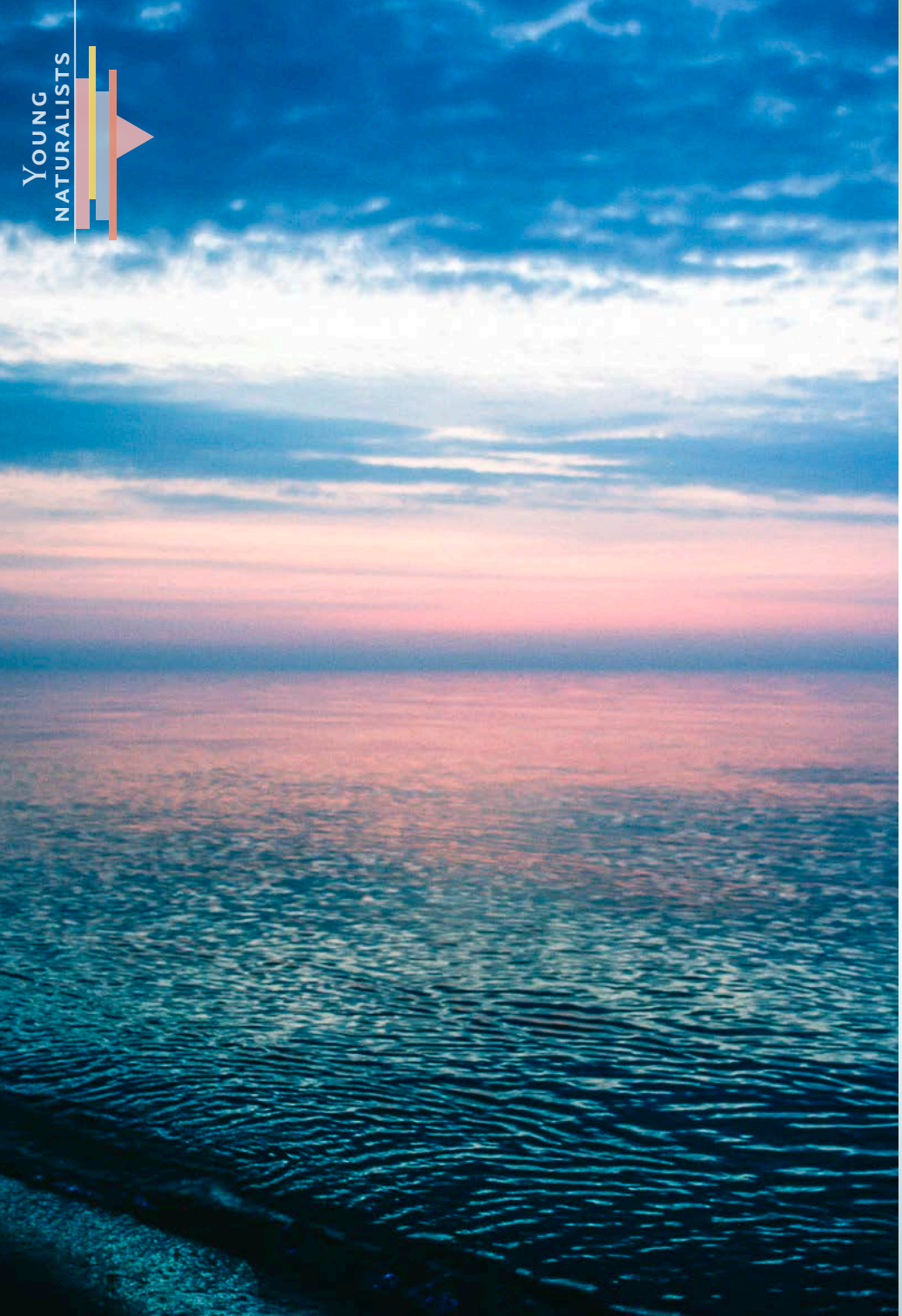


By Mary Hoff

The Greatest Lake

Lake Superior makes Minnesota better with its scenic beauty and abundant natural resources.

It's big. It's bold. It's beautiful! It's Lake Superior, one of the largest, cleanest, and most awesome freshwater lakes in the world. And it's right here, with 154 miles of scenic shoreline stretching along our state's northeastern border—a place that many Minnesotans know as the North Shore.

This big lake, the largest of five North American water bodies known as the Laurentian Great Lakes, enriches our lives in many ways. We drink the water it provides and catch fish from beneath its waves. Gigantic ships use it to carry goods to and from distant places. Each year, millions of people find adventure and fun along its shores. It has a fascinating past, an amazing present, and an exciting future. Let's take a look!

RICHARD HAMILTON SMITH

GARY ALAN NELSON

Water, Water, Everywhere

If you've ever driven along or stood on the shore of Lake Superior—or even looked at a photo of North America from space—you know that it is a BIG body of water. It's sometimes called an inland ocean, and in many places along its shoreline you can look out and see only water, just as you would at the seaside.

How Big?

Lake Superior is the largest lake in the world by one measure, *surface area*. It covers 31,700 square miles, beating the runner-up, Africa's Lake Victoria, by more than 5,000 square miles.

If you measure Lake Superior by *volume*—that is, the total amount of water it holds—it's the third-largest freshwater lake in the world, topped only by Lake Baikal in Asia and Lake Tanganyika in Africa.

Lake Superior is deep, too. At 1,332 feet, it's the fourth-deepest lake in the United States.

Superior holds more water than all the other Great Lakes—Huron, Ontario, Michigan, and Erie—combined. In fact, it holds 10 percent of the liquid freshwater on the surface of our planet!

Cold and Bold

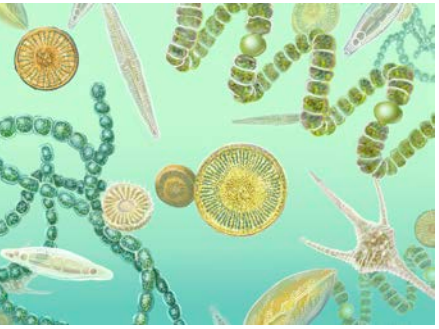
Size isn't the only thing that makes Lake Superior so great. Of the five Great Lakes it's by far the coldest, with an average surface temperature historically between 40 and 50 degrees. That's way, way chillier than your local swimming pool.

Lake Superior is also superior when it comes to beauty. Vast blue expanses of water, pebbled beaches, rocky shorelines, and bountiful burbling streams all make the big lake a go-to place for people in search of nature's natural refreshment. It's no surprise that eight Minnesota state parks, a national scenic trail, and a national forest are on or within a few miles of its shores.

Lake Superior is exceptional in might as well. Stretching 350 miles from one end to the other, its massive open space gives strong winds an opportunity to build up as they sweep across its surface. In a big storm in October 2017, waves grew as high as 29 feet—taller than a two-story house. Over the decades, somewhere between 300 and 600 big ships have sunk in the lake during powerful storms.

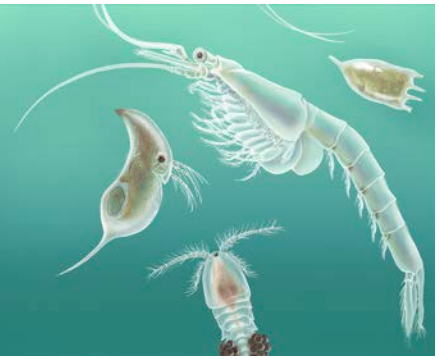
Wild Things

Looking out over Lake Superior, you might have a hard time imagining it as a friendly place to live. But in the great expanse beneath the surface, organisms far more abundant than the stars in our galaxy are dancing the great dance of life.



Sun Catchers

Supplying the energy for that dance are the living things that capture the sun's energy and use it to live and grow. The most abundant sun catchers are *phytoplankton*—tiny algae suspended in the water. They include *diatoms*—microscopic creatures shaped like tiny glass boxes—as well as *flagellates*, *cyanobacteria*, and *green algae*.



Floating Zoo

Phytoplankton provide food for many other things that live in Lake Superior. Tiniest of the plant eaters are *zooplankton*, microscopic animals that float about in the open water. Star of the big lake's floating zoo is a crayfish relative called an *opossum shrimp*. These little crustaceans hang out in deep water during the day. In the evening, they float upward to graze on algae, other zooplankton, and bits of dead things.

At the Bottom

In the sand and silt at the bottom, tiny creatures play a role in keeping Lake Superior healthy. Among the most abundant is a shrimplike creature called a *scud*. This rice-grain-sized animal eats dead diatoms and other bits of organic material that trickle down from above. Scuds are important food for fish that cruise the bottom.

TAINA LITWAK

Fish.

Lake Superior is home to dozens of species of fish that come in all shapes and sizes. Different ones prefer different parts of the lake. Here is a sampler:

Cisco. Formerly called lake herring, cisco live in the top layers of the lake. They eat mainly plankton.

Trout. Lake Superior has several types of trout, also known as *char*. Brook trout and lean lake trout are native fish that live in shallower water and are popular among recreational anglers. Siscowet live in deep water and eat other fish. Rainbow trout were stocked in the lake in the late 1800s.

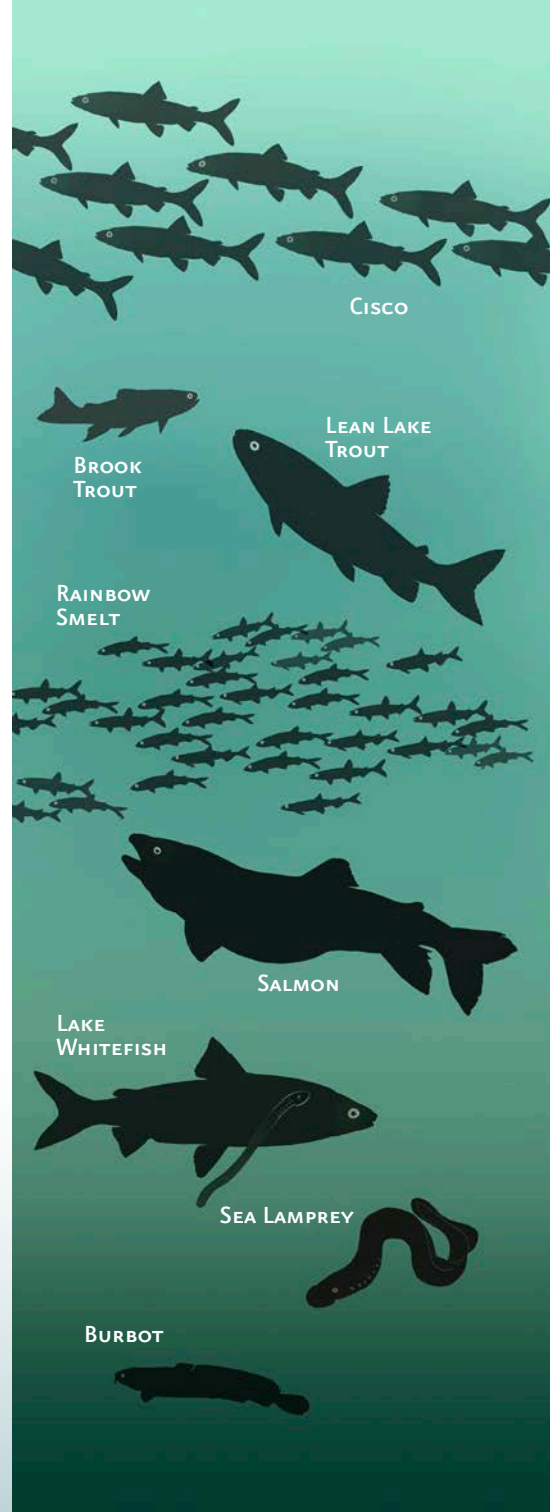
Rainbow smelt. Rainbow smelt invaded Lake Superior in the early 1900s. They serve as food for bigger fish.

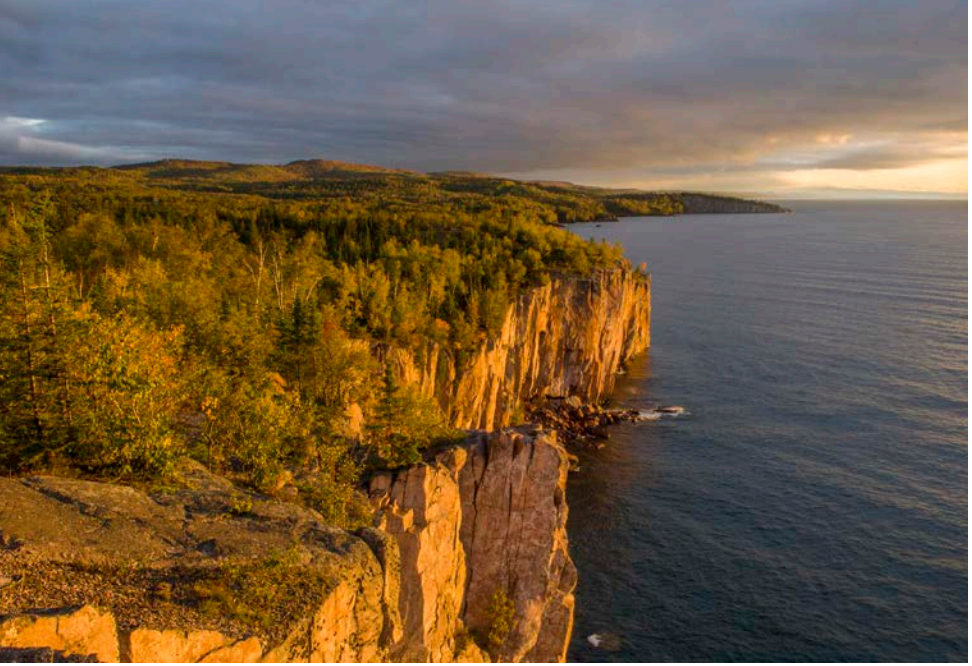
Salmon. Coho, chinook, and pink salmon were introduced to Lake Superior in the 1800s and 1900s.

Lake whitefish. Lake whitefish hang near the bottom of the lake. They eat opossum shrimp, scuds, and cisco eggs.

Sea lamprey. The sea lamprey invaded the Great Lakes through a shipping canal. It uses a toothy rasping tongue and a suction-cup grip to make a hole in a fish and suck out its blood and bodily fluids.

Burbot. Hanging out far beneath the waves, burbot eat ciscoes and other fish as well as opossum shrimp and scuds.





GARY ALAN NELSON

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Ancient Origins

If you've visited the North Shore, you know it's a rocky place. Massive cliffs loom along the lake, boulders line the shoreline, and wave-smoothed pebbles cover the beaches.

Maybe you've even hunted for *agates* on some of those beaches, looking for the rust-colored stones that people love to collect.

All this rock offers clues to how this big lake formed.

Rivers of Rock

Just over a billion years ago, the land we now know as North America began to tear apart right where Lake Superior now stands. Rock heated by the Earth's core started pushing up along a large, U-shaped *rift*. The rock melted as it approached the surface, moving through cracks and volcanoes before spreading out over the surface.

Some of the melted rock contained iron and magnesium. As it cooled, it solidified to form a dark gray volcanic rock called *basalt*. Basalt makes up many rock formations on the North Shore, including ones you can climb on at Kitchi Gammi Park (Brighton Beach) in Duluth or Gooseberry Falls, Temperance River, and Cascade state parks.

Other melted rock also came burbling to the surface from within the Earth. Rich in quartz and other minerals, it cooled to form a tan- or pink-colored rock called *rhyolite*. Palisade Head and Shovel Point, two well-known North Shore rock formations, are mainly made from rhyolite.

Some of the liquid rock solidified under the surface. Because it cooled more slowly, it ended up with bigger mineral crystals. The rock on which Split Rock Lighthouse sits is made of this type of rock, known as *diabase*.

The rock flows continued for some 25 million years, accumulating up to 6 miles thick in some places. Over time, some of the rocks were worn or eroded by wind, lakes, streams, and glaciers, creating cliffs.

Scraping Away

Rain-fed rivers carried sand and silt into the new depression. These formed new rock as the bits glued together to form other kinds of rock now found in the area.

Then, starting about 2 million years ago a series of glaciers moved in from the north. As they advanced, they blocked water created by melting ice from flowing out of the area, causing the surface of the water in the Lake Superior basin to rise much higher than the lake we see today. The glaciers also deepened the basin by scraping away rock, sand, and soil and carrying them south. Over the millennia, the lake grew and shrank as glaciers came and went. The most recent glaciers melted about 11,000 years ago.

Left: Palisade Head, a massive cliff along Lake Superior, is made mostly of a tan- or pink-colored rock called rhyolite. Above: Basalt, a dark gray volcanic rock, can be seen at Kitchi Gammi Park (Brighton Beach) in Duluth.

RICHARD HAMILTON SMITH

RICHARD HAMILTON SMITH

Helping Humans

Summer or winter, many Minnesotans know Lake Superior for its massive scale and rugged beauty. Each year, more than a million people flock to the North Shore to enjoy the scenery, find refreshment in its cool breezes, pick pebbles on the beaches, toss in a fishing line, or just stare in wonder at the expanse before them.

But Lake Superior offers many other benefits, too.

Travel Corridor

For thousands of years, Indigenous people who have lived near Lake Superior have used it to travel from one place to another. In the 1600s, explorers from Europe used it to move west across the continent. By the early 1700s, the big lake was a major route for canoes and other boats in the fur trading era, when the fur *pelts* of North American mammals were traded for European goods. Today Lake Superior still provides an important way to move goods from one place to another. Ships as long as three football fields end to end carry iron ore, automobiles, lumber, grain, and more between Minnesota and other places in the United States and around the world via the St. Lawrence Seaway, which connects the Great Lakes to the Atlantic Ocean.

Water to Drink, Fish to Eat

Lake Superior is also an important source of water and food. Many communities near its shores rely on the lake for their water supplies And for centuries it has provided fish to people near and far. Long before Europeans arrived on the scene, Indigenous people speared and netted fish for food. In the late 1800s, fishing became a major industry in the area. Today the fishing industry is smaller, but some 100 commercial anglers still fish the big lake for fish to sell at market.

Fishing for Fun

People fish Lake Superior for fun and adventure, too. Anglers come from far and wide to try their hand at catching salmon or trout. Famous recent catches include a 10-pound, 14-ounce coho salmon in 2023 and a 43.25-inch-long lake trout last March.

COURTESY OF CLINT AUSTIN/ DULUTH NEWS TRIBUNE

The Lakewalk path in Duluth was damaged by storms made more destructive by climate change. The path has since been rebuilt and reinforced.

GARY ALAN NELSON

Taking Care

Lake Superior may be ginormous, but its size has not protected it from harm by humans.

Fish from Afar

One big source of disruption has been the introduction of species of fish not naturally found here. In the 1800s and early 1900s, people deliberately released salmon and trout into Lake Superior. These *nonnative* fish species competed with *native* fish for food, altering the balance of nature in the lake.

The balance became even more disrupted with the introduction of other nonnative species. Some traveled through artificial waterways connecting the lake to the Atlantic Ocean. Others were accidentally transported in by ships from distant shores. Perhaps the most harmful have been sea lampreys, which attach themselves to other fish and suck bodily fluids from them. They, along with people catching too many fish, caused disastrous drops in native fish populations.

Other Disruptors

Nonliving things have disrupted Lake Superior, too. Wastewater from paper mills and mining companies have contaminated parts of the lake. Smoke from power plants have contributed acids and mercury. Microplastics—bits of plastic too tiny to see—are increasingly being found in Lake Superior.

Climate change is a factor that will continue to shape the lake. So far it has warmed the water, reduced ice cover in winter, and fueled bigger and more frequent storms that batter the shoreline. One place popular with visitors to Duluth, the Lakewalk path along the shoreline, had to be rebuilt and reinforced to withstand destructive waves.

The Future

The good news? In recent years, fisheries managers have worked to help native species better coexist with introduced fish. Barriers and chemicals are helping to control sea lampreys. Over time, the lake has achieved a new balance that allows native fish to thrive alongside their introduced counterparts. Shipping regulations have reduced the likelihood of introducing more nonnative species. And laws and regulations are helping to keep the big lake clean.

Climate change still holds a big question mark for the future. But today many people are working to turn that around, too. If we all do what we can to take care of Lake Superior, this greatest of lakes can continue to thrive and share its many gifts for generations to come.

Teachers resources. Find a Teachers Guide and other resources for this and other Young Naturalists stories at *mndnr.gov/young_naturalists*.