

Healthy Shorelines

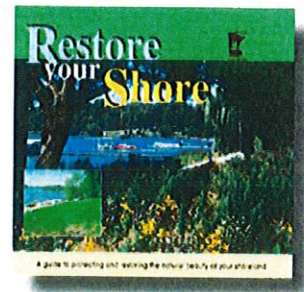
So What's the Problem?

There are many shorelines where the banks were long ago stripped of the native plant community, including trees and shrubs, and converted to turf grass-type lawns. The loss of this vegetation encourages soil erosion and nutrients to flow directly to the lake. As these practices spread around a lake, there are fewer areas left to treat runoff water and provide habitat. Studies of Minnesota lakes have shown that the removal of natural vegetation near the shoreline reduces the amount of habitat available to songbirds and amphibians and reduces fish-nesting. Many of these problems could be prevented or minimized if an area of native plants is maintained or restored.

Shoreland ordinances allow a limited number of trees and shrubs to be cleared to accommodate stairways and access paths. However, the applicable standard for such removal is that the screening of structures, vehicles or other facilities as viewed from the water may not be substantially reduced. Dead or diseased vegetation can be removed although they may be important for songbirds and other wildlife. Invasive species can be an overwhelming problem both on the shore and in the water. The local zoning office or DNR area hydrologist should be contacted for guidance before proceeding with any lakeshore alterations or removal of live vegetation.

What Can You Do?

- Protect the health of the vegetation growing on your property.
- Invasive species tend to spread rapidly. Learn to identify the most common invasive species. Invasives should be removed, but replanting native species may be needed to protect shorelines from erosion.
- Use herbicides that are labeled for an aquatic site or use a more precise method of application, like a wick applicator or a cotton glove over the top of a chemical resistant glove to apply the product only to those plants you want to control.
- Leave vegetation in place to screen structures, vehicles or other facilities as viewed from the water.
- Consider leaving dead or diseased vegetation in place as they may be important for songbirds and other wildlife.
- Most importantly, leave an area of native plants between the house and the shoreline area. Limit the removal of trees and shrubs.
- If you have been mowing near the shoreline, simply discontinue that practice to allow growth of native plants or restore and replant with native flowers, shrubs or trees.



Contact the local Soil and Water Conservation District, DNR area hydrologist or your county zoning office to get assistance. There are also a number of books and "on-line tools" (*Restore Your Shore* <http://www.dnr.state.mn.us/restoreyourshore/index.html> and *Score Your Shore* <http://www.dnr.state.mn.us/scoreyourshore/index.html>) and other literature available to help you support shorelines that promote healthy lakes and streams and the biotic communities that depend on them.

Glossary of Terms

Shore Impact Zone: land located between the waterbody and one-half of the structure setback

Bluff Impact Zone: bluff and land located within 20 feet from the top of a bluff

Steep Slopes: land having an average slope greater than 12 percent

Runoff: precipitation or snow melt, which is not intercepted by vegetation, absorbed in soil, or evaporated, that moves over the land surface to streams, lakes, ditches, and depressions in the ground

DNR Contact Information



DNR Ecological and Water Resources
website and a listing of Area Hydrologists:
<http://mndnr.gov/waters>

DNR Ecological and Water Resources
500 Lafayette Road, Box 32
St. Paul, MN 55155
(651) 259-5100

*This information is available in an
alternative format on request.*

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DNR Information Center

Twin Cities: (651) 296-6157

Minnesota toll free: 1-888-646-6367

Telecommunication device for the deaf (TDD): (651) 296-5484

TDD toll free: 1-800-657-3929

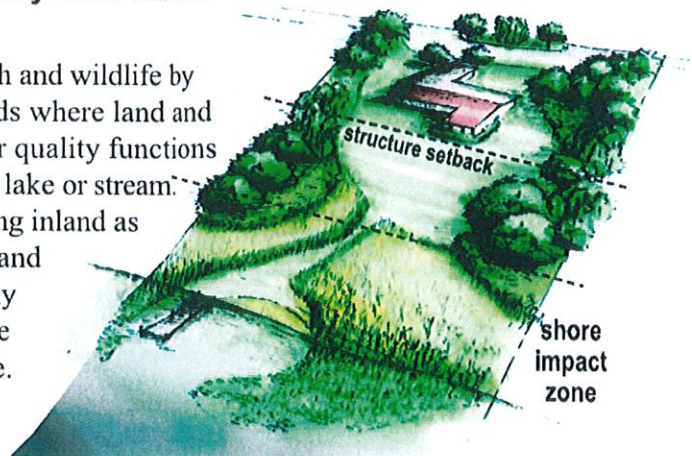
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Healthy Shorelines

What is a Healthy Shoreline?

A healthy shoreline supports a diverse community of fish and wildlife by providing native vegetation that fulfills their habitat needs where land and water meet. Native vegetation provides important water quality functions by slowing and filtering water runoff as it moves to the lake or stream. Shorelines with a diverse mixture of native plants extending inland as well as offshore of the bank are more resilient to wave and ice erosion. Our lakes, streams and wetlands need healthy shorelines to reduce runoff, filter pollutants, and provide important habitat functions that benefit fish and wildlife.



Vegetation Management in Shoreland Areas

The protection of natural vegetation in shoreland areas, especially along lakes and streambanks, is critical to maintaining water quality and wildlife habitat. Good shoreland management requires the protection of natural vegetation in shore impact zones, steep slopes and bluff areas.

Shoreland vegetation (native trees, shrubs, forbs, grasses) provides numerous ecological benefits including:

- Minimizes the erosive impact of raindrops
- Holds soils and limits soil erosion from surface runoff, which is important since high velocity or concentrated runoff volumes can readily erode soils
- Removes nutrients in runoff which would degrade water quality
- Binds and strengthens the soil column with deep, dense roots which prevent and reduce the likelihood of bank or slope failure
- Provides diverse fish and wildlife habitat
- Provides privacy and helps screen shoreland development
- Provides natural and aesthetic views
- Reduces erosion by protecting the banks against wave energy

What is a Shore Impact Zone?

The shore impact zone is land located between the waterbody and one-half of the structure setback.

This concept was created in the 1989 shoreland standards to maintain existing buffers, limit the number of buildings placed in close proximity to the water, reduce soil erosion caused by construction or vegetation removal, and preserve aesthetic values. It serves to buffer the water from more intensive land uses.

A proliferation of accessory structures (boathouses, fish houses, sheds, etc.) clutters shores and displaces natural vegetation. Moreover, construction near the shoreline brings grading and filling activities and increases erosion. In order to protect shoreland soils, vegetation and aesthetics, the Shore Impact Zone was designated to protect important amenities of the lake while still allowing for access to the waterbody.

Healthy septic systems

Residents in areas without access to public sewer systems maintain their own septic systems or subsurface sewage treatment systems (SSTS). A poorly functioning septic system is a threat to human health and the environment because it may not remove pathogens, nutrients and other chemicals from the used water before it enters our groundwater or lakes.

Understand your system

A septic system has three parts:

- household plumbing
- a tank to collect sewage and solids
- a soil treatment area

All three parts must be working to provide effective sewage treatment. Learn more: [📖 Septic systems 101 \(wq-wwists1-10\)](#)

Maintain your system

Many septic system owners assume as long as their used water “goes away,” their system must be working properly. Septic systems must be designed specifically for your site’s conditions and installed correctly. Only regular maintenance and evaluation of the system can ensure that it is actually treating your sewage.

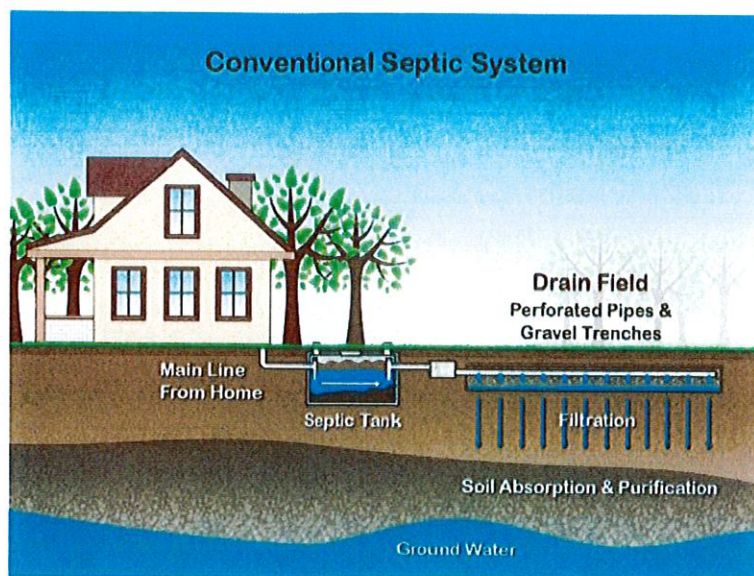



Illustration of conventional septic system

Look for symptoms of a poorly functioning septic system. These include a pipe that goes directly to the lake or ground (even laundry water!), sewage surfacing in the yard or a ditch, sewage odors, high levels of nitrates or coliform bacteria in well water tests, or algae blooms and excessive plant growth in nearby ponds or lakes.

Septic system maintenance will increase system life. The MPCA suggests that septic tanks be evaluated at least every three years and pumped out when sludge and scum accumulate to the point of endangering the soil treatment system. For some homes, the accumulation can take many years; in other homes this process may take less than a year. The accumulation depends entirely on how the system is used. For example, routine garbage disposal use will increase accumulation of material in the tank. Septic tank additives are not an alternative to pumping the accumulated solids from the tank.

Manage your system

These operation and maintenance guidelines will prevent costly repairs or premature replacement of your septic system:  [Septic system DOs and DON'Ts \(wq-wwists6-14\)](#)

Household plumbing

- Conserve water, repair leaks and use low-flow fixtures.
- Spread water usage throughout the day and week. If you have periods of high use, talk to a septic professional about options that will help your system manage your lifestyle.
- Minimize use of harsh cleaners, bleach, antibacterial soaps and detergents.
- Do not dispose of paints, medications or chemicals through your septic system.
- Keep grease, lint, food, feminine hygiene products and plastics out.

Septic tank

- Pump solids through tank's maintenance hole regularly — at least every three years.
- Do not remove solids through inspection pipes.
- Install and insulate risers to maintenance hole for improved management access.
- Have baffles inspected when tank is pumped.
- Install an effluent screen and service as necessary.
- Do not use tank additives or cleaners.

Soil treatment area

- Maintain grass, native grasses or flowers over the treatment area. Mow, but do not fertilize, water or burn.
- Do not plant trees, shrubs or deep-rooted plants on or near the area.
- Do not grow vegetables or locate playgrounds above the area.
- Keep heavy vehicles off area (cars, tractors, snowmobiles, boats, etc.).

- Help prevent the system from freezing. See links in the additional resources section for details.



Don't let your septic system freeze

Cold temperatures are on their way. Don't let your septic system freeze. Here are some simple tips that can help you avoid costly problems with your septic system.

Hire a licensed professional to help you

The MPCA maintains a [list of professionals currently licensed by the state](#) to conduct this specialized work. Interview your septic system professional and learn about how they do business. Make sure they are licensed, reputable and reliable by asking for and checking references.

Additional resources

Since local ordinances can vary from the state code, always check with your **local government** (township, city or county) to determine the requirements in your area.

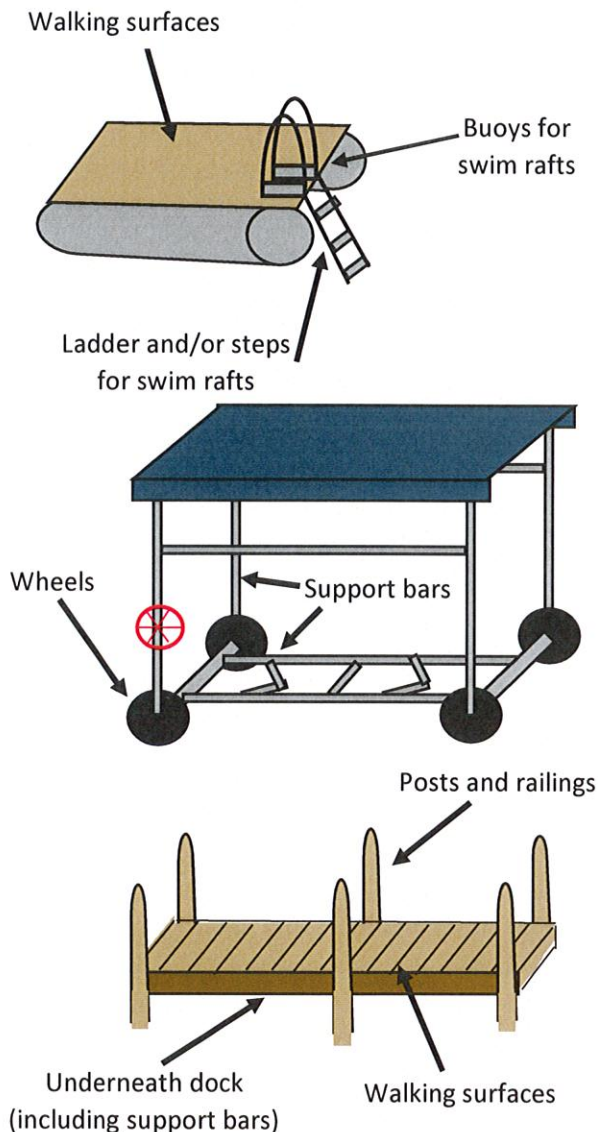
- [Septic systems owners \(University of Minnesota\)](#)
- [What to do with your septic system during a flood](#)
- [Abandoning a subsurface sewage treatment system \(wq-wwists4-01\)](#)
- [Disclosing SSTS at property transfer \(wq-wwists6-11\)](#)

Protect Our Lakes!

How to Clean Docks, Lifts, Swim Rafts, and Other Associated Equipment

View a video of these procedures here: <https://www.youtube.com/watch?v=-vabkGxzT9U>

Clean and Rinse these pieces of your equipment:



Minnesota law requires a dry time of at least 21 days for any used docks, lifts, swim rafts, or other associated equipment before moving and installing the equipment to a different body of water.

CLEAN

Thoroughly inspect all surfaces of your dock, boat lift, swim rafts, and other associated equipment. This includes any railings, posts, wheels, buoys, support bars, ladders, and steps. All of this equipment has been sitting in the water for a long period of time, which provides an opportunity for Aquatic Invasive Species (AIS) to attach themselves. Remove and dispose of any aquatic plants, small animals (e.g. snails, mussels, eggs), mud, and other debris. If you find an invasive plant or animal you think is new to your lake: take a picture, keep a sample, and report it to the Minnesota Department of Natural Resources immediately.

RINSE

All of your equipment should be rinsed off. Pressure washers work great for getting off any AIS that maybe stuck or attached onto your equipment that are not easily removed by hand or a cleaning tool. If possible, rinse your equipment off with hot water (at least 120°F). Hot water will be able to kill off any AIS that is present that you may not be able to see with the naked eye.

DRY

If you buy or sell a dock, lift, swim raft, or other associated equipment, it must dry for at least 21 days before moving to a different body of water.

PLAN AHEAD

Cleaning, rinsing, and drying your docks, lifts, rafts, and other associated equipment will take time. If you need help with any of these tasks, there are some cleaning tools available for purchase through different vendors. Or if you are physically unable to clean, drain, or dry your equipment, ask a family member, friend, neighbor, or hire a permitted Lake Service Provider. It is important to take all of these steps to help prevent and limit the spread of AIS!



Minnesota Sea Grant

A Systemwide Program of the University of Minnesota

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Fire, Water, and Ash: Are Wood Fires Harmful to Lakes?



John A. Downing
Jul 1, 2021

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People love an outdoor wood fire. They are a great way to keep warm, dispose of unwanted brush, cook food, and create ambience while enjoying outdoor activities.

8 to 9-Minute Read

For many Minnesotans, myself included, a wood fire is a family tradition.

A friend named Jean Melin, who edits the [Wabana Chain of Lakes](#) newsletter, asked me whether wood fires pose problems around lakes. She told me that my father, who lived for many years near Lake

Wabana, would tell her he was quite concerned about keeping wood-fire ashes away from water.

My father was right to be concerned.

But it's not the fire that's a problem.

It's the ash that's left behind.



Wood is Good

Wood can be important physical habitat structures for fish. It can act as a spawning surface or substrate for many species, protection from predators, and a source of food. When there is wood in water, it can provide a substrate for colonization of algae and fungi and bacteria that are food sources for the invertebrates that fish feed upon.

Wood also has important physical effects for lakes and streams. Large logs and trees can create different water channels such as pools, undercut banks, and areas of scouring. These channels can change subsurface flow in streams that affect fish habitat and the flow of nutrients throughout the food web. Wood is also critical to reducing erosion especially during floods. Woody debris can interrupt the flow of runoff into water bodies and thereby reduce pollutants from entering the water. When runoff is slowed, shoreline vegetation (if it is present) has a chance to take up pollutants (e.g., nitrogen from fertilizer) so it does not go directly into a lake or stream.

Submerged wood can also sequester carbon, which helps slow climate warming.¹⁻³

Woody material in lakes is called “coarse woody debris” and consists of logs, branched logs, snags (e.g., logs or branches sticking out of the water), coarse stumps and roots, fresh wood, and decayed wood.²

Wood is good for water. It’s good for fish and other animals and plants. It’s also especially good for people and their lakeside or shoreline property. But studies show that when landowners develop shoreland, they remove an average of 90% of the wood from along their shores and underwater.¹ This is one of the many ways shoreland development can harm lakes. It is far better for lakes to leave wood in the water and a broad strip of natural vegetation along the shore.



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Ash is Bad

If wood is good for lakes, why would burnt wood be a problem? Good question.

When wood burns it goes through drastic chemical changes, which may seem obvious. But, wait. When wood ash combines with water it forms lye. Wood-ash lye is a little less caustic than the commercial lye used in drain and oven cleaners, but still not what you want in your water. Lye also has a softer side, but I’ll get to that later.

Wood is made of lignin and various types of celluloses that are made mostly of carbon, hydrogen, and oxygen.⁵ Burning wood releases the energy stored in those molecules as heat and carbon dioxide, water, and other materials⁶ that are released into the atmosphere. Burning takes away a large fraction of the carbon in wood leaving behind a lot of the other chemical elements. Wood is made up of 2,000-times more carbon than any of the many trace elements it contains.⁷ Trace elements can include many metals and other elements that are not dangerous when in low concentrations but can be more significant when most of the carbon, oxygen, hydrogen, and nitrogen are burned away and only ash remains.

Lye's softer side is soap. Since the third century, real soap was formed by mixing lye with oils or butters. The resulting soap contains no lye (and is no longer caustic) because the lye was drastically transformed.⁴



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We Have An Ash Problem

Because wood is seen as a renewable energy source and people burn wood for heating and power generation, wood-ash disposal is an important problem. According to the [Minnesota Department of Natural Resources](#), a cord of seasoned wood (defined as stacked wood 4 feet x 4 feet x 8 feet; 3.6 m³) weighs an average of 4,940 pounds (2,241 kg). Considering wood, bark, twigs and some foliage, ash is an average of about 1.8% of this weight if it is completely combusted

at high temperature.^{5,8} Burning a cord of wood generates 90 pounds of ash (40 kg). This ash is a mixture of different chemicals and elements that are much more noxious, mobile, and water-soluble than the wood that it came from.⁹⁻¹²

Chemical Composition of Wood Ash

Many scientists are studying the composition of wood ash. I have compiled some of the compositions into averages in the table below. Some particularly concerning elements are noted in red. Because water quality is greatly harmed by excess phosphorus, it deserves special attention. Incidentally, another nutrient implicated in eutrophication, nitrogen, is very low in ash because it is driven off to the atmosphere as various gases,¹³ some of which can cause acid rain (see Table 1 below).

Phosphorus. Phosphorus, though, is present in wood ash at about 1.2% of the whole weight of ash. This means that the burning of a full cord of wood can result in about 1.6 pounds of elemental phosphorus (0.72 kg) becoming concentrated in the ash. For reference, this is more than the amount of phosphorus (an important component of all foods) excreted into raw sewage each year by an adult.¹⁴ This concentration is about six times the legal upper limit for phosphorus in lawn fertilizer in Minnesota which is 0.67% phosphate (0.22% phosphorus). We should be as careful in disposing of our wood ash as we are in disposing of our fertilizer and sewage. Proper disposal of ash to keep it from being washed into lakes and streams is good stewardship.

pH. There are several other chemical problems with wood ash that also suggest the need for careful disposal and management. First, addition of wood ash to water can raise the pH of the water to around a pH of 12 (normal pH for water in Minnesota is between a pH of 7 and a pH of 8 with brown waters a little lower). Plants and animals can usually only live and thrive within a narrow range of pH which is why acid rain is a problem for lakes.¹⁵

Calcium. Calcium is also very highly concentrated in wood ash at around 26% of dry weight. This suggests that wood ash could increase the alkalinity or buffering capacity of lakes; although calcium is likely to be deposited in sediments at such a high (basic) pH.

Potassium. Potassium is very concentrated in wood ash but the influence of high potassium on aquatic ecosystems is unknown. The

word “potassium” is the Latinized form of the word “potash,” which in older Dutch translates to literally “pot ashes.” The chemical symbol for potassium is “K” which comes from the Latin “kalium,” which comes from the Arabic “al-qaliy” (alkalai) that means burnt ashes.

Heavy metals. Wood ash contains a surprising array of heavy metals (e.g., zinc, nickel, copper, lead, chromium, arsenic, cadmium and mercury, among others). In high enough concentrations, these can cause problems for people and aquatic and terrestrial environments.



Image credit: ©FotoHelin. Stock.adobe.com.

How to Manage Ash

The most important aspect of managing wood ash and charcoal ash is to keep it away from water. Ashes from campfires and bonfires should be moved away from water when they are cool enough to do so safely. Ashes can enhance forest growth if carefully applied in a way that will keep it from washing into waterways.¹⁶ Ash can be added to gardens but only if the existing soil pH is quite acidic because soils with high pH can make nutrients inaccessible to garden plants. Ash can be applied to agricultural fields if conditions are monitored carefully.

We may have forgotten how rich a resource wood ashes are. In 1894 a charming book was published called, “Wood Ashes and their Use: a Practical Treatise on the Value and Use of Wood Ashes”¹⁷ which can be downloaded free of charge. A web search on “uses for wood ashes” will

turn up dozens of good uses ranging from shining silverware to repelling garden pests. Just keep ashes away from water. If you move completely cooled wood ashes to a forest, make sure to spread them out to prevent the concentration of metals and high pH. Spread them on flat ground to prevent them from washing away. My wife, Marcia, suggests covering completely cooled ashes with leaves or duff to keep them from washing away and from spoiling the beauty of the forest.

Fire Safety

There are lots of important reasons to minimize use of wood-fire ash in recreational areas other than the preservation of good water quality. Every summer, there is a spike in injuries and deaths from recreational fires.¹⁸ Climate change is expected to bring our region a five-fold greater risk of wildfires by mid-century.¹⁹ These fires are expected to increase deforestation, property damage, and degrade water quality.²⁰ The majority of wildfires and wildfire damage in our region are human caused.²¹ Although fires bigger than three feet across or three feet high require a permit in Minnesota and other states, small campfires for cooking or ceremonial purposes do not require a permit, according to the [Minnesota Department of Natural Resources \(MNDNR\)](#). Before burning, you should always check the [MNDNR website](#) because under dry conditions no fires, including campfires, are permitted. Always check fire regulations before setting a campfire or bonfire on public land as rules change with weather and ground conditions. Even though campfires may be permitted in state parks when conditions are safe, firewood collection is prohibited, and all fires in state parks and forests need to follow state guidelines.

Takeaway Your Ashes

Enjoying a fire near water can be an immensely enjoyable part of recreational experiences. It is important to protect water resources for ourselves and for future generations by making sure ashes are cold and disposing of them properly where they can't wash into waterways.

The solution is easy. If we all pick up and properly dispose of wood-fire ash, we can help keep Minnesota's lakeshore environments beautiful and healthy.

TABLE 1. Elemental Materials in Wood Ash

The table shows the average amounts of various materials in wood ash. This table was compiled by John A. Downing from an online database and other published sources.²²⁻²⁴ Elements of particular concern are asterisked.

Element	Symbol	Average	Percent
Calcium	Ca	260,485	26.05%
Potassium	K	59,101	5.91%
Silicon	Si	51,090	5.11%
Magnesium	Mg	46,307	4.63%
Aluminum	Al	13,964	1.40%
*Phosphorus	P	11,938	1.19%
Iron	Fe	11,608	1.16%
Sulfur	S	9,412	0.94%
Sodium	Na	5,513	0.56%
Titanium	Ti	1,187	0.19%
Nitrogen	N	1,739	0.17%
Barium	Ba	1,659	0.17%
*Zinc	Zn	1,457	0.15%

Element	Symbol	Average	Percent
*Nickel	Ni	831	0.08%
Chlorine	Cl	690	0.07%
Boron	B	392	0.04%
*Copper	Cu	300	0.03%
*Lead	Pb	125	0.01%
Antimony	Ab	108	0.01%
*Chromium	Cr	85	0.01%
Vanadium	V	46	<0.01%

Editors note: *Thank you to Minnesota Sea Grant Fish and Aquaculture Extension Educator Amy Schrank for fish habitat information.*

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