By putting even one “action” into practice around your lakeshore property, you will reduce stormwater runoff and help improve water quality and the eco-system of our lake.

► Everyday Action #1: Practice Lake/River-friendly Lawn Care

The fertilizers and clippings from traditional suburbanized lawns or shorelines contribute to poor lake water quality because they add grass borne nutrients to the surface waters. Once established, natural landscapes are less expensive and easier to maintain than traditional lawns.

- **Keep the native trees and vegetation** on your property; their extensive root systems help stabilize the landscape, aiding in groundwater recharge and reducing runoff.
- If you need or desire a lawn for recreation, strictly **use phosphorus-free fertilizers** and only maintain turf that is at least 30 feet from the lake.
- Mow often, and **leave grass clippings on the lawn** as a natural fertilizer. Use clippings as mulch, or compost all of your yard waste that might otherwise "fertilize" local waters.
- Use lawn and garden chemicals carefully and sparingly. Follow label directions.
- **Reduce use of pesticides** and weed killers by mulching, hand weeding and employing other organic methods.
- **Control pet and livestock waste**. This not only makes you a courteous neighbor, it also improves the quality of our waters. Dispose of such wastes far from the water’s edge to help ensure that bacteria, phosphorus and nitrogen from these wastes don’t end up in our lakes.

Want to Know More?

Minnesota Department of Natural Resources, “Landscaping with Native Plants”
651-296-6157; www.dnr.state.mn.us/gardens/nativeplants/index.html

► Everyday Action #2: Use Phosphorus-free Products

We hear a lot about phosphates and that they're bad for the environment. The reason they're particularly bad for water sources is because the nutrient—phosphorus—is what feeds algae, the slimy, stinking, bacteria-laden green mess we see on the lake water. While they are technically not plants, algae feed on phosphorus and grow by photosynthesis, so we can think of them as the tiniest plants in the lake. Algae can come in filamentous forms that grow in mats on top of the water.

Aquatic algae occurs naturally in Minnesota waters. It has lived here for hundreds of years in relative harmony with other native species. However, it wasn't until the impact of man and man's industries that it became the problem it is today. Excess algae can cause potential health risks from bacterial growth, clogging of water intakes, impaired drinking water quality, decline in lakeshore recreational quality, and property depreciation.

Phosphates come from a number of sources, such as agricultural and lawn fertilizer run-off, treated municipal wastewater, and failing septic systems—all of which are being flushed into our lakes. **The main household sources of phosphate are lawn fertilizer and the detergents formulated for automatic dishwashers** (containing up to 8% phosphate). In both applications the use of phosphate is unnecessary.

Ordinary people, like us, can make a daily impact in reducing the amount of phosphate in our waters.

- **Use only phosphate-free dishwasher detergents.** Several brands are available in local markets. They perform as well or better than the most popular phosphate containing brands. In some markets they are displayed in a separate eco-friendly and/or organic product section.
- Use lawn and garden chemicals carefully and sparingly. **Use only phosphate-free lawn fertilizer:** The middle number of the formula must be zero (e.g. 15-0-5 or 20-0-6). Follow label directions carefully.

Want to Know More?

Partnership for Phosphate reduction's list of phosphate-free products

http://www.dcpfosphatefree.org/phosphate_free_products.html

The EPA's list of earth-friendly products

<http://www.epa.gov/dfe/pubs/projects/formulat/formpartc.htm#ccleaners>

► Everyday Action #3: Use Rain Barrels

Residential water use increases 40 – 50% during summer months due to our outdoor water use. A rain barrel can be used to collect rainwater from rooftops for use on lawn and plants during dry periods. Rain barrels can also be arranged to slowly release the collected rain fall to areas that can soak up the water, reducing stormwater runoff and increasing groundwater recharge. The use of rain barrels is a good way to reduce your water or power bill, while reducing stormwater runoff into the lake.

Benefits of Rain Barrels

- Rain barrels **conserve water and help lower costs** (a rain barrel can save approximately 1,300 gallons of water during peak summer months).
- Rain barrels **reduce water pollution** by reducing stormwater runoff, which can contain pollutants like sediment, oil, grease, bacteria and nutrients.
- Rain barrels are **inexpensive** and easy to build and install.

When installing your rain barrel, you'll need to remove the existing downspout and elbow (and keep for reinstallation in the late fall). Then add another downspout section that will need to be custom cut to an appropriate height above your rain barrel. Two, connected downspout elbows (forming an S shape) or hinged extension should sit about two inches above the rain barrel inlet hole. Install fine mesh screen over any openings in the rain barrel to prevent mosquitoes and to trap debris.

The rain barrel should be installed on top of blocks or a wooden crate to make it easier to distribute the water (using a hose or watering can). Rain barrels should be drained and removed for the winter months to prevent ice damage.

Ready-made rain barrels range from \$89 and up, depending on size, style and added features. For local suppliers, inquire at your local home and garden supply store, garden center, nursery, or hardware store; or search the Internet for "rain barrels".

Want to Know More?

How to build and install a rain barrel

<http://www.uri.edu/ce/healthylandscapes/howtorainb.html>

or http://www.cwp.org/Resource_Library/Center_Docs/Residential/rainbarrelgarden.pdf

Safe use of rain barrel water in the vegetable garden

<http://www.uri.edu/ce/healthylandscapes/Rain%20barrel%20bro.pdf>

► Everyday Action #4: Minimize Impervious Surfaces

Pervious surfaces (also known as porous or permeable surfaces) allow water to percolate into the soil to filter out pollutants and recharge the water table. Impervious/impermeable surfaces are solid surfaces that don't allow water to penetrate, forcing it to run off. Impervious surfaces include asphalt, concrete, stone, class five driveways, brick or concrete pavers; pervious surfaces include planting beds, mulched beds, gravel, permeable pavers, and turf.

Large expanses of impervious surfaces cause a host of problems on the environment:

- **Pollution of surface water.** When contaminated stormwater runs off impervious surfaces, it flows directly into rivers, lakes, and wetlands, generating problems for biodiversity as well as public health.
- **Flooding of surface water and erosion of stream banks.** Large expanses of impervious surfaces contribute excess runoff during periods of heavy rainfall. This sudden influx of runoff into rivers can cause flash flooding and erosion of stream banks.

- **Water table is not adequately recharged.** Because impervious surfaces send rainwater into storm drains rather than allow it to percolate down to our aquifers, groundwater may be used faster than it is recharged.
- **Formation of stagnant water puddles.** On impermeable surfaces where runoff has no drainage route, stormwater can puddle for long periods of time. Stagnant puddles can become breeding places for undesirable insects such as mosquitoes and collect nutrients.
- **Heat island effect.** Due to the heat-absorbing quality of asphalt and other paving materials, sites with high ratios of impermeable surfaces **increase ambient air temperatures** and require more energy for cooling.

Roofs, sidewalks, paved driveways and roads all increase the amount of water that runs off into our lakes—carrying fertilizers, household cleaners, paints, solvents, pesticides and motor oil. Decrease the amount of hard surfaces in your yard so water can soak into the landscape and keep pollutants out of lakes. Rain gardens (keep reading for information on these), rain barrels (see previous section), and using more pervious materials such as mulch, gravel, straw, or permeable pavers for sidewalks, driveways and patios will increase permeable areas. Other ideas to consider are:

- **Green roofs.** A green roof is a specially-engineered rooftop that supports plant materials and retains rainwater. Green roofs have been utilized in Europe for centuries and are quickly gaining popularity in both urban and rural landscapes in the United States.
- **French drains.** French drains are ditches filled with gravel or rock used to capture stormwater and direct its flow. They can be utilized on the downslope side of impervious surfaces to move runoff to an area where it can infiltrate the soil.

Want to Know More?

University of Delaware Cooperative Extension's "Permeable vs. Impermeable Surfaces" http://ag.udel.edu/udbg/sl/hydrology/Permeable_Impermeable_Surfaces.pdf

University of Delaware Cooperative Extension's Hydrology – Sustainable Landscapes <http://www.ag.udel.edu/udbg/sl/hydrology.html>

► Everyday Action #5: Practice Low Impact Boating

Imagine moving swiftly enjoying the early wooded lakeshore, an morning's first early easily amidst the rich cattails and bulrushes. sailing across the lake, light waves softly the feel of the wind across the water,



across the water, morning quiet of the occasional call of bird risers, cruising aquatic environment of Or picture yourself noticing the sounds of splashing on the hull, gently gliding the boat working with the power

of the natural elements to effortlessly guide the boat along. These experiences are difficult and often impossible when using motorized watercraft, but easily accomplished in kayak, canoe or sailboat. Utilizing non-motorized watercraft offers boaters the opportunity to experience their favorite lake from a different vantage point. Give it a try—you might find the experience you've been craving.

But of course, there are many excellent uses for our motorized watercraft, offering their own unique boating opportunities, which can be conducted in lake-friendly fashion. When using slow-no-wake or low impact boating there are far more opportunities for excellent angling, birding, or simply peaceful excursions. And perhaps most importantly, low impact boating will help preserve these opportunities for everyone, including generations to follow. Before your next voyage peruse these guidelines as a refresher on some of the most effective low-impact boating practices.

- **Keep your boat properly trimmed.** An engine in the water makes much less noise, creates less wake and prevents erosion.
- **Keep your engine well-tuned.** It will run more efficiently, pollute less and be quieter.
- **Try an electric motor.** It's almost silent and virtually pollution-free.
- **Observe state regulations** and be aware of individual, lake-specific restrictions.
- **Slow down.** Boating slowly makes less wake, less noise, reduces pollution and is less disruptive to wildlife and other people; plus, you'll see more and enjoy the lake longer. It also decreases the amount of nutrient-rich lake-bottom sediment that is stirred up into the lake, where it fuels algae growth.
- When using a motor, **stay out of shallow areas** where a churned bottom can stir up nutrients, adversely affect water quality, and disrupt vegetation and fish spawning grounds.
- Be observant and **give wildlife a respectful berth.**
- **Stay 200 feet away from loons** and view them with binoculars or a spotting scope.
- **Consider the size of your boat** and motor when choosing a lake. Smaller ponds are not appropriate for large boats or engines.
- Remember that **swimmers, canoeists, kayakers, sailboats, sailboards** and other non-motorized users always **have the right-of-way.**
- Minnesota law requires when going faster than headway speed (5 mph), boaters **stay at least 150 feet from shore**, swimmers and other boaters.

- Minnesota law requires all Personal Watercrafts must **travel at slow-no wake speed** (5 mph or less) within 150 feet of non-motorized vessels, shore or docks. PWCs must also travel at slow-no wake speed when passing through emergent or floating vegetation.
- Operation of personal watercraft is permitted only **between 9:30 AM and one hour before sunset**.

~ Excerpted from *New Hampshire Lakes Association*; http://www.nhlakes.org/ed_low_imp_boat.htm

► **Everyday Action #6: Prevent the Spread of Aquatic Invasive Species (AIS)**

How do you describe a condition where harmful polluting agents spread rapidly to new lakes and rivers, are self-replicating and cannot be treated effectively or eradicated once they have been introduced? Minnesota Waters calls this condition an Aquatic Epidemic, or an “Aquademic.”

Minnesota Waters believes the current Aquatic Invasive Species (AIS) aquademic is a defining ecologic, economic and social crisis in our state. Although education, awareness and voluntary actions have greatly increased Minnesotans’ knowledge of AIS—and prompted some positive action to prevent their spread—more must be done. To beat them, we will need to make equally serious investments and cultural changes. To learn more about Minnesota Waters AIS position and recommendations, visit: www.minnesotawaters.org.

Three common invasive

□ **Eurasian watermilfoil**

Eurasian watermilfoil was introduced to North America from Europe. It spread westward to inland lakes primarily in the 1950s and 1980s.

Eurasian watermilfoil has established in lakes with populations of native plants. In some lakes the plant appears to coexist with native flora and has little impact on fish and other aquatic animals. In nutrient-rich lakes it can form thick underwater stands of tangled stems and the water's surface. In shallow areas the plant can interfere with water recreation such as boating, fishing, and swimming. The plant's floating canopy can also crowd out important native water plants.



Eurasian watermilfoil typically has 12 to 21 pairs of leaflets. The native northern watermilfoil, with which it is often confused, usually has 5 to 9

species include:

(Myriophyllum spicatum) accidentally introduced to Europe. Spread westward by boats and waterbirds, it reached between the 1950s and

difficulty becoming well-established plants. In some lakes the plant can form thick underwater vast mats of vegetation at shallow areas the plant can recreation such as boating, The plant's floating canopy

A key factor in the plant's success is its ability to reproduce through stem fragmentation and runners. A single segment of stem and leaves can take root and form a new colony. Fragments clinging to boats and trailers, or tangled in propellers and jet pump in-takes, can spread the plant from lake to lake. The mechanical clearing of beaches, docks, and landings creates thousands of new stem fragments. Removing native vegetation creates perfect habitat for invading Eurasian watermilfoil.



is its ability to reproduce through stem fragmentation and runners. A single segment of stem and leaves can take root and form a new colony. Fragments clinging to boats and trailers, or tangled in propellers and jet pump in-takes, can spread the plant from lake to lake. The mechanical clearing of beaches, docks, and landings creates thousands of new stem fragments. Removing native vegetation creates perfect habitat for invading Eurasian watermilfoil.

□ **Curly-leaf pondweed**

Curly-leaf is a submersed aquatic plant that generally grows from the shore in 3–15 feet of water. Curly-leaf tolerates low water clarity and will readily invade disturbed areas. In spring, curly-leaf pondweed can form dense mats that may interfere with boating and other recreation on lakes. Curly-leaf also can cause ecological problems because it can displace native aquatic plants.

(Potamogeton crispus)

In midsummer, curly-leaf results in rafts of dying plants often is followed by an undesirable algal blooms. Like abundance of curly-leaf varies environmental conditions, such as winter snow depth, and spring water clarity, which can effect its growth.

Curly-leaf pondweed is similar in appearance to many native pondweeds commonly found in

plants usually die back, which piling up on shorelines, and increase in phosphorus and other aquatic vegetation, the from year to year depending on

Curly-leaf pondweed leaves are somewhat stiff and crinkled, approximately ½-inch wide and 2 to 3 inches long; leaves are arranged alternately around the stem, and become more dense toward the end of branches. It has small "teeth" visible along the edge of the leaf; begins growing in early spring before most other pondweeds; and dies back during midsummer. The flower stalks, when present, stick up above the water surface in June; appears reddish-brown in the water, but is actually green when pulled out of the water and examined closely. Curly-leaf pondweed is easily confused with claspingleaf pondweed, which has leaves with no "teeth" around their edges.

Like Eurasian watermilfoil, curly-leaf pondweed is not native to the United States and often causes problems due to excessive growth. When control is necessary, herbicides and harvesting can be effective. Grants are available for control efforts on a lake-wide basis.

□ **Zebra mussel** (*Dreissena polymorpha*)

Zebra mussels and the Quagga fingernail-sized to solid surfaces in to 1-½ inches long yellow and mussels can



Zebra mussels are small, D-shaped, fingernail-sized aquatic animals.

a related species, mussel, are small, animals that attach water. Adults are ¼

These develop into

and have D-shaped shells with alternating brownish colored stripes. Female zebra produce 100,000–500,000 eggs per year. microscopic, free-living larvae that begin to

form shells. After 2–3 weeks, the microscopic veligers start to settle and attach to any firm surface using "byssal threads." It is the only freshwater mussel that can attach to objects. They are native to Eastern Europe and Western Russia and were brought over to the Great Lakes in ballast water of freighters. Populations of zebra mussels were discovered in the Great Lakes around 1988.

Zebra mussels can cause problems for lakeshore residents and lake users. Homeowners that take lake water to water lawns can have their intakes clogged. Mussels may attach to motors and possibly clog cooling water areas. Shells can cause cuts and scrapes if they grow large enough on rocks, swim rafts and ladders. Anglers may lose tackle as the shells can cut fishing line. Zebra mussels can also attach to native mussels, killing them. Zebra mussels filter plankton from the surrounding water. This filtering can increase water clarity, which might cause more aquatic vegetation to grow at deeper depths and more dense stands. If a lake has high numbers of mussels over large areas, this filter feeding could impact the food chain, reducing food for larval fish.

Zebra mussels have spread throughout the Great Lakes and the Mississippi River from Brainerd downstream, and are now in other rivers and inland lakes. They are established in Minnesota and were first found in the Duluth/Superior Harbor in 1989. Diving ducks, freshwater drum (sheepshead), and other fish eat zebra mussels, but will not significantly control them.

Since mussels attach to boats, nets, docks, swim platforms, and boat lifts, they can be moved on any of these objects. They also can attach to aquatic plants, making it critical to remove all aquatic vegetation from your boat before leaving a lake. Microscopic larvae may be carried in water contained in bait buckets, bilges or any other water moved from an infested lake or river. Examine boat hulls, swimming platforms, docks, aquatic plants, wood and other objects along shorelines of lakes and rivers.

Zebra mussels are a prohibited invasive species (DNR), which means import, possession, transport, and introduction into the wild is prohibited.

Infested Lakes and Rivers in Minnesota

The Minnesota DNR designates and identifies *infested waters*. Water bodies are designated infested if they contain invasive species that could spread to other waters if activities are not regulated, and where the risk of spread to an uninfested waterbody through such activities is

high. Find the current Infested Waters List at: http://files.dnr.state.mn.us/eco/invasives/infested_waters.pdf

Aquatic Invasive Species Management

The Minnesota Department of Natural Resources' (DNR) Invasive Species Program is responsible for preparing a long-term plan for the statewide management of invasive species of aquatic plants and animals. The DNR is coordinating invasive species management efforts within the state, and establishing priorities for prevention, management, and research.

Aquatic plants growing in public waters are owned by the state. The Minnesota DNR's Aquatic Plant Management Program requires permits for controlling, planting, or destroying aquatic plants and other organisms in public waters and public waters wetlands. The Minnehaha Creek Watershed District (MCWD) does not have authority to issue permits for aquatic plant management. The two most common ways to control aquatic plants are mechanical control (to cut or pull by hand or with equipment such as rakes, cutting blades, hand-operated, or motorized trimmers) and herbicide treatment (use plant-killing chemicals that are applied in liquid, granular, or pellet form). Improperly applied herbicides will kill native vegetation. Both require DNR permits. All plants that are mechanically controlled must be removed from the lake. To reduce human exposure to chemicals, temporary wateruse restrictions are imposed in treatment areas whenever herbicides are used. Only herbicides labeled for aquatic use are allowed, and any herbicide use requires a DNR permit. Using a herbicide without a DNR permit is a misdemeanor, punishable by a fine of up to \$700.

Aquatic invasive species **found** in the Minnehaha Creek Watershed include:

- Eurasian Watermilfoil
- Curlyleaf Pondweed
- Purple Loosestrife

Aquatic invasive **species of concern** (not yet known to exist in the Minnehaha Creek Watershed) include:

- Zebra mussel
- Spiny water flea
- Bighead carp

~Excerpted from: http://www.minnehahacreek.org/documents/AquaticinvasivespeciesMCWD_000.pdf

For more information on Aquatic Invasive Species Management and Prevention:
Minnesota DNR <http://www.dnr.state.mn.us/eco/invasives/index.html>

Stop Aquatic Hitchhikers!

If you are a water recreationist—boater, angler, water-skier, sailor, or canoeist—there are some important things you can do to prevent the transport of harmful invasive species from one lake or river to another. In Minnesota it is illegal to transport prohibited invasive species.



STOP AQUATIC HITCHHIKERS!

Prevent the transport of nuisance species.
Clean all recreational equipment.
www.ProtectYourWaters.net

- Inspect** your boat, trailer, and equipment and **remove** visible aquatic plants, animals, and mud before leaving the water access.
- Drain** water from your boat, motor, bilge, live wells, and bait containers before leaving the water access.
- Spray, rinse or dry** boats and recreational equipment to remove or kill species, such as microscopic zebra mussel veligers, that were not visible when leaving a waterbody. Before transporting to another water:
 - Spray/rinse with high pressure, and/or hot tap water (above 120° F), especially if moored for more than a day; or
 - Dry for at least 5 days
- Dispose** of unwanted bait and other animals or aquatic plants in the trash.
- Report** new sightings of aquatic invasive species. If you suspect a new infestation of an invasive plant or animal, save a specimen and report it to a local natural resource office.

~ Extracted from The Minnesota Department of Natural Resources <http://www.dnr.state.mn.us/invasives/preventsread.html>

► **Everyday Action #7: Restore Your Shoreline to a “Natural” Condition**

Preserving or installing a shoreline landscape that is rich in native species allows water to soak in, rather than run off. Plants absorb nutrients that would otherwise flow into the lake, causing algae blooms and excessive aquatic vegetation growth. Vegetative buffers, un-mowed areas of land between a lawn and the shoreline, also trap sediments that fill in wetlands and lakes. A vegetation buffer might be planted with native plants, or it can simply be an untouched area left to grow naturally.

The benefits of vegetation buffers are:

- Stabilize the shoreline and reduce erosion.** Vegetation buffers help protect water quality by reducing stormwater runoff and nutrients that enter the water. Roots of native plants run deep, helping to stabilize the shoreline by holding the soil together. A vegetation buffer of native plants is an effective, attractive alternative to rip rap (a collection of stones used as an embankment) or

retaining walls, which fail to reduce runoff, hold soil together or provide habitat.

□ **Reduce runoff.** Unlike the shallow, compacted roots of turf grass, which allow little water to penetrate the soil and instead cause water to run off into lakes and rivers, the deep roots of native plants and grasses allow water to filter down into the ground. These plants also help remove nutrients and pollutants from the ground by taking them up through their roots and absorbing them, thereby reducing the amount that reaches lakes, rivers and streams.

□ **Provide habitat.** Vegetation buffers planted with native plants provide a diverse habitat for butterflies, birds and other wildlife. On the flip side, buffers can also act as a deterrent for unwanted wildlife such as geese, which prefer the open areas of lawns. Also, keep native aquatic plants; they're critical life-support systems for our lakes. With their amazing filtering abilities, native aquatic plants such as cattails and bulrush are natural water purifiers, taking up nutrients and allowing sunlight to penetrate into the lake and create the base of the food chain. The rooted aquatic vegetation is also a veritable fish nursery, which provides critical refuge habitat for young fish.

□ **Easy maintenance.** One of the best strategies for maintaining a vegetated buffer is to just leave it alone. Native plants have adapted to the conditions around them, so they require little maintenance such as watering, weeding, fertilizing or mowing.



Create a Vegetated Buffer

The easiest way to create a vegetated buffer is to select an area along the shoreline, stop mowing, raking or weeding and just let the vegetation grow naturally. Shoreland buffers should be at least 15 feet deep to effectively reduce runoff from reaching the water body.

In some areas you might choose to restore the shoreline to a natural habitat by planting native vegetation. Native plants enhance a vegetation buffer in ways that non-native plants do not. For example, they better endure changes in temperature and precipitation levels; they often spread more rapidly and consistently, forming a denser mass of roots with which to filter runoff; and they tend to require little or no fertilization and other maintenance.

Before starting a landscaping project, research local ordinances and permitting processes to make sure you follow them. Call your local soil and water conservation district, county, city, or township office with questions about rules and regulations.

Learn what you can and cannot do on or to the lake and lakeshore. It is unlawful in Minnesota to knowingly alter shoreline, fish habitat or aquatic vegetation without a permit from the DNR.

Want to Know More?

Minnesota Shoreland Best Management Practices, "Naturalizing Your Shoreline"
612-625-9256; www.shorelandmanagement.org/quick/faqpdf/nsfaq.pdf

Minnesota Department of Natural Resources, “Natural Buffers and Lakescaping”
651-259-5700; http://files.dnr.state.mn.us/publications/waters/shoreline_alterations_lakescaping.pdf

The University of Minnesota Extension Service’s full list of Minnesota native plants www.extension.umn.edu/distribution/horticulture/components/7447z.pdf

Minnesota Department of Natural Resources, list of native plant nurseries
www.epa.gov/greenacres/nativeplants/factsht.html#Native%20Plant

► **Everyday Action #8: Plant a Rain Garden**

A rain garden is a shallow, depressed garden planted with vegetation designed to absorb stormwater or water runoff. By collecting water that runs off from impervious, man-made surfaces, rain gardens reduce the pollution entering our lakes and rivers, and help protect water quality.

A rain garden can be built anywhere stormwater runoff occurs. Rain gardens do not require a lot of space, money, or professional landscaping expertise. With the right instructions, plants and some expert resources, you can build one yourself.

The Benefits of a Rain Garden

- **filters runoff pollutants** such as fertilizers, sediments and pesticides
- **absorbs 30% more water** than turf grass lawns
- **recharges groundwater**
- **helps prevent flooding**
- **creates habitat for birds and butterflies**
- **reduces mosquito breeding**

Create a Rain Garden

Create your shoreland buffer using some of these trees, shrubs, grasses, and flowers considered native to Minnesota:

- American hazelnut
- American highbush cranberry
- big bluestem
- black eyed Susan
- blazing star
- blue false Indigo
- bur oak
- gray goldenrod
- interrupted fern
- lake sedge
- little bluestem
- mountain ash
- prairie smoke
- red osier dogwood
- showy goldenrod
- showy sunflower
- sky blue aster
- switchgrass
- Virginia bluebells
- wild columbine
- wild prairie clover
- wild geranium
- white oak
- wild plum
- wild rose
- white waterlily
- yarrow

The most important factors in building a rain garden are location, type of soil, size and shape, suitable plants, and maintenance.

□ **Do not plant rain gardens in a wet area.** There needs to be 3 feet of separation between the bottom of the rain garden basin and the water table. If it is less than that, move your rain garden to a different location.

□ **Do not plant your rain garden over septic systems,** near walls, or over underground utilities. Before you do anything, be sure to call Gopher State One Call at (800) 252-1166 to check for underground utility cables, pipelines, or anything else that may be buried underground.

□ **Place your rain garden at least 10 feet away from a house** or other building.

□ Since the goal is to have your rain garden collect and filter runoff, **build it in a spot where it can catch the water running downhill** from roofs, gutters, downspouts, sump pump outlets, sidewalks, driveways or other paved surfaces.

□ The soil in a rain garden must drain well so that water does not stand on the surface or run off. **Modify unsuitable soil by adding compost,** which works over time to loosen the soil and make it more absorbent. If a soil is too wet, sand or gravel may also be added. Another option is to replace the soil with a rain-garden soil mix. The ideal rain garden mix is 50–60% sand, 20–30% topsoil, and 20–30% compost.

□ A rain garden **should be one-third the size of the area from which it is receiving drainage.** For example, if the rain garden will be receiving runoff from your backyard, and your backyard is 540 square feet, then the rain garden should be approximately 180 square feet or 10' x 18'.

□ Rain gardens can be designed in any shape, but they **should be twice as long as they are wide** in order for the water to spread evenly over the whole bottom. Typically a kidney or oval shape is used.

□ **Select perennials to provide consistent ground cover,** as opposed to annuals which need to be replanted every year. Choose plants appropriate for your soil type that can tolerate both drought and wet conditions. Place drought-tolerant plants on the edges or berms of your rain garden, and place wet-tolerant plants closer to the middle of the rain garden. Native perennial plants are the best choices for rain gardens as they adapt to the climate. Recommended rain garden plants for Minnesota include blue flag iris, marsh milkweed, big bluestem, sedges, red twigged dogwood and buttonbush.



□ Be vigilant about pulling weeds in the first year so that they do not compete with young plants. **Water the rain garden twice a week if rain is not doing the job.**

□ Don't use chemical herbicides or any kind of fertilizers in your rain garden. **Mulch heavily with weed-free, untreated material like leaves, wood chips or rocks.**

□ **In the fall, cut back or mow down plants** in the rain garden in order to help them re-start in the spring.

Want to Know More?

University of Wisconsin Extension Water Resources Education, “Rain Gardens: A How-to Manual for Homeowners”; www.clean-water.uwex.edu/pubs/pdf/home_rgmanual.pdf

University of Minnesota Extension, “How Can I Create a Rain Garden?”
800-876-8636; www.extension.umn.edu/distribution/naturalresources/components/DD8241_4.pdf

Rain Gardens of West Michigan, “Rain Gardens: How to Design and Construct a Successful Professional Rain Garden”
616-454-RAIN or 616-451-3051; www.raingardens.org/docs/rain_garden_factsheet.pdf

The Minnesota DNR’s informative article on rain gardens www.dnr.state.mn.us/volunteer/mayjune04/raingardens.html

► **Everyday Action #9: Protect and Enhance Wildlife Habitat**

Waterfront property is biologically diverse ... from wet meadows, hardwood forests, and bogs, to fish, birds, reptiles and insects. Up to twice the number of wildlife species can be found near the shore as in upland areas. Those of us living on the shore can play an important role in maintaining this rich diversity of living things.

For many, the presence of wildlife is an important part of daily life. If you regard living with wildlife as an important part of your life, plan your land development accordingly. Manicured lawns, removing trees and piling sand on the shore will all discourage wildlife from your property. The songbirds, spring peepers and turtles will favor less-developed lots or will disappear altogether. To attract the wildlife you cherish, preserve as much of the natural plant community as possible. Consider replacing a large lawn with native vegetation and winding walking paths.

Landscaping for Wildlife

One of the goals of landscaping for wildlife is to create a natural buffer zone and travel corridor between your home and the water’s edge. Within the buffer areas are near-shore waters where vegetation grows. In addition to vegetation, you may consider providing things such as bird houses, brush piles and water sources. Follow these guidelines when landscaping for wildlife:

- Provide the four basic needs for wildlife: food, water, shelter and living space.** Needs vary from season to season.
- Consider the function of plants and structures.** Will it provide food, secure nesting cover or shelter from storms?

- **Plant or retain a variety of trees, shrubs and ground cover of different heights** to encourage many species of birds and wildlife.
- **Plan habitat restoration** to maximize usefulness to wildlife (e.g. food should be near cover).
- **Connect adjoining habitats** rather than scattering patches of food, cover and water.
- Design the landscape to **protect wildlife from avoidable hazards** such as cats, windows, or chemical applications.
- **Use native plants and seeds** and match them to local climate and site conditions.
- **Test soils and evaluate moisture** and sunlight at each site to determine which plants will flourish.

Important Plants for Wildlife

Conifers	balsam fir, common juniper, eastern red cedar, tamarack, white spruce, black spruce, jack pine, red and white pine, eastern hemlock
Grasses & Legumes	big bluestem, little bluestem, sideoats grama, switchgrass, native clovers, American vetch
Butterfly/Bee/Moth Plants	birches, aspens, pussy willow, blackberry, meadowsweet (Spirea), weigela, dill, aster, marigold, sweet William, petunia, black-eyed Susan, sweet pea, nasturtium, verbena, marjoram, savory, zinnia, yarrow, columbine, pearly everlasting, milkweed, sedges, wild carrot, purple coneflower, fireweed, sunflower, lupine, daffodil, peony, goldenrod, vetch
Hummingbird/Oriole Plants	coralberry, weigela, fuschia, touch-me-not, petunia, hollyhock, columbine, delphinium, foxglove, wood lily, tiger lily, cardinal flower, phlox
Winter Plants	hackberry, sumac, highbush cranberry, cockspur hawthorn, crabapple
Acorn & Nut Plants	hickory, American and beaked hazel, oaks, black walnut, American chestnut

► **Everyday Action #10: Know the Shoreland Regulations**

When undertaking any kind of building project, permits are required. Land alteration affects the rate, volume, and quality of surface water runoff which ultimately must be accommodated by the existing surface water systems within the Minnehaha Creek Watershed District. The watershed is large—180 square miles—and its outlet, Minnehaha Creek, has limited capacity to carry flows. Flooding problems already occur in the urbanized areas of the District along Minnehaha Creek, and on Lake Minnetonka shoreland.

Projects which increase the rate of stormwater runoff can aggravate existing flooding problems and contribute to new ones. Projects which fill floodplain or wetland areas can aggravate existing flooding by reducing flood storage and hydraulic capacity of waterbodies, and can degrade water

quality by eliminating the filtering capacity of such areas. Dredging projects can also degrade water quality and eliminate the natural appearance of shoreland areas.

If you are undertaking any of the following projects, consult MCWD's "Does your project require a permit?" (www.minnehahacreek.org/permit_req.php) before proceeding:

- Building a house, large addition, or driveway**, and structure setbacks
- Installing landscaping**, disturbing the land, clearing vegetation, creating a large stockpile of soil, dredging
- Planning a project** near a lake, stream, river or wetland
- Planning a project to riprap, bioengineer or landscape your eroding shoreline
- Installing a sandblanket beach** on your shoreline
- Building a retaining wall** or boat dock
- Placing or replacing a culvert or bridge** at a stream crossing
- Ice ridge alteration**

Regulatory Matters

When it comes to water and shoreland management, it can be confusing to know what agency or local government unit (LGU) to contact and who has regulatory authority over which shoreland activities. In general, it depends on what the activity is—from removing aquatic vegetation to installing septic systems, and every shoreland activity in between, there are multiple entities managing and enforcing the laws that govern these activities.

Local government units are general-purpose political subdivisions of a state, such as counties, cities, townships, towns and villages. Supplementing these forms of local government are special district government bodies: independent, limited-purpose governmental units that usually perform a single function or activity, such as watershed districts and soil and water conservation districts.

What is the Shoreland Zone?

The shoreland zone is the land within 1,000 feet of a lake and 300 feet of a river or stream.

Who has regulatory authority?

The Minnesota Department of Natural Resources has regulatory authority of activities or actions that take place below the ordinary high water level (OHWL) of a lake or river. Local government units have regulatory authority of activities or actions that take place above the OHWL.

What is Ordinary High Water Level (OHWL)?

According to the Minnesota DNR, the ordinary high water level is the highest water level that has been maintained long enough to leave evidence on the landscape. Commonly, the OHWL is the point where natural vegetation changes from predominantly aquatic to predominantly terrestrial. For lakes and rivers, the OHWL is the elevation of the bank of the channel.

When should I contact the LGU?

If you're proposing shoreland activities dealing with any of the projects listed on the previous page that occur above the OHWL, contact the appropriate LGU. You may need a permit.

Want To Know More?

To learn more about the missions and activities of each state agency and LGU that plays a role in managing Minnesota's water resources, visit www.minnesotawaters.org and click on: What We Do; Support; and Building Effective Groups Resources. The document is titled: State and LGU Water Missions and Activities.

Minnesota DNR "Water Permits Answers"
www.dnr.state.mn.us/permits/water/answers.html

Minnesota North Star (click on the link on the left hand side of the page for Local Government or State Government)
<http://www.state.mn.us/portal/mn/jsp/content.do?id=-8494&agency=NorthStar>

► Everyday Action #11: Practice Low Impact Development

Low Impact Development (LID) is an innovative, ecosystem-based approach to land development and stormwater management. The LID philosophy is modeled after nature: Manage rainfall at the source. LID's goal is to mimic a site's natural hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source, resulting in a "hydrologically functional" landscape and a protected watershed.

The basic principles of Low Impact Development are:

□ Conserve natural areas

Natural areas are key for stormwater management, and their protection will help maintain the ecological integrity of the site.

□ Minimize development impacts

Impervious surfaces can be reduced by minimizing road widths, shrinking parking lots, and building footprints, decreasing setbacks. Storm pipes, curbs, and gutters can also be reduced significantly. During development, preservation of sensitive soils, minimizing grading and lot disturbance help maintain the site's ecological integrity.

□ Maintain site runoff rate and control small storms

Maintaining the natural runoff rate from a site protects receiving waters, such as stream channels and wetlands, as well as the fish and wildlife habitat they provide. The goal is to maintain the historic, pre-developed volume, rate, frequency, and duration of stormwater discharges so that discharges are not excessively high during wet winter months or excessively low during dry summer months. Techniques include maintaining natural flow paths, using open drainage instead of closed (pipe) systems, flattening slopes, dispersing drainage, lengthening flow paths,

maximizing sheet flows, and saving headwater areas.

☐ **Use integrated management practices (control volume and pollutant loads)**

Instead of conveying stormwater and treating it in large, costly end-of-pipe facilities located at the bottom of drainage areas, LID addresses stormwater through small, cost-effective landscape features strategically distributed throughout the site. This includes not only open space, but also rooftops (green roofs), streetscapes (rain gardens), parking lots (porous surfaces), sidewalks (tree filter boxes), and medians (vegetated swales).

☐ **Implement pollution prevention, proper maintenance, and public education programs**

Individuals and groups that are responsible for maintaining LID facilities should receive educational brochures and other materials, and have access to workshops, so that they know their responsibilities and have the knowledge to carry them out.

Want To Know More?

The Conservation Design Scorecard, a project of 1000 Friends of Minnesota, can raise the bar for future Conservation Design developments that are put on the ground. This scorecard is intended to be used by planners, planning commissions, local officials, developers, conservation professionals, and citizens – the very people who helped create it. Learn more and access the Scorecard at: www.1000fom.org/growing/lakes/conservation-design-scorecard.

► Everyday Action #12: Practice Responsible Vehicle Care

In general, vehicles contribute much to the pollutants in the environment, and those that end up in our lakes, rivers and streams via stormwater runoff. Minimize your vehicle's impact by observing the following:

- ☐ **Collect motor oil and engine coolant for recycling.** Seal well and take to a recycling center.
- ☐ **Keep cars tuned up** and in good operating condition. Check for oil drips often.
- ☐ Store fuels and other chemicals carefully. Check containers regularly for leaks. **Clean up fuel or oil spills immediately.**
- ☐ **Use car wash facilities, rather than your driveway,** because their wastewater goes into the sanitary sewer for treatment. Keep your car off the grass to avoid compacting soils.
- ☐ **Walk, bike, or take the bus** whenever possible. 🍷

History of Our Lakes

A Brief History of Minnesota's Water Resources

In the twenty-year period prior to 1865, Minnesota became the home of about 265,000 people who chose to live on the frontier. They traveled to Minnesota from as far away as the eastern states and as nearby as neighboring Wisconsin and Iowa. A few arrived directly from the Old World. Often several families made the journey together, bringing with them their worldly possessions, including household goods and livestock. Some had saved money for as long as three years before they had enough to pay their way west. Others arrived with little in their pockets. Among the pioneers were future leaders in government and politics, agriculture, lumbering, milling, banking and newspapering. Far more numerous were those whose role was to build Minnesota with hard work and little fanfare. ~ from *A History of Minnesota* by William W. Folwell, 1961.

In the mid-1860s, railroads linked Minnesota with the outside world and put St. Paul within 30 hours of Chicago. Prior to this time, water transportation played a major role in the exploration, trade, commerce, and settlement of the State.

Supplies were brought in, furs sent out, in canoes, barges, boats, steamboats. Water linked frontier Minnesota with nation and world; and within the area it connected community with region. On the rivers, logs were floated to mills in a great lumber industry. Lakes and streams, easy of access, had much to do with the location of cities and towns and the exploitation of the soil. Falls and rapids offered water power for industry, large and small. ~ from *Minnesota: A History of the State* by Theodore Blegen.

Logging and farming were mainstays of Minnesota's early economy. The sawmills at Saint Anthony Falls, and logging centers like Marine on St. Croix, Stillwater, and Winona, processed high volumes of lumber. These cities were situated on rivers that were ideal for transportation. The state's iron-mining industry was established with the discovery of iron in the Vermilion Range and the Mesabi Range in the 1880s; and the Cuyuna Range in the early 1900s. Ore was shipped by rail to Duluth and Two Harbors, then loaded onto ships and transported eastward over the Great Lakes.

The myriad lakes and streams in Minnesota form a remarkable inland navigation system, though use of the system by water craft is influenced by natural conditions and navigational hazards such as exposed bedrock, boulders, or gravel beds creating waterfalls, rapids, and shoals. Other common obstructions to navigation are snags, deadheads, drifting ice, floating muskeg, wild-rice beds, log drives and booms, low or stationary bridges, and dams—including those engineered by beaver.

The greatest impediment to water transportation in Minnesota has always been winter when lakes and rivers normally freeze over, rendering boats (other than ice boats) useless until the spring thaw. Winters closed navigation, curbing amenities like mail service and isolating people—even whole communities—for months on end. The freezing and thawing of waterways also

affected land transportation in Minnesota. During such seasonal transitions, river fords became impassable, and ferries—crucial elements of many early roadways—became useless. ~Adapted from “*Minnesota's Inland Shipwrecks: History of Inland Water Transportation in Minnesota,*” The Minnesota Historical Society 🍷

A Brief History of the Minnehaha Creek Watershed District (MCWD)

Geological History

Over millions of years, volcanoes, oceans, and movement of the earth's crust lay down and shaped the rocks that today underlie the Minnehaha Creek Watershed. Glaciers sculpted the surface of the watershed as huge ice sheets advanced and retreated. The large St. Croix Moraine formed where the end of a great glacier sat over the present day Twin Cities for many years. The continual movement of ice gouged up gravel, clay, and sand from the bedrock and carried it along, finally dumping it in layers (called "drift") at this end point. Where the drift was thick, hills and ridges formed. Where huge ice boulders displaced the drift, holes formed. Many of these holes eventually became lakes.

Human History

Humans first arrived in the area some time after the last ice age. At some point, they began to alter the natural landscape through repeated use of fire, reducing undergrowth in the forest and opening up pockets of prairie and oak savannah. They laid out villages, trails, and plots for crops in choice locations, typically next to large water bodies.

When Americans first passed Minnehaha Creek around 1800, they saw unbroken wilderness. The first white settlers in the 1850s soon logged and plowed most of the watershed. Wildlife retreated to undeveloped corners. Large animals such as bear and bison disappeared. As farmers drained lakes and wetlands for fields and pastures, runoff increased. Animal wastes and erosion fouled the waters. Yet life for these early settlers centered on water as a source of power and transport. Well into the 1900s, almost every town in the watershed still centered on either a mill or a port on Lake Minnetonka.

Farming

Even as the area's future cities sprouted from the mills, bridges, and docks along the Creek and Lake Minnetonka, most settlers went to work at the primary economic activity of the watershed: farming. The first pioneers planted corn, beans, and potatoes, among other crops, as well as garden vegetables such as peas, turnips, pumpkins and radishes. They often kept chickens (for eggs), sheep (for wool), cows (most for dairy, some for beef), and hogs. They hunted game when they could, foraged for wild grapes, raspberries, and nuts, and tapped maple sap for syrup. Most of what they grew they ate themselves. Wheat and oats were cash crops that they could bring to the mills for grinding, then sell to markets as far away as Europe. Ginseng root was harvested for export to China for a few years in the mid-1800s.

It soon became clear to the settlers that while the flat, well-drained fields of the eastern watershed were well adapted to fields of grain for market, the hilly terrain of northern Edina and on west around Lake Minnetonka was better suited to a cash crop for regional consumption: fruit.

Excelsior's Peter Gideon experimented with rootstocks until in 1863 he discovered the area's first winter-hardy apple, which he named after his wife, Wealthy.

Horticulturists continued to experiment and develop plants that could survive the climate and produce large, sweet, saleable produce: strawberries, raspberries, currants, apples, grapes, and cranberries. The area continued to produce fruit until the extended droughts of the 1930s. Labor and materials shortages during World War II all but finished off the area's fruit growers.

Tourism

In 1855, the Fort Ridgely Territorial Road opened passage from Minneapolis to Wayzata. Wayzata's Garrison and Walker immediately began a stagecoach run into St. Paul. In 1860 the steam side-wheel paddleboat Governor Ramsey launched in Excelsior began carrying passengers, mail and goods from Minnetonka Mills throughout Lake Minnetonka.

In the years after the Civil War, tourists including wealthy southerners and easterners, began coming to the "healthy waters" of Lake Minnetonka. More hotels went up in response. The St. Paul and Pacific Railroad built a train line to Wayzata in 1867, making Minnetonka convenient to visit for the first time. Several steamboats eventually plied the lake. The steam ship companies dredged out the channel into the upper western end of the lake in the mid-1870s.

In 1876, the area hosted 6,000 summer visitors. In 1879, the Hotel St. Louis, the first of five huge resorts on the lake opened in Deephaven. Hotel traffic boomed in the 1880s, with new hotels continuing to go up around the lake. Through the 1880s tens of thousands stayed at the lake hotels each summer. More than 200,000 came in 1883, with 100,000 taking lake-excursion boats. At the same time, quarter-acre lots on Lake Minnetonka were advertised to a growing group of summer cottage owners.

Even during the years of the tourist bonanza, an increasing number of people were building year-round homes on the lake. Then, as transportation to the rest of Minnesota improved, tourists began searching for new places to take their vacations. When the majestic Lafayette Hotel burned in 1897, it marked the end of an era. Lake Minnetonka had almost completely transformed from vacation destination to permanent residential communities.

Public Green Spaces

Ever since Excelsior set aside its Commons in 1854, residents of the Minnehaha Creek Watershed have been especially blessed by having a significant portion of the Watershed—especially shore lands—dedicated to public use, including the Chain of Lakes, Minnehaha Creek, and Minnehaha Falls in Minneapolis, Big Island Regional Park in Lake Minnetonka, Civic Center and neighboring parks in Minnetonka, and French, Carver, and Lake Minnetonka Regional Parks—units of the Three Rivers Park District (formerly Hennepin Parks).

In 1857 Edward Murphy donated the first parkland to the City of Minneapolis. In 1883, the Legislature authorized a Board of Park Commissioners for the city. In 1885 Colonel William S. King donated the land around Lake Harriet. This system expanded to its present extent following the vision of Theodore Wirth. Most Minneapolis parklands were donated or purchased rather than condemned.

The Legislature honored the grace and history of Minnehaha Falls by making it the first Minnesota State Park in 1889. Besides fishing, swimming, sharing picnics, and of course, visiting the falls, from 1894 to 1934 visitors could also enjoy visiting a zoo, run for many years

by the flamboyant Fish Jones. There was also a carnival, a track for horse racing—and a number of rowdy bars—next to the park during this same period. Through the 1930s, 20,000 people camped at the Falls annually.

As suburban development swept across the rural landscape after World War II, local governments preserved some of the last open lands. The Braemar Park Plan pioneered the Edina Parks in the late 1950s and early 1960s just as that city's farms disappeared. Farmer Morris T. Baker donated 210 acres that was to become the first unit of the Three Rivers Parks. Today there are many millions of visitors to the watershed each year, including 5.5 million to the Chain of Lakes and half a million to Minnehaha Park. 🍷

About MCWD

The Minnehaha Creek Watershed District (MCWD) is the regional governmental unit responsible for managing and protecting the water resources of the Minnehaha Creek watershed, located in the area including and immediately west of Minneapolis, Minnesota. The District was established in 1967 under the Minnesota Watershed District Act, which recognizes that hydrologic boundaries rarely match political boundaries. The 1955 act established watershed districts to integrate water management efforts between city, county and state agencies.

The District covers approximately 181 square miles that ultimately drain into the Minnehaha Creek (which then enters the Mississippi River). The watershed includes natural treasures such as Minnehaha Creek, Lake Minnetonka, The Minneapolis Chain of Lakes and Minnehaha Falls. There are eight major creeks, 129 lakes and thousands of wetlands within the MCWD.

The MCWD also includes all or part of 27 cities and two townships in Hennepin and Carver Counties. The MCWD is governed by a seven-member Board of Managers, who are appointed by the Hennepin and Carver county boards.

Mission & Goals

The Minnehaha Creek Watershed District is committed to a leadership role in protecting, improving and managing the surface waters and affiliated groundwater resources within the district, including their relationships to the ecosystems of which they are an integral part. We achieve our mission through regulation, capital projects, education, cooperative endeavors, and other programs based on sound science, innovative thinking, an informed and engaged constituency, and cost effective use of public funds.

Contact Information

Eric Evenson
District Administrator
952-471-0590 ext. 201
eevenson@minnehahacreek.org

Julie Westerlund
Education/Communications Manager
952-471-0590 ext. 209
jwesterlund@minnehahacreek.org

Mark Ten Eyck
Land Conservation Program Manager
952-471-0590 ext. 202

Chanhassen
Deephaven
Edina
Excelsior*
Golden Valley
Greenwood*
Hopkins
Independence
Laketown Township
Long Lake*
Maple Plain
Medina
Minneapolis
Minnetonka
Minnetonka Beach*

***Entirely in district**

Get Involved With MCWD

In September 2006, the Minnehaha Creek Watershed District and the state-wide nonprofit Minnesota Waters began a unique partnership to carry out MCWD's Watershed Association Initiative (WAI).

MCWD is activating groups of citizens who have come together with the common value of protecting their local water resources. This goal of protecting and preserving local water resources can begin to be achieved through citizen-led groups working with the District. The scientific expertise, organizational capacity, development resources, and citizen-led conservation experience that both the MCWD and Minnesota Waters provide are important for a strong start and a sustainable future for lake, stream, and watershed associations.

Goals of the WAI:

- Empower citizens
- Educate property owners
- Provide training and workshops
- Strengthen and encourage collaboration
- Promote a network of citizen groups
- Support citizen-led lake, stream, and watershed associations

Join the Citizen Advisory Committee

Each year the Minnehaha Creek Watershed District (MCWD) seeks individuals to serve on its Citizen Advisory Committee (CAC). Serving as a CAC member is a great way to help protect and preserve Minnehaha Creek, Lake Minnetonka, the Minneapolis Chain of Lakes, and other valued resources within the MCWD.

Meetings are held once each month in the evenings throughout the coming year. Currently, the Citizens Advisory Committee is currently involved in the District's Rulemaking Process and meets on the fourth Thursday of every month.

In addition to the individuals currently serving on the CAC, MCWD staff annually seeks to solicit the involvement of other interested parties. Appointment are primarily based on referral by municipalities, general qualifications, geographic representation of existing committee members, previous experience with MCWD and other factors deemed relevant by the MCWD Board of Managers. For more information and an application, visit: www.minnehahacreek.org/CitizenAdvisoryCommittee.php 🐾

Film Screening: Troubled Waters: A Mississippi River Story

Courtesy of TPT, [“Troubled Waters” is now immediately available for on-demand viewing online.](#)