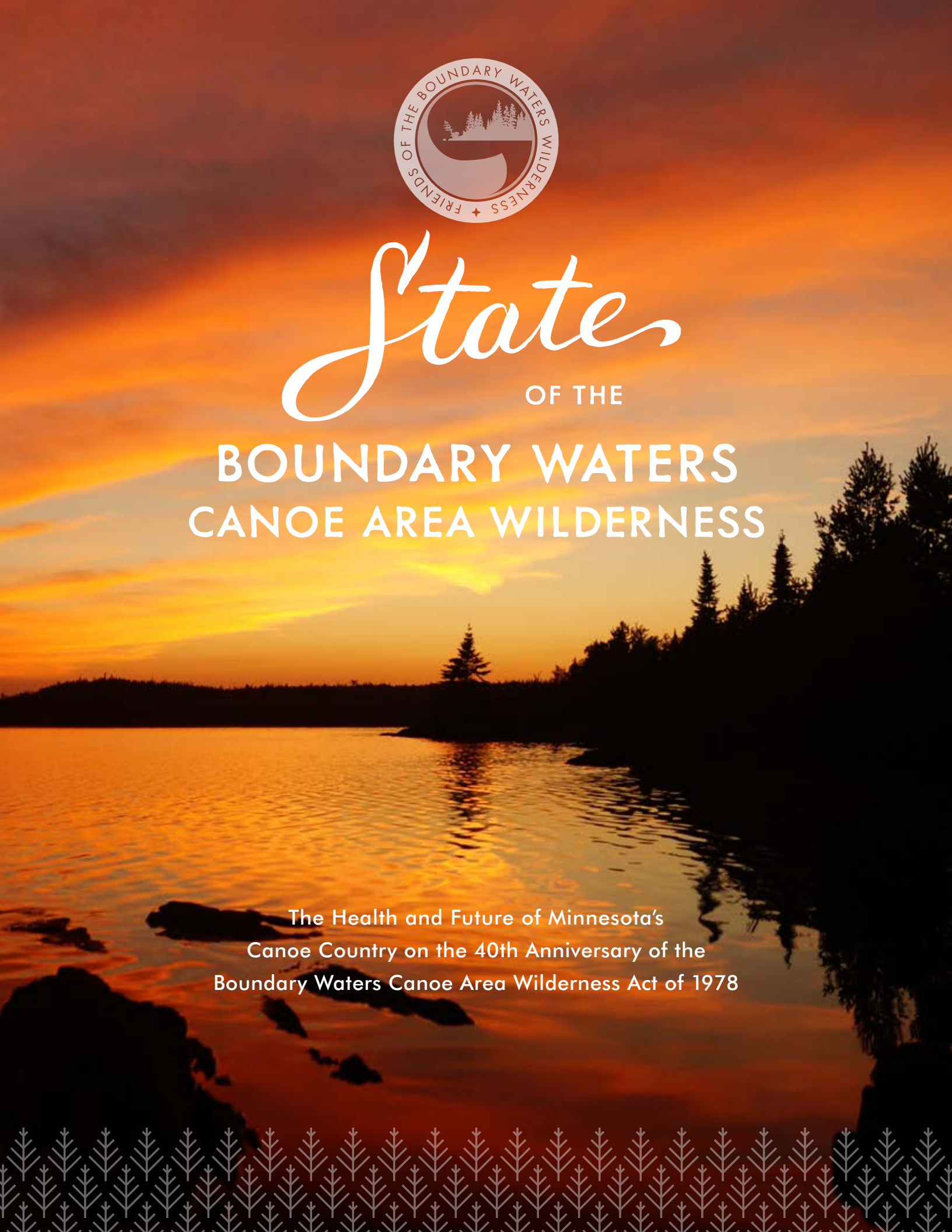


State of the Boundary Waters Canoe Area Wilderness

The Health and Future of Minnesota's Canoe Country on the 40th Anniversary of the Boundary Waters Canoe Area Wilderness Act of 1978

The Boundary Waters Canoe Area Wilderness (BWCAW) encompasses more than one million acres of wild woods and waters in northern Minnesota. It was first protected by the 1964 Wilderness Act, which was followed 40 years ago this year by enhanced protection under the Boundary Waters Canoe Area Wilderness Act of 1978. More than 200,000 people from across the world experience the BWCAW each year, whether on a quick day trip or through extended camping adventures in the backcountry.

Water defines this unparalleled canoe country, covering 20 percent of its total area. The dense collection of more than 1,000 lakes connected by rushing rivers and ancient trails makes paddling the preferred method of travel. Despite being near Lake Superior, most water flows west and north — ultimately to Canada's Hudson Bay.

Overall, the BWCAW is healthy, but the world around it has changed considerably over the decades. New threats from climate change and potential sulfide mining pollution could result in long-lasting and irreversible damage to the area. Emerging challenges like these will require new strategies to protect this special place.

Friends of the Boundary Waters Wilderness is committed to the long-term well-being of our nation's most popular wilderness area. Since 1976 we have advocated for sound management policies grounded in the best science available. We know the future of the BWCAW depends on keeping track of its ecological health and peoples' experiences within it. This *State of the Boundary Waters Canoe Area Wilderness* report shares our assessment of the current conditions and future challenges facing the canoe country that is so dear to us all.

The Boundary Waters Canoe Area Wilderness is managed by the U.S. Forest Service and makes up about a third of the Superior National Forest. It is intended to be a place "retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions."[1] Federal laws and treaties protect indigenous rights to hunt, fish and gather natural resources like wild rice. The Minnesota Department of Natural Resources manages boating, hunting and fishing within it.

Dear Friend,

Sitting by the campfire after a long day of paddling and portaging in the Boundary Waters Canoe Area Wilderness (BWCAW), we are filled with a sense of belonging and contentment. Whether it is the call of a loon echoing in the air, the tug of a walleye on the line or the pageantry of the Northern Lights in the night sky, these timeless experiences in the sacred places of the Boundary Waters nourish our souls, inspire our imaginations and connect us with the natural world.

On this 40th anniversary of the creation of the BWCAW — and as part of our longtime leadership in protecting, preserving and restoring this national treasure — the Friends of the Boundary Waters Wilderness has prepared this *State of the Boundary Waters Canoe Area Wilderness* report. Its overview of the current situation in the Boundary Waters examines ecological health, human experiences, emerging threats and other key factors.

As a federally designated wilderness area, the BWCAW is protected from human interference and should change only at nature's pace. Unfortunately, the natural rhythms of the wilderness are not immune to modern-day threats like global climate change and proposed sulfide mining operations. While nature is ever-changing, threats like these have the potential to render the BWCAW, as we now know it, unrecognizable.

Despite these new challenges, the BWCAW is cherished by those who experience it. People from all over the world visit the Boundary Waters. People live near the wilderness because it is deeply ingrained in their lives. Those of us who love the BWCAW share a great responsibility to ensure that this unique wilderness, protected by those who came before us, can be passed on to future generations as healthy and whole as we found it.

We hope this report enables and inspires all of us to be effective wilderness stewards so that our children, grandchildren and other future generations may know the silence of a lake, the sight of a dark sky and the peace of a campfire in the BWCAW. It is the greatest gift we can give.

Sincerely,

CHRIS KNOPF
Executive Director, Friends of the Boundary Waters Wilderness

Section 1

AGENTS OF CHANGE

"The important thing to realize is that the Boundary Waters is protected; but it's not safe. There are really big issues facing it."

—GREG SEITZ

The "Wilderness" designation is the highest level of protection for our nation's public lands. The 1964 Wilderness Act intends for these lands to be as minimally impacted by humans as possible. Boundary Waters policies call for Leave No Trace practices, small group sizes and limited motorized vehicles. Nevertheless, forces like climate change and proposed sulfide mining operations threaten to make severe and long-lasting changes to how the Wilderness looks and functions. Because these issues have the potential to create significant and irrevocable consequences for the woods, wildlife and water in the BWCAW, we give them special attention here.

Previous page landscape: Rocky Trail by Justin Meissen CC-BY-2.0
Previous page inset: Mushroom along Johnson Falls Trail by Eugene Kim CC-BY-2.0
Photo above: Jon 'ShakataGaNai' Davis, South Farm Lake CC-BY-SA-3.0

CLIMATE CHANGE

Status: The continued consumption of fossil fuels and the changes to climate it causes are already impacting the Wilderness and have profound implications for the Boundary Waters ecosystem.

Climate change's global impacts have not spared the Boundary Waters Canoe Area Wilderness (BWCAW). Far from the loon on the lake and the wind in the pines, the burning of fossil fuels is transforming the Wilderness we know.

Northeastern Minnesota is the fastest-warming part of the state, a trend which is most pronounced in winter. Northern Minnesota's winters have been warming 10 times faster than its summers—with the average winter temperature rising one degree Fahrenheit per decade. In fact, Minnesota's winters are warming faster than any other region of the country, with average temperatures increasing by up to 7.5 degrees since 1970. Climate change is also likely why the Boundary Waters region is experiencing more severe windstorms and extreme rainfall events.[1]

Visitors to the Wilderness in a hundred years will likely paddle through a dramatically different landscape. The Boundary Waters sits on the southern edge of North America's boreal forest. All of the boreal tree species in the Wilderness are within 100 to 300 miles of the southwestern edge of their range. Tallgrass prairie exists only 120 to 200 miles away. Climate change means both ecosystems will shift north. Oaks and maples will eventually replace much of today's boreal pine forests, while some areas will convert to grasslands.[2]

Research already documents an increase in deciduous tree growth in our northern forests. Over the next 100 years, western parts of the Boundary Waters are expected to continue to transition to oak savanna, with widely spaced deciduous trees amid grasslands. The thin soils of the Boundary Waters are expected to dry under warmer temperatures, leaving forests prone to drought and fire. Oak savanna ecosystems thrive under hot and relatively dry conditions. In the eastern half of the Wilderness, boreal forest coniferous species may manage to persist on cooler north-facing slopes or other protected areas, but they are no longer expected to dominate the forest.[3]

> "One or two more degrees of warming would definitely tip the balance away from boreal."[4]
>
> –DR. LEE FRELICH, DIRECTOR OF THE UNIVERSITY OF MINNESOTA'S CENTER FOR FOREST ECOLOGY

Chris Evans CC-BY-2.0

Scientists predict that the Boundary Waters could have a whole new look by century's end as the oak savannas of southern Minnesota move north with the warming climate. **Shown above:** A Boundary Waters lake before significant climate change impacts.

Minnesota Department of Natural Resources

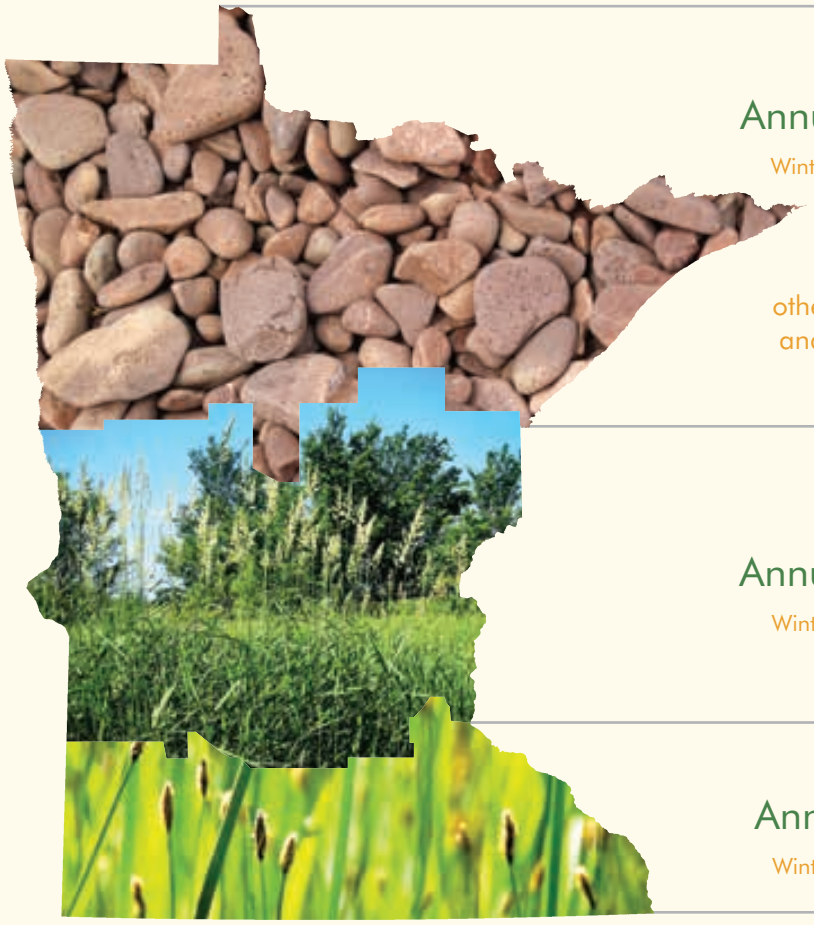
Shown above: After significant climate change impacts, Boundary Waters lakes could look like the Gneiss Outcrop Scientific and Natural Area in Granite Falls, Minnesota.

Climate change is expected to disrupt precipitation patterns and create conditions favorable to the infestation of forest-altering pests. If Wilderness peatlands dry, they may rapidly release stored carbon into the atmosphere, further compounding the rate of climate change. Warmer winter temperatures have contributed to an explosion of eastern larch beetles, which have killed or damaged a third of Minnesota's tamarack trees.[5]

Changes in climate may also affect the numbers and kinds of wildlife found in the BWCAW. Warmer winters are believed to be a contributing factor to the declining moose population in northeastern Minnesota. Moose are creatures of cold places, and their numbers have dropped precipitously in the past decade. Reduced snowpack may impact Canada lynx numbers. Changes in forest composition from warmer temperatures may already be contributing to declines in certain songbird populations *(see page 23)*. Longer, hotter summers are expected to increase water temperature in lakes, which will lead to changes in vegetation, water clarity and quality, as well as an increase in algal blooms and degraded fish habitat.[6]

The Boundary Waters has an important role to play in the decades ahead — as a place to observe and understand the impacts of climate change on a landscape without much human manipulation — and by providing important refuge for species losing habitat elsewhere. For example, as much of the rest of Minnesota loses its cold-water lakes, the remaining ones in the BWCAW will be ever more critical for species like cisco and lake trout *(see page 21)*.

Total Temperature Change, 1895–2015[7]



Annual Average ↑2.3°F

Winter Lows ↑4.8°F Summer Highs ↑0.3°F

Temperatures are rising faster in winter than in any other season, especially in Minnesota and throughout the Midwest region.[8]

Annual Average ↑2.0°F

Winter Lows ↑4.0°F Summer Highs ↓0.2°F

Annual Average ↑1.1°F

Winter Lows ↑3.4°F Summer Highs ↓1.4°F

River rock by James St. John; Champlin, MN by J. Wynia; Summer River Grass by Sharon Mollerus. CC-BY-2.0

SULFIDE MINING

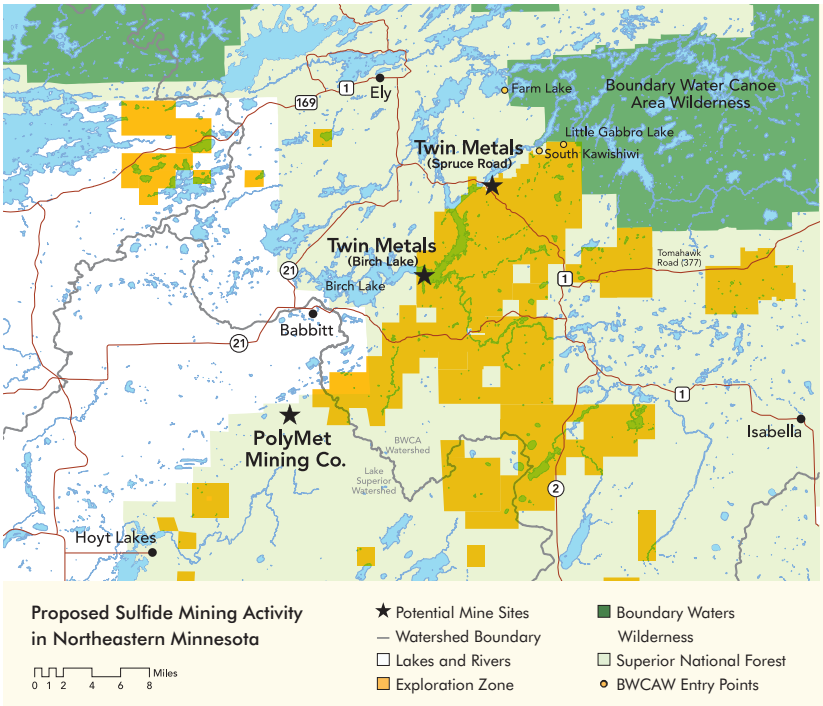
Status: The development of sulfide mines near the Boundary Waters would cause serious water pollution and degrade the Wilderness.

Copper, nickel and other minerals buried in northern Minnesota's ancient bedrock have attracted the interest of miners since the ore was discovered in 1955. A geologic formation called the Duluth Complex contains low-grade sulfide ores with small amounts of metals like copper and nickel. But sulfide mine waste creates contaminants when exposed to air and water, which can severely damage lakes, rivers and ecosystems. These pollution risks are more severe than the impacts caused by Minnesota's traditional iron mining, and can contaminate waterbodies for hundreds, even thousands of years. In fact, no sulfide mine has ever operated without polluting nearby waters.

Mining is not allowed within the boundaries of the BWCAW (except for a provision allowing it in national emergencies). In the 1978 Act of Congress that formalized protections for the Boundary Waters, a Mining Protection Area was designated along the road corridors near the BWCAW known as the Echo Trail, the Fernberg Road and the Gunflint Trail.

Recent interest in developing sulfide mining in the region has caused significant political controversy. Two major proposed mines, PolyMet and Twin Metals, would disturb the wilderness and cause great pollution to three Minnesota icons: the BWCAW, Lake Superior and Voyageurs National Park. The PolyMet mine would be an open-pit mine located at the edge of the BWCAW watershed. If developed, Twin Metals would be an underground mine two to three miles from the BWCAW border and within the Boundary Waters watershed.

Any groundwater pollution from the Twin Metals mine would enter Birch Lake, flow through the White Iron Chain of Lakes to Fall Lake, and enter the BWCAW as part of the Rainy River watershed. These waters — cherished for fishing, swimming and providing habitat for wildlife — flow past BWCAW campsites and entry points, resorts and cabins.



Status of Proposed Mine Projects

PolyMet: This proposed mine is in the permitting phase after concluding environmental review in 2016. Conservation organizations have filed lawsuits that include challenges about the mine's impacts on wolf and lynx habitat.

Twin Metals: This project has been entangled in political and legal conflict over the leasing of state and federal minerals near the BWCAW in recent years. Given the serious risks posed to the Boundary Waters ecosystem, the federal government initiated a study of a possible 20-year mineral withdrawal of 234,000 acres in the Boundary Waters watershed in 2017. The government is slated to make a decision on the mineral withdrawal in early 2019.

The Twin Metals project would be located in a beautiful part of the Superior National Forest on both sides of popular scenic route Highway 1. It would turn a recreational area into a major industrial zone. Mining noise from heavy equipment and blasting would carry great distances, including into the BWCAW. Forest fragmentation from roads, utility corridors and structures would create more areas for invasive species to find a foothold, while driving away native animals like lynx and wolves.

While the PolyMet project is outside the Wilderness watershed, its pollution may still have a pathway to the BWCAW. Scientists from the Great Lakes Indian Fish and Wildlife Commission raised this concern in August 2015. They noted that changes in hydrology caused by other nearby taconite mine pits were not included in PolyMet's environmental review. Their data suggest that pollution from PolyMet could flow northward underground through other pits and into the BWCAW watershed.[9,10]

A sulfide mine in the BWCAW watershed would have several risks to the Wilderness, including:

- Substantial pollution able to reach the Wilderness from underground or surface leaks
- Local water supplies adversely affected by mine activities
- Water pollution from acid mine drainage or mine technology failures
- Increased sediment runoff from storm events
- Disturbance of wetlands[11,12]

Greg Seitz

Acid Mine Drainage
Acid mine drainage from mining exploration in 1976 continues today along the Spruce Road near the BWCAW, where Twin Metals has proposed a full-scale mine.

Wikicommons

Open Pit Mine
The proposed PolyMet Mine would be an open-pit mine similar to the Chino Copper Mine in New Mexico.

Ryan Mattke

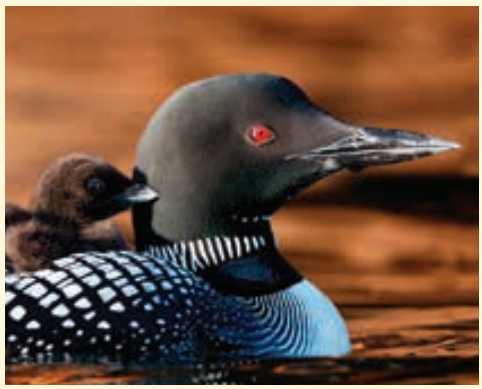
Threatened Waters
Twin Metals has proposed a sulfide mine at the edge of the Boundary Waters Wilderness and on the shores of the South Kawishiwi River.

"The BWCAW is a crown jewel in Minnesota and a national treasure."[13]

—GOVERNOR MARK DAYTON

Section 2

PRECIOUS WATERS



Gavia immer

"If I sat in that canoe, I thought,
I could look into the interior of the lake...
With a canoe, I thought,
I could become one with the water."

—SUE LEAF

In the coming century, nothing will be as valuable as clean water. As the climate warms and changes, the 2,000 lakes of the BWCAW, with their abundant clean water and critical aquatic habitat, become more precious every year. These waters also face new perils as extractive and polluting industries target the region for development.

A period map of the Boundary Waters area before it gained protected status.

Previous page landscape: "Autumn Gold" by Sue Nankivell
Previous page inset: Richard Simonsen
Image above: Minnesota Historical Society

CURRENT CONDITIONS

Status: Boundary Waters lakes, rivers and streams are generally clean and healthy, but are at risk from climate change, potential mining pollution and other contaminants.

Ninety-two percent of lakes in northeastern Minnesota meet water quality standards for aquatic recreation, meaning they are suitable for swimming and wading. The high number of healthy lakes is due to the region's abundant wetlands and forests, which slow erosion and filter runoff.[1] This makes lakes in the BWCAW exceptional habitat for fish species like lake trout. Lakes are often stained red-brown with tannins or dissolved peat from wetlands in the headwaters of lakes and rivers.

The waters of the BWCAW are some of the cleanest in the nation. Every lake, stream and wetland in the Wilderness is designated by the State of Minnesota as an outstanding resource value water.[2]

One study of Boundary Waters lakes used satellite imagery and analysis to estimate water clarity. One-hundred percent were found to fully support recreational activities like swimming. The sub-watersheds of the Kawishiwi River located entirely or mostly within the Wilderness are all "excellent, relatively stable and reflective of natural watershed conditions."[3]

So far, few Wilderness lakes show evidence of shifts in factors like nutrients, temperature or clarity. Extensive monitoring is needed to detect changes and guide management in the face of emerging threats.[4]

1978 BOUNDARY WATERS CANOE AREA WILDERNESS ACT

"Section 1. The Congress finds that it is necessary and desirable to provide for the protection, enhancement, and preservation of the natural values of the lakes, waterways, and associated forested areas..."

Wilderness Water Management

The U.S. Forest Service's *Wilderness Stewardship Performance Guidebook* helps the agency assess the condition of resources in the Boundary Waters. Forest Service monitoring is based on achieving this goal: "Water quality and quantity have been protected in this wilderness and actions taken, where appropriate, to maintain or restore natural conditions and processes."[5]

Most of the wilderness is also subject to the 1909 Boundary Waters Treaty between Canada and the United States. This treaty established that neither country will pollute waters along the entire international border "to an extent that would cause injury to health or property in the other country."[6]

Library of Congress, *Show-Card Design and Ornament*, 1903, Public Domain

WATER QUALITY THREATS

Status: Lakes, rivers and streams in the BWCAW are some of the cleanest in Minnesota. Drainage from proposed sulfide mines and altered lake temperatures from a changing climate may forever alter these precious waters.

SULFIDE MINING

In 2013 and again in 2018, the Kawishiwi River in the Boundary Waters was designated one of the 10 Most Endangered Rivers in America. The river flows out of the Boundary Waters near Gabbro Lake and re-enters the Wilderness at Fall Lake. The designation was a recognition of the ecological risks from the proposed Twin Metals sulfide mine, which would be located next to and under the river only a few miles from the Wilderness.

Extracting copper and nickel from sulfide ore releases chemicals that harm water. Acid mine drainage is the dangerous mix of acidic water laden with toxic metals that runs off a mine site. This mixture kills fish and other aquatic life, leaving lakes and rivers dead for years. Acid mine drainage and sulfate discharges can also affect the cycling of phosphorus between lake sediment and water, causing increased algal growth, loss of water clarity and eutrophication.[7]

CLIMATE CHANGE

Research inside and near the Wilderness has shown that boreal lakes are warming, contributing to increased organic productivity. On nearby Isle Royale National Park, scientists studying its protected inland lakes find "habitat quality in this remote park is changing rapidly." Studies on one lake indicate water temperatures have changed during the 20th century, likely due to increasing air temperatures.[8]

These kinds of changes can have a strong effect on habitat quality. Warmer surface waters in summer extend deeper, reducing the amount of cold, dark waters some fish and other organisms require. Water temperature also influences how nutrients move through the lake system.[9]

Climate change will also make lakes more vulnerable to threats from aquatic invasive species like spiny water flea and rusty crayfish. A changing climate can influence the establishment, spread and distribution of invaders, and alter the resilience of native habitats and species to invasion.

Minnesota Pollution Control Agency

Minnesota Pollution Control Agency

Aaron Fulkerson CC-BY-SA-2.0

Citizen Science in Canoe Country

In 2016 Friends of the Boundary Waters Wilderness launched a citizen science project to monitor the water quality of Wilderness lakes. More than 50 people helped record lake temperature, clarity, pH and dissolved oxygen content as well as record wildlife sightings. Over time, this information will help us understand the health of the BWCAW waters and detect any changes that may occur.

MERCURY

All lakes tested in northeastern Minnesota have mercury concentrations in game fish above safe levels.[10] The Minnesota Department of Health advises limiting the amount of walleye and northern pike consumed from any BWCAW lake.

Mercury is dangerous not just for wildlife but also for humans. It can harm the central nervous system, causing poor motor skills, dulled senses and, in severe cases, irreversible brain damage. Mercury is particularly harmful to developing fetuses and infants. In the Lake Superior Basin, eight percent of Minnesota infants surveyed were born with high levels of mercury — above the regional average.[11]

Coal-fired power plants are the largest source of mercury emissions in the Great Lakes region, followed by metals mining and processing and fossil fuel combustion. Approximately 62 tons of mercury are emitted from human activities each year in the United States.[12]

Much of the mercury deposited in the Boundary Waters comes from sources far from Minnesota — carried thousands of miles on the wind, falling to earth and into Wilderness waters. About 90 percent of the mercury deposited in Minnesota originates from other states and countries.[13]

Climate Change and Mercury

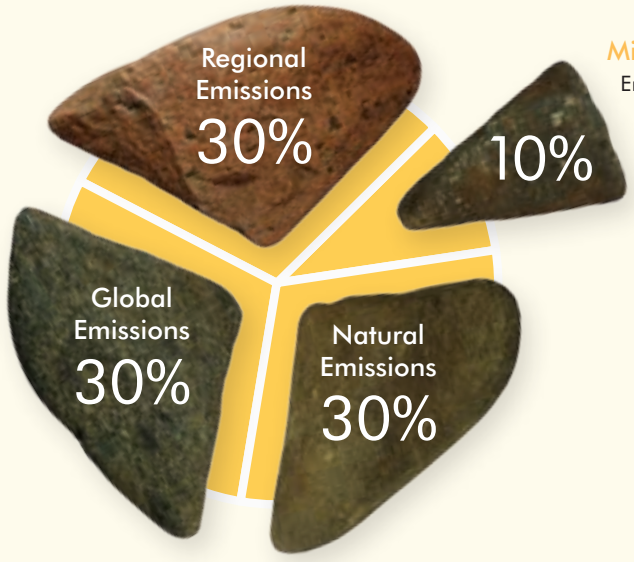
Variability in seasonal precipitation caused by climate change can contribute to the creation of methylmercury, the toxic form of mercury. Cycles of wet and dry conditions can stimulate peatlands to release more methylmercury. Heavier rains expected with changes in climate patterns can wash more mercury into rivers and lakes without first being filtered through soils.

Mining and Mercury

Minnesota's existing taconite mines and processing plants emit mercury to the air and discharge sulfate to water bodies. Sulfate can spark the conversion of mercury to its dangerous methylmercury form.[14,15] Proposed sulfide mines are expected to add to the region's sulfate load — and to the area's existing mercury problem.

Mercury contamination is a persistent problem. While the Great Lakes states have made progress, reducing their mercury emissions by as much as 50 percent since 1990, mercury contamination in our lakes, streams and fish remains high.[16]

Sources of Atmospheric Mercury Deposition to Minnesota[20,21]



Minnesota Mercury Emissions 10%

Emissions are created by:
- Energy Production: 36%
- Taconite Processing: 30%
- Other Sources: 34%

Sulfate + Mercury = Methylmercury

Sulfate from mines and wastewater treatment plants, and mercury deposited from air, can come together and create methylmercury. This form of mercury readily contaminates fish and harms aquatic plants, including wild rice.

VISITOR IMPACTS TO WATER

Many Boundary Waters visitors drink water right from the lake, unfiltered and untreated — a unique experience in the modern world. Yet 200,000 people who visit the Wilderness each year can add up to a lot of people rinsing themselves, cleaning dishes, shampooing and using latrines near the water. Without care, users can be a source of significant water pollution.

Wilderness visitors can help protect canoe country waters by practicing the Leave No Trace camping principles of not soaping and rinsing in lakes and always using designated latrines.

One of the most common ways humans contaminate Wilderness waters is with bacteria. Fecal coliform concentrations *(E. coli)* in waters around Boundary Waters campsites are often significantly elevated. Campsite latrines must be dug into the shallow topsoil of the region, and contaminants can leak. Latrines should be located at least 150 feet from shorelines, and in soils that can filter out contaminants. In addition, human visitors sometimes use non-designated areas as latrines.[17]

Good News for Some BWCAW Lakes

The Minnesota Pollution Control Agency, Forest Service and Vermilion Community College recently completed a study of three high-use wilderness lakes. Alton, Ensign, and Caribou all met water quality standards for clarity, nutrients and algae. There was no significant difference in water quality between deep and shallow locations.[18,19]

RESPONSIBLE WILDERNESS WATER USE LEAVES NO TRACE

Do not go in the water when covered in bug spray, sunscreen, soap

Do not spit toothpaste in the water

Consider natural cleaning and hygiene products and never bathe or wash dishes directly in the water

Use the latrines for their intended purpose

Do not burn trash; it releases harmful dioxins into water

Minnesota Historical Society

Section 3

WILDERNESS LIFE

"Fishing results:
Ken caught the most: one smallmouth bass,
one northern, two leeches.
Rick: one northern, one walleye.
Brant: one northern.
Myself: I caught one leech."

—GREG GJERDINGEN

The unique slice of boreal habitat found in the BWCAW provides specific conditions and resources that many living organisms need to survive or breed. Eight forest types make up the Superior National Forest. Twelve percent of the landscape is water. Diverse habitats make for diverse inhabitants: 50 mammal species reside here; various fish of cold, deep lakes swim below anglers' canoes; large carnivores — wolves, bear, lynx — roam the woods; delicate plants and flowers, fleeting insects and more than 220 species of birds find the rare combination of water, climate and food they require to thrive.[1]

WILDLIFE

Status: Many of the Boundary Waters' wildlife species are sensitive to impacts from human pollution and climate change. The region is at risk of losing the presence of some of its most notable species.

MOOSE

Moose *(Alces alces)* stand six-and-a-half feet tall and weigh around 1,000 pounds. They look cobbled together out of leftover parts, but they are well built to survive the harsh conditions in canoe country.

However, moose have a hard time handling heat. If winter temperatures rise above 23 degrees Fahrenheit, moose eat less and their nutrition and health suffer. In the summer, moose start experiencing heat stress at 63 degrees and begin breathing hard at 68 degrees.[2] Moose find safety, food and cooling in lakes and wetlands. In cool water, moose reduce their respiration rate by almost 30 percent and their overall energy expenditure by about 10 percent.[3]

Moose populations in northeastern Minnesota, including the Boundary Waters, have experienced a significant decline over the last decade. Between 2006 and 2016, the population fell by more than half — from 8,840 to just 3,710. While researchers remain concerned about this decline, Minnesota received some good news in 2016 when wildlife surveys indicated the calf survival rate was its third highest since 2005.[4]

Climate Change and Moose Population Decline

The State of Minnesota, Ojibwe bands and the federal government have undertaken extensive research since 2012 to understand the decline in moose numbers. Climate change appears to underlie most moose mortality.

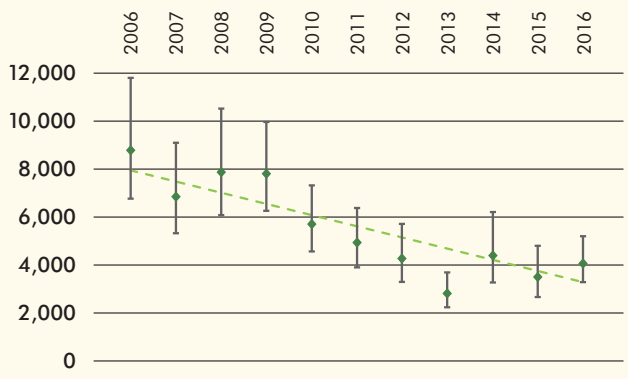
Warmer temperatures in both summer and winter stress and weaken moose. As temperatures rise, ticks and other parasites spread and survive the winter, and can sicken moose. White-tailed deer numbers have also increased with a warming climate, spreading parasites like brainworm to the moose population. Weak and diseased moose are also more susceptible to wolf depredation.[5]

Minnesota climatologists predict shorter, warmer winters with fewer extremely cold days. The average summer temperature in northern Minnesota is expected to rise as much as seven degrees by 2100.[6,7] To protect the Boundary Waters' iconic moose, Minnesota must address climate change impacts, the region's deer population and the availability of adequate moose habitat.

Sulfide Mining and Moose

Proposed sulfide mines in northern Minnesota are poised to destroy thousands of acres of moose habitat, including many wetlands they depend on for food and cooling. Polluted runoff from the mines could also kill aquatic vegetation moose need to build nutritional reserves.

Estimated Moose Population[4]



Courtesy of Minnesota Department of Natural Resources, 2014

CANADA LYNX

Canada lynx *(Lynx canadensis)* are a federally listed threatened species under the Endangered Species Act. The Arrowhead region of Minnesota, including the Boundary Waters, provides federally recognized critical habitat for a significant number of these secretive animals.

Researchers have identified a "significant reproducing population" of lynx in the Superior National Forest: 24 breeding females and 13 breeding males.[8] Because of access difficulties, surveys have not yet been conducted in the Boundary Waters, where scientists anticipate possibly the highest population of the wild cats in the region.

As winters grow warmer and snow packs are not as deep, bobcats and coyotes can more easily compete with lynx for territory. This may result in lynx territory shifting farther north into Canada. Bobcats also interbreed with lynx, diluting the gene pool.

Other Factors Affecting Lynx:

- Suppression of forest fires and timber management practices that destroy habitat
- Roads and snowmobile trails that fragment lynx habitat and provide access to competitors[12,13,14]

Management Methods

The Superior National Forest identifies these goals for the management of lynx:

- Identify habitat connections
- Use wildlife fencing, underpasses and overpasses
- Reduce incidental mortality of lynx related to trapping
- Maintain or enhance habitat
- Manage for lynx at the landscape level
- Maintain important connectivity with habitat and lynx in Canada[15]

Lynx

Lynx depend on snowshoe hare for food, consuming on average one hare every two to three days, especially in winter. Adequate hare habitat is essential to healthy lynx populations.

When hare densities are low, female lynx have fewer kittens, fewer young survive to adulthood and lynx populations decline. Lynx and hares are both adapted to deep snow habitats. Snowshoe hares seek dense forest understories for food, protection from predators and shelter from harsh weather.

Lynx require forests with plenty of downed logs and exposed roots for their dens. The availability of both young and old forests is important for their survival.[9,10,11]

Benjamin Olson

Gary Kramer, U.S. Fish and Wildlife Service

Jitze Couperus CC-BY-2.0

WOLVES

About 2,900 wolves make Minnesota their home, many of them in the Boundary Waters and surrounding area. Wolves in Minnesota are a federally threatened species under the Endangered Species Act.[16]

Northeastern Minnesota, including the Boundary Waters, has the distinction of once sheltering the last remaining wild wolf population in the lower 48 states. Thanks to the Endangered Species Act and careful management, the gray wolf, or timber wolf *(Canis lupus)*, has increased in numbers and repopulated northern Wisconsin and Michigan's Upper Peninsula.[17] A healthy wolf population exists in the Superior National Forest, and hearing a howl on a trip in the Wilderness is a hoped-for highlight for most visitors.

Prior to protection under the Endangered Species Act in 1974, wolf hunting was allowed in Minnesota. Their protected status has fluctuated since that time. Wolves were removed from the Endangered Species List in January 2012, and Minnesota allowed hunting and trapping for two years. In December 2014 a federal judge reinstated federal protection for the wolf, and hunting was once again prohibited.[18]

Wolf surveys in 2017 indicate the state's population has increased by 22 percent. Scientists believe the increase in the white-tailed deer population is responsible for the increase in wolf numbers.[19]

Research has shown that the presence of wolves can have an ecosystem-wide beneficial effect. When wolves were reintroduced to Yellowstone National Park, species like ravens, wolverines and bald eagles benefited from scavenging opportunities on carcasses of animals killed by wolves. Even vegetation in the park improved, as elk changed where they browsed in response to the presence of wolves, allowing heavily impacted areas to re-grow.[20]

BLACK BEARS

About 20,000 American black bears *(Ursus americanus)* are found throughout Minnesota, including the Boundary Waters. Despite a healthy population of black bears sharing the BWCAW with hundreds of thousands of visitors annually, bear-human conflicts are extremely rare.[21]

Limited food sources in the Boundary Waters region make bears susceptible to annual shortages of berries and hazelnuts, which can be killed by late frost or drought. When a bear's regular diet is disrupted, it can quickly turn its attention to human food sources.[22]

Tips for Staying Out of Bear Trouble

- Keep a clean campsite; never eat or store food in your tent
- Hang a pack or use a bear-resistant container to store food, garbage and any other strong-smelling items
- If you encounter a bear, shout, bang pots or throw fist-sized rocks to scare it off; a very persistent bear may be discouraged by spraying pepper spray into its eyes[23]


David Bradford Kane


Cameron Wittig CC-BY-ND-2.0


Greg Walters CC-BY-2.0


Mheisel CC-BY-2.0


Benjamin Olson


Deb Gruhlke


Aaron Fulkerson CC-BY-SA-2.0

"The biodiversity of wilderness landscapes, yielding surprises around every bend in the trail, is part of their spiritual appeal."[57]

—DR. JOHN PASTOR, FOREST ECOLOGIST

Species of Special Concern

These small creatures living in the Boundary Waters and the surrounding area are rarely seen by humans. They are some of Minnesota's "Species of Special Concern" because of their rarity and sensitivity to change.[24,25,26,27,28]

Northern bog lemming
(Synaptomys borealis)
Found in only 10 peatlands in Minnesota, including in the Boundary Waters region; they prefer acidic bogs dominated by sphagnum moss, shrubs and peat

Smoky shrew
(Sorex fumeus)
Prefer cool, damp forest floor with a thick litter layer, moss-covered rocks and decaying debris

Eastern heather vole
(Phenacomys ungava)
Live in coniferous forests with a heathy understory, wet meadows, rocky hillsides, forest edge or deciduous shrubby habitats; need to be near water, boulders, coarse woody debris and plants of the heather family

Northern long-eared bat
(Myotis septentrionalis)
Designated as a federally threatened species in 2015 due to a fatal and spreading disease known as white-nose syndrome; in summer, bats leave caves for forested habitats near water sources

Four-toed salamander
(Hemidactylium scutatum)
Live in mature upland deciduous or mixed deciduous-coniferous forests interspersed with sphagnum seepages, vernal ponds or other fish-free habitats

FISH

Status: Fish scientists and managers believe the Boundary Waters, with its clean, deep lakes, protected watersheds and cool northern temperatures, provides a refuge from some human impacts for many Minnesota fish species.

For many people, fishing is one of the most important reasons to go to the Boundary Waters. But the fish of the BWCAW are not shielded from the risks of changes in water quality and climate, the spread of invasive species and other human-caused impacts.

Climate Change and Fish

In the decades ahead, longer, hotter summers will increase lake water temperatures, resulting in changes in vegetation, water clarity and quality, increased algal blooms and degradation of fish habitat.[29,30,31]

Sulfide Mining and Fish

Mercury from mining pollution not only threatens aquatic life — it can render fish dangerous to eat. Toxic levels of heavy metals and other contaminants from mine runoff have poisoned waterways near sulfide mines across the country and could put fish populations in the Boundary Waters at risk should these mines be developed.

CISCO

Cisco *(Coregonus artedi)*, also known as tullibee or lake herring, are a cornerstone of many Boundary Waters' lake ecosystems. Schools of cisco feed many favored game fish species, including walleye and lake trout. But cisco cannot tolerate warm waters, preferring temperatures below 62 degrees Fahrenheit, as well as high levels of dissolved oxygen.[32]

Cisco numbers have been declining for decades, never fully recovering from overfishing in the first half of the 20th century. Recent population declines are likely connected with significantly warmer summer temperatures, competition with non-native rainbow smelt and other introduced species, predation by northern pike and the eutrophication of lakes. Scientists predict that 460 of Minnesota's 620 cisco lakes will no longer support the fish by 2100.[33]

Some deeper, cooler lakes located in the Boundary Waters may continue to support cisco and their dependent walleye and lake trout fisheries, meaning Wilderness waters could be a critical ecological refuge for this species.[34,35]

LAKE TROUT

Lake trout *(Salvelinus namaycush)* prefer deep lakes with water temperatures below 55 degrees Fahrenheit. In Minnesota, most lakes with these features are in or near the Boundary Waters. Climate change could result in trout disappearing from an estimated 30 to 40 percent of Minnesota lakes by 2050. Those lakes that are deep enough to retain cold, well-oxygenated waters may be able to continue to shelter trout.[36]

The factors threatening the future of lake trout include:

- Increased runoff and siltation of spawning grounds
- Warmer water temperatures, increased algal growth and less dissolved oxygen
- Earlier warming of surface waters leading to fewer days trout fry can feed
- Less winter ice cover, leading to more winter storm wave action that can kill trout eggs[37]

USFWS, Timothy Knepp

Common Sportfish

Walleye *(Sander vitreus)* is a delicacy of canoe country. Declines in one of its favorite prey species, the cisco, from warmer lake temperatures, is believed to have contributed to the dramatic decline of walleye in Lake Mille Lacs in central Minnesota.[38]

Northern pike *(Esox lucius)* are known for their ferocity, and are a key species for sport and subsistence fishing. Threats to northerns include increasing occurrences of spring droughts in shallow bays where they spawn, and water too warm or too low in oxygen to support reproduction.

Smallmouth bass *(Micropterus dolomieu)* are not native to the Boundary Waters, but the popular sport fish was introduced into many lakes by humans seeking to expand fishing opportunities.

Brook trout *(Salvelinus fontinalis)* prefer water temperatures below 68 degrees Fahrenheit and are stocked in some small, cold lakes in the Boundary Waters. Low stream flow in the fall due to changing precipitation patterns hurts the survival of young brook trout.[39]

Lake sturgeon *(Acipenser fulvescens)* are ancient, slow-growing fish that can live to more than 100 years old and grow longer than five feet. Sturgeon primarily live on the bottom of large, clean, freshwater rivers and lakes. The population, once significantly depleted by overfishing, dams and water pollution, is still affected in many places by dams and destruction of spawning areas.[40]

Walleye: US Fish & Wildlife Service Public Domain, by Duane Raver. Northern Pike: U.S. Fish & Wildlife Service National Image Library, Drawing by Timothy Knepp, Public domain. Smallmouth Bass: U.S. Fish and Wildlife Service Public Domain, Duane Raver. Brook Trout Illustration: Public Domain. Lake Sturgeon: USFWS Public Domain, Hagerty, Ryan.

BIRDS

Status: The boreal forests on the Minnesota–Ontario border are critical for a wide variety of bird species. While most of the region's bird populations appear stable for now, changes in climate and human activities on the landscape have major implications for birds.

For many, the common loon's song echoing across Wilderness lakes is the hallmark sound of the Northwoods. Many other bird species also find the habitat they need in the forests, lakes, rivers and wetlands of the Boundary Waters. Long-term monitoring reveals an enormous diversity of bird species using our northern woods.

HEALTH OF BIRD POPULATIONS

The Superior National Forest is designated an "important bird area" by the National Audubon Society due to its diversity of habitat types interspersed by lakes and waterways. The forest provides habitat for 163 species of breeding birds — an impressive 74 percent of all regular breeding bird species in Minnesota. Migrating birds that use the area but do not stay to breed bring the numbers to 227 species using the forest each year. Breeding species include 24 species of warblers, representing 77 percent of the 31 warblers that breed in Minnesota.[41]

Scientists studying bird populations in the Superior National Forest and adjacent areas find that bird communities overall are fairly healthy and stable. One 20-year monitoring project of 62 species found that 24 species increased significantly.

However, eight species of birds showed worrisome population declines *(see list below)*.[42] Researchers believe some of these declines are due to human-caused changes in the landscape (in North America and on wintering habitat in Central America) as well as from the effects of climate change, loss of nesting habitat from fragmentation, nest predation and collision with structures. Some declines are not yet understood.

Species Showing Significant Decrease

- Broad-winged hawk
- Connecticut warbler
- Evening grosbeak
- Magnolia warbler
- Ruffed grouse
- Swainson's thrush
- Wilson's snipe
- Yellow-bellied flycatcher

Species Showing Significant Increase

- American robin
- Black-and-white warbler
- Blackburnian warbler
- Black-capped chickadee
- Black-throated green warbler
- Blue jay
- Cape May warbler
- Cedar waxwing
- Golden-crowned kinglet
- Gray jay
- Hairy woodpecker
- Hermit thrush
- Nashville warbler
- Northern flicker
- Northern parula
- Ovenbird
- Pileated woodpecker
- Purple finch
- Red-breasted nuthatch
- Ruby-crowned kinglet
- White-throated sparrow
- Winter wren
- Yellow-bellied sapsucker
- Yellow-rumped warbler

Towers and Birds

Tall communication towers with guy lines have been constructed near the Boundary Waters in recent years, including a 450-foot AT&T tower which Friends of the Boundary Waters Wilderness challenged in court. These towers are a significant cause of bird deaths. Research shows bird fatalities at communication towers can be reduced by 50 percent or more by removing non-flashing red lights.[43]

Swainson's Thrush is one of the bird species most commonly killed by communication tower collisions.[44]

Matt Reinbold CC-BY-2.0

THE COMMON LOON

The common loon *(Gavia immer)* only builds its nest where the shoreline is natural and undeveloped, and needs clear water to see its prey when diving.

Minnesota's loon population includes roughly 12,000 individuals — about the same number as in the first statewide survey in 1989. This is a greater population of loons than in all other states combined except Alaska. The Minnesota Department of Natural Resources (DNR) concludes the state's loon population remains "healthy overall."[45]

Nevertheless, loons are sensitive to pollution and changes in their environment, and encounter a variety of threats that warrant careful monitoring and precautionary action.

Fatal Fishing Tackle

Across the loon's breeding range, lead poisoning accounts for 12 to 50 percent of adult loon deaths. Loons, bald eagles, swans and other birds can be poisoned by eating lead fishing sinkers and jigs. Just one lead sinker is enough to slowly sicken and weaken a loon until it dies.[46] Sinkers made out of non-toxic materials are available to purchase and work well. Anglers are encouraged to switch to non-lead tackle.

Mercury

The heavy metal mercury and its potent effects as a neurotoxin is a concern for birds that eat fish. Mercury from sources like coal power plants is deposited in lakes far from the source, where it slowly works its way through the ecosystem. Sulfate, often a byproduct of mining, can transform non-toxic forms of mercury into dangerous forms that can bioaccumulate in the bodies of fish and loons, and kill. Loons poisoned with mercury are less likely to reproduce and are not able to care for their young.[47]

Migration Dangers

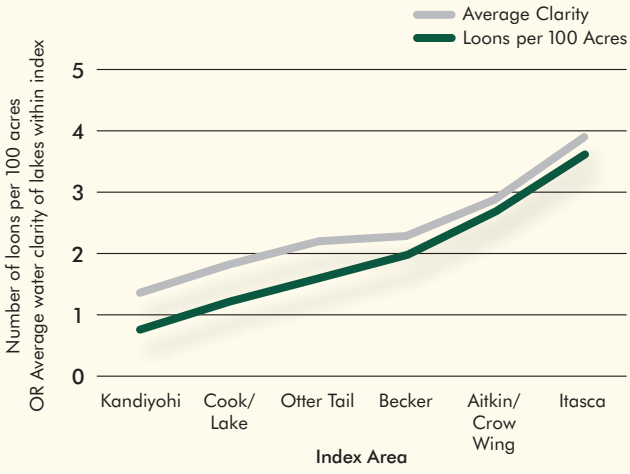
Large numbers of loons have also been killed on their migration and wintering grounds outside the Boundary Waters in recent years due to:

- Exposure to toxic chemicals from the 2010 Deepwater Horizon oil spill in the Gulf of Mexico; the impacts contribute to loon mortality, low weight gain and reproductive failure[48]
- Large outbreaks in the Great Lakes of avian botulism

Lake Clarity vs. Loon Density

When DNR scientists compared lakes where loons live to information about water clarity, they found a significant relationship between the birds and clear water.

Minnesota Loon Monitoring Program 1994–2015 report, page 4



Benjamin Olson

FLORA

Status: The Boundary Waters is largely a boreal landscape dominated by spruce and pines and other northern vegetation. It contains habitat-dependent rare plants that can be impacted by climate change and human activities.

BOREAL FOREST

There is very little boreal forest in the contiguous United States, and the Boundary Waters contains most of it. Towering white pines and native plants define this Wilderness scenery.

In addition to white pines, the Wilderness includes forests dominated by jack pine, red pine, a mix of red and white pine, boreal hardwoods and conifers, northern hardwoods, aspen, birch and spruce-fir and conifer bogs composed of black spruce, tamarack or white cedar.[49]

The variety of trees growing in the Boundary Waters is dictated by climate, geology, soils, topography, fire and wind — and shaped today by humans through climate change and fire suppression.

WILD RICE

Wild rice *(Zizania palustris)*, the state grain of Minnesota, is an important food for people and wildlife. Known as manoomin ("the good berry") to Ojibwe people, it is also a key cultural resource. Ojibwe oral tradition notes that when the people traveled from the east through the Great Lakes, they were instructed to look for the place where "the food grows on the water" to make a new home. This led them to the shores of Lake Superior, where the abundant manoomin was received as a gift from the Creator.[50]

Wild rice is an aquatic plant that is not related to common rice, and grows in the shallow parts of many Boundary Waters lakes. It has high protein content and is a key part of some people's diets. It provides food for many bird species, including ducks and red-winged blackbirds.

Harvesting Wild Rice

Wild rice grains are harvested by gently bending the rice stalks over the canoe and sweeping the rice sticks over the stems. After the harvest, rice must be processed by drying, freezing or soaking.

Minnesota Pollution Control Agency

Rare and Remote

Botanists studying native plants and flowers in remote parts of the Boundary Waters have been rewarded with amazing discoveries. Some of the rarest plants are isolated remnants of species that retreated north with the glaciers, separated by hundreds of miles from their next nearest cousins. Many live in hard-to-reach locations in the Boundary Waters, and decades pass between scientists seeing them.

Water-Dwelling Plants

Algae-like pondweed (above)
(Potamogeton confervoides)
One of the rarest species in Minnesota; found in Minnesota only once in the Boundary Waters, where it prefers acidic bogs[51]

Lavender bladderwort (above)
(Utricularia resupinata)
Most of Minnesota's population is found in the Boundary Waters; the plant is believed to flower only when water levels are low at the same time as air temperatures are warm, making them vulnerable to changes in hydrology and precipitation[52]

Slender rush (left)
(Juncus tenuis)
Prefers sandy habitat and faces risk of damage by wilderness travelers[53]

Cliff-Dwelling Plants

The tall cliffs that form palisades along many lakes on the Canadian border, especially north of the Gunflint Trail, have tiny secrets concealed on their ledges.

Weak arctic sedge
(Carex supine)
Observed only three times: in 1889, 1936 and 2009[54]

Purple reedgrass
(Calamagrostis purpurascens) and
hoary whitlow grass
(Draba cana)
Only a few occurrences found in the state, mostly in the Boundary Waters region[55]

Sticky locoweed
(Oxytropis viscida)
Found only in one place in Minnesota — on top of a cliff near the Border Route Hiking Trail, almost 600 miles from the plant's primary population in Canada; the plants could be damaged by erosion from activities taking place above their cliffs, by rock-climbing or climate change[56]

Algea-like pondweed: USDA-NRCS PLANTS Database, Britton, N.L., and A. Brown, 1913; Slender rush: USDA-NRCS PLANTS Database, *Wetland flora: Field office illustrated guide to plant species;* Lavendar bladderwort: USDA-NRCS PLANTS Database, Britton, N.L., and A. Brown, 1913

Section 4

ECOLOGICAL HEALTH

"A deeply held morality
toward all creatures is the fundamental core
of our continued existence."

—JOHN PASTOR

The BWCAW contains a unique ecosystem and landscape found nowhere else on earth. Living organisms — plants, animals and humans — are in constant interaction with nonliving environmental elements like air, water and soil. Factors such as fire, climate change, sulfide mining and non-native species can have powerful and profound effects on the Wilderness. This network of interactions in the Boundary Waters ecosystem makes its management, protection and restoration a complex task.

Bacon Rock at Dorothy Molter's Isle of Pines on Knife Lake.

NON-NATIVE PLANTS AND ANIMALS

Status: Exotic organisms threaten to disrupt lakes and forests in the Boundary Waters.

The introduction and spread of non-native species in the Boundary Waters region presents a threat to the well-being of native organisms and the natural functioning of the ecosystem. Non-native species often outcompete native plants and animals and can degrade natural habitats. Frequently, these invaders are transported from one area to another unknowingly by humans on boats, clothing and gear such as fishing line and anchor rope. With attention and care, people can help prevent the distribution of these harmful non-native species.

Compared to national forests and wilderness areas in other states, the Boundary Waters and the Superior National Forest still have relatively low levels of invasive species. However, with thousands of visitors every year from all over the world, the potential exists for invasive species to become a much larger problem.

Surveys indicate that more than 60 percent of the BWCAW invasive plant infestations are small, at less than 25 square feet in size. This gives managers an opportunity to eradicate invasives at these locations and control their spread. Some of the most common invasive plants found are orange and yellow hawkweeds, oxeye daisy and Canada thistle.[1]

CLIMATE CHANGE AND INVASIVE SPECIES

Warming weather and changes in precipitation patterns may give some non-native species an advantage, catalyzing their introduction, spread and disruption of native habitats. In addition, invasive species like earthworms and exotic tree pests will magnify the impacts of warmer temperatures.[2]

Aquatic Invasive Species

Minnesota Aquatic Invasive Species Research Center, University of Minnesota

Spiny waterflea *(Bythotrephes cederstroemi)* has infested Caribou, Devil Track, Flour, Greenwood, Gunflint, McFarland, Pine and Saganaga Lakes along the Gunflint Trail. The tiny crustaceans clog fishing lines, outcompete native species and are not edible to most fish.[3,4]

Minnesota Aquatic Invasive Species Research Center, University of Minnesota

Starry stonewort *(Nitellopsis obtusa)* is a plant that invades lakes, driving out native plants and damaging bass and sunfish spawning habitat. Its small reproductive cells can attach unnoticed to boats and trailers and in the fur and feathers of birds and other animals.[5,6,7]

Peter Pearsall/U.S. Fish and Wildlife Service

Rusty crayfish *(Orconectes rusticus)* are present in 17 lakes in the Superior National Forest, eight of which border or are in the BWCAW. They can displace native crayfish and impact aquatic plant beds which are important for invertebrates and fish.[8,9]

U.S. Fish and Wildlife Service

Purple loosestrife *(Lythrum salicaria)* is an aggressive perennial that invades wetlands and shorelines, replacing cattails and other native plants. It creates dense stands which are unsuitable habitat for many native animals like ducks, rails, muskrats and frogs.[10]

Stop Aquatic Invaders

With attention and care, people can help prevent the distribution of harmful non-native species:

- Clean all visible aquatic plants, zebra mussels and other material from watercraft, trailers and equipment before leaving any water body
- Drain water-related equipment and bilge, livewell and baitwell before leaving landing
- Dispose of unwanted bait in the trash

Removal and Management Efforts

On land, invasive plants and other organisms are most often found in areas used intensively by humans, such as entry points, campsites and portages. In a 2005 survey of 20 Boundary Waters portages, researchers found non-native species either directly on or within three feet of trails.[11]

Emerald ash borer *(Agrilus planipennis)* is a beetle which threatens to eliminate most of Minnesota's ash trees. The Superior National Forest has about 19,000 acres of black ash swamps. Cold winters are key to killing Emerald ash borer. Unfortunately, winter is the fastest-warming season in northern Minnesota. The loss of ash swamps has the potential to dramatically change the volume and speed at which water moves across the landscape.[12]

Earthworms are not native to the boreal forest. Worms found in the Border Lakes Region have been introduced by humans and are causing changes in the soil, leading to long-term impacts in the types of plants that can grow. Earthworms consume leaf litter, which exposes and warms the soil and affects the survival of native species. They also make it easier for non-native plants such as buckthorn and garlic mustard to grow.[13]

Gypsy moth caterpillars consume the foliage of several types of trees and can destroy millions of acres of forest each year. People may unintentionally spread the gypsy moth by moving objects like canoes and firewood that have egg masses attached.

Several other species of invasive plants threaten the Boundary Waters ecosystem. They contribute to declines in plant diversity, reducing food and habitat for waterfowl and spawning grounds for fish, and disrupting hydrology. Some of them have reproduction and dispersal strategies that make them difficult to control — like producing massive amounts of seeds, releasing chemicals from roots that are toxic to native plants and producing seeds that can be carried long distances on the wind.

Invasive Plants Present in the Wilderness Include:

- **Spotted knapweed** *(Centaurea biebersteinii)*
- **Canada thistle** *(Cirsium arvense)*
- **Common tansy** *(Tanacetum vulgare)*
- **Orange and yellow hawkweeds** *(Hieracium auranticum, H. floribundum, H. pilosella, and H. piloselloides)*
- **Garlic mustard** *(Alliaria petiolata)*

How You Can Help:

- Pack out leftover fishing bait and containers
- Learn what invasive plants look like and report suspected infestations to the Superior National Forest
- Make sure seeds are not stuck to clothes or gear
- Clean mud or dirt off vehicles, pets and boots before traveling onto public land
- Plant native species in gardens and yards
- Pay attention to what is in seed packets
- Do not move firewood
- Use locally acquired or certified firewood

More info:
playcleango.org

Superior National Forest Management

The Superior National Forest began a program to eradicate non-native invasive plants in the BWCAW in 2014. Crews use a combination of herbicides and hand-pulling methods.

In 2016 crews visited 326 infestation sites in the Boundary Waters and performed treatments at 226 sites. Progress has been made at several of these sites. In 2016, after nine years fighting purple loosestrife on Knife Lake and Little Gabbro–Gabbro Lakes, fewer of this persistent species were found than the previous year. Crews treated tansy infestation on Eagle Mountain, and found little left after four consecutive years of treatment.[14] The Superior National Forest also works to control rusty crayfish in the Kawishiwi River watershed and gypsy moths across the area.

Stop Terrestrial Invaders

Friends of the Boundary Waters Wilderness has partnered with the Superior National Forest and REI Corporation to control the spread of invasive species in the Wilderness. The partners published *Non-Native Invasive Species in the Border Lakes Region*, a guide to help BWCAW users identify invasive species and prevent their spread. Each booklet contains postcards for reporting observations of non-native species to the Forest Service. Reporting helps the Forest Service respond to outbreaks. You can view, download and print this booklet at *friends-bwca.org/issues/invasive-species.*

AIR QUALITY

Status: Regional haze impairs BWCAW air quality and visibility.

Under the federal Clean Air Act, all wilderness areas in the United States are designated "Class 1 Airsheds," which is intended to prevent degradation in air quality over these spaces. The primary air quality concern in the Boundary Waters is increased haziness.

Taconite processing and coal power plants can contribute to haze over canoe country. The Minnesota Pollution Control Agency found that the Minntac Mine in Mountain Iron, Minnesota has the single largest impact on haze in the Boundary Waters, contributing noticeably to haze in the Boundary Waters on 530 days over a three-year period.[15,16]

The natural visibility in the Boundary Waters is about 80 miles. In 2010, on average, it was about half that.[17]

The State of Minnesota and the federal government completed a regional haze plan in 2012 intended to improve air quality in the Boundary Waters. It included requirements to make modest emissions reductions at seven taconite plants (six in Minnesota and one in Michigan). It was challenged in court by six conservation organizations, including Friends of the Boundary Waters Wilderness, for failing to achieve the necessary emissions reductions to bring the region to natural conditions. The state's plan was upheld by the U.S. Court of Appeals in January 2016.

Minnesota is on track to meet identified 2018 "progress goals" for BWCAW visibility, but the state has not mapped out a plan that will achieve the goal of natural visibility by the 2064 deadline.[18]

National Park Serivce / Interagency Monitoring of Protected Visual Environments http://vista.cira.colostate.edu/improve

Seven images from Voyageurs National Park showing variations in regional haze.
Photos taken at 9 a.m. or 3 p.m.

FIRE

Status: Without natural fire frequencies, the BWCAW will lose the Wilderness characteristics we value. Climate change may result in unnaturally hot fires that also transform the BWCAW.

The forests of the BWCAW developed with fire. Fire is a natural part of the ecosystem. Jack pine and black spruce evolved with fire, often requiring fire to melt the sealant on their cones to spread their seeds. White and red pine also have thick bark to protect their inner layers from fire, and foliage high out of flames' reach. Frequent fire also helps control many invasive plants, including buckthorn.

Fire suppression makes the Boundary Waters forest more susceptible to larger, hard-to-control wildfires. In the absence of occasional burns, the forests become choked with balsam fir, the least fire-resistant conifer in the northeastern United States. Balsam fir is usually absent in natural boreal forests, only appearing late in the cycle of growth and fire. Because it is shade-tolerant, it has grown unnaturally thick in many parts of the Boundary Waters.

The role of fire in the Boundary Waters forests is better understood thanks to the work of Miron Heinselman, a Forest Service ecologist who started working in the 1940s. He described a carefully balanced system. If fire occurs too often, young trees are burned before they become established. Too little fire leads to old trees dying before a fire opens their cones and releases their seeds for the next generation. Heinselman pioneered a vision of the boreal forest as a "shifting forest mosaic," with stands of different ages and fire-friendly species keeping the habitat diverse and healthy.[19]

Analyzing growth rings from cores taken from tree trunks, Heinselman found that Boundary Waters forests burned on average every 100 years before European settlement. Depending on the type of forest, this burn cycle could range from 50 to 350 years.[20,21]

More recent research investigating why and how fire occurred in this ecosystem points to the likelihood that many historic burns were human-set. Ojibwe people strategically used fires to clear camps and trails and create blueberry habitat, and in the process shaped the Wilderness we know today. Some stands of old-growth red and white pine along lakes and rivers bordering Minnesota and Canada were burned as often as every five to six years during the fur trade era of the 1700s and 1800s, when Ojibwe and Voyageurs were most active in the area. It is believed both groups ignited fires which had profound and lasting impacts on the forest.[22]

> "To restore the natural ecosystem of the Canoe Area, fire should be reintroduced through a program of prescribed fires and monitored lightning fires. Failing this, major unnatural, perhaps unpredictable, changes in the ecosystem will occur."[32]
>
> —MIRON HEINSELMAN

Pagami Creek Fire, Greg Seitz

Notable wilderness wildfires: In the past decade, major fires have burned significant parts of the wilderness, in some cases consuming businesses and residences outside the wilderness.[24,25,26] These fires have had benefits for the boreal forest, consuming the understory and releasing jack pine and spruce cones. But these big blazes have also caused concerns that — due to the unnatural intensity of the fire caused by thick stands of balsam fir, blowdown fuel and ecological shifts related to climate change — the forest will never return to the function and appearance of the past several centuries.

FIRE MANAGEMENT

The Superior National Forest's prescribed burns in the BWCAW are focused on the 1999 timber blowdown area or for safety purposes for property and communities outside the Wilderness. The rest of the forest rarely burns. When possible, natural fires in the BWCAW are allowed to burn as long as they do not threaten safety or property outside the Wilderness. But without returning regular fire to the Wilderness, the Boundary Waters will no longer have the character so many people have come to love.

Today, researchers contemplate whether forest management of the region should include more fires. "Prescribed wilderness fire in these particular places … would help restore and maintain the region's historic fidelity and ecological integrity. If indigenous groups [namely the Boundary Waters Ojibwe] were active participants [to the end]."[23]

VISITOR IMPACTS

Status: The Boundary Waters' popularity as a place of recreation has resulted in significant detrimental impacts.

A canoeist paddling the shore of a Boundary Waters lake will see miles of unbroken forest. Trees grow, fall and rot. Water washes against rock and soil. Then, arriving at a campsite, the paddler often encounters a much different landscape — one with abundant signs of human impacts.

A three-decade study of campsite impacts in the Boundary Waters indicates that people are having profound impacts on the size and well-being of Wilderness campsites. Campsite alterations include impacts to campsite size, vegetation cover, tree damage and root exposure and soil conditions.[27,28]

Stumps and scarred trees were apparent at many campsites included in the study. Even though visitors are instructed to gather only dead and downed wood for campfires, surveys in 2014 revealed only two-thirds as many trees and half as many tree seedlings at campsites as in 1982, indicating that significant cutting of vegetation is occurring.

Sites are literally washing away as soil, disturbed by campers and loosened by tree loss, erodes. Each site examined in 2014 had lost approximately 26.5 cubic yards of soil over the three decades — almost 6,000 dump truck loads of dirt for campsites across the Boundary Waters. Four out of 10 trees showed evidence of moderate to severe damage and root exposure.[29,30]

Soil erosion exposes roots and rocks, which reduces tree cover in the core of the site, which leads to greater sun exposure for the site. A cycle is created when visitors, searching for new level and shaded areas for their tents, expand campsites further. In addition, campers frequently bring individual rather than group tents, leading to the creation of "satellite" tent pads. The number of satellite tent pads more than doubled between 1982 and 2014.[31]

Campsite Management Solutions

- Sidehill campsites: Where topography permits, campsites can be cut into gently sloping terrain to prevent campsite sprawl
- Tent pads: Building flat pads would provide desirable locations and discourage campers from making their own pads elsewhere; intensive impact in a smaller area is preferable
- Restrictions: If necessary, restrictions like prohibiting axes and saws in the Wilderness or even banning campfires (as implemented at many national parks) are possible in order to control tree damage

How You Can Help

- Share a tent
- Use the smallest firewood you can find
- Gather wood away from campsites
- Keep trash out of latrines; the faster latrines fill, the sooner new ones are needed, which can further expand the site
- Watch your step; trampling vegetation causes more erosion
- Follow Leave No Trace practices

_Kripptic CC-BY-2.0

As careful as they might be, BWCAW visitors still adversely affect the area. Soil erosion at campsites, for example, has amounted to an estimated 6,000 dump truck loads over the course of three decades.

Section 5

HUMAN CONNECTIONS

Swimming, Day #1

"The experience left me feeling like a part of something much larger, something ancient and complex. I love experiencing moments like this, where I feel small in the grandeur of life, like I have so much to live up to and respect in the world around me."

—CORI, AGE 16

Humans in the BWCAW date back more than 10,000 years, following the retreat of the glaciers.[1] Centuries ago, the Ojibwe people, or Anishinaabe, migrated into the region and made their home hunting, fishing and harvesting wild rice. More recently, the area has been a place for retreat and recreation, driving regional economies upon which businesses are built.

As the most visited wilderness area in the country, wilderness managers are working to understand who visits, how people spend their time and how our presence impacts this unique and wild place.

Previous page landscape and inset: Kate Kinkade CC-BY-2.0
Photo above: A.Gross

VISITOR TRENDS

Status: Gathering visitor-use information across a million-acre wilderness with multiple entry points is challenging. Data on BWCAW visitor demographics is likely incomplete. Racial diversity among Wilderness users is lacking, with the BWCAW comprising largely a white constituency.

In 2016 people from every state in the country visited the BWCAW. And every year, visitors include people from multiple foreign countries.[2] While comprising just one percent of the total protected wilderness acreage in the country, the Boundary Waters attracts 10 percent of all wilderness visitors.[3] Ninety-seven percent of visitors surveyed in 2015 came from outside St. Louis, Lake and Cook counties — the majority from Wisconsin, Illinois, Michigan, and Minneapolis and St. Paul.[4]

Changes in BWCAW Permit Numbers[7]

	2009	2015	% CHANGE	# CHANGE
Day Use Motor	5,228	4,564	–14.55%	–664
Overnight Hiking	244	355	+31.27%	+111
Overnight Motor	1,548	1,283	–20.65%	–265
Overnight Paddle	20,482	19,894	–2.96%	–588

Understanding the Numbers

According to Superior National Forest visitor surveys, between 2009 and 2015 the total number of Boundary Waters visitors fell by 8 percent while the number of people visiting between October and April grew.[5] Some urge caution when interpreting these numbers, as many Forest Service studies of BWCAW use do not include users that visit through nonprofit camps, other organizations or through wilderness outfitters. It is possible this has led to a significant undercounting of visitation, particularly by youth.

One Ely-based outfitting company reported that in 2016 its customers came from 44 states and nine foreign countries. Half were between the age of 20 and 39, with the single-largest group being people in their 20s.[6]

In contrast, Forest Service visitor studies suggest an aging demographic. Since the first survey nearly 40 years ago, visitor age has increased by almost 20 years, with a mean age of 45. Forest Service data also show between 25 and 30 percent of visitors are women, and that visitors are increasingly coming from urban rather than rural communities. Visitors to the Wilderness today are also more likely to have a college education than they did in 1969.[4]

Wilderness advocates pay close attention to visitor numbers, worrying that fewer visitors could mean fewer defenders of wilderness. While nationally the number of people participating in outdoor recreation holds steady or is slightly rising, participants in outdoor recreation comprise a shrinking percentage of the overall growing population. Between 2009 and 2015, just under half of all Americans participated in outdoor recreation.[8]

Wilderness advocates are also paying closer attention to the racial and ethnic composition of those who use wilderness areas, with recognition that wilderness benefits belong to all, and that wilderness preservation depends on broad public support. In both 1991 and 2007 BWCAW studies, 97 percent of visitors were white.[4] Boundary Waters users in their own informal observations are likely to notice the lack of racial diversity in the people they meet on portages or at campsites. Increasingly, programs through organizations like Friends of the Boundary Waters Wilderness and YMCA wilderness camps are introducing more racially diverse youth to the BWCAW with the goal of creating a more accessible and appreciated Wilderness. *(See next section, Future Factors, for more on this topic)*. However, much work remains to be done for a more inclusive BWCAW.

> "The Boundary Waters is a Wilderness Area unlike any other. I think there's a part of it that's essential for the human soul. We don't have very many places like it left on earth."[9]
>
> —BETSY DAUB

CULTURAL SIGNIFICANCE

Status: The BWCAW remains a culturally significant place to American Indians and nearby communities, and preserves a history of human habitation, travel and commerce.

The Boundary Waters is an important place for Ojibwe and other indigenous Americans. Scientists believe northeastern Minnesota was first habitable about 11,000 years ago, after the landscape had 2,000 years to recover from the retreat of the glaciers. The region continues to be an important place for Ojibwe people today.

The Bois Forte and Grand Portage Bands of Chippewa and the Fond du Lac Band of Lake Superior Chippewa actively manage and use lands in northeastern Minnesota, on which they have legally guaranteed rights to hunt, fish and gather dating back to the 1854 treaty with the federal government. The 1854 Treaty Authority, an inter-tribal natural resource management agency, collaborates with the Superior National Forest on studies of moose and lake sturgeon within the ceded territory.[10,11]

North Hegman Lake, Chad Fennell CC-BY-2.0

Superior National Forest

Shooting the Rapids by Frances Anne Hopkins, 1879

Minnesota Historical Society

Pictographs

Paintings on rocks are found in numerous lakes around the Boundary Waters, including Crooked, Lac La Croix, North Hegman, Fishdance, Basswood and Jordan. Their exact age is not known, but they may range from as recent as 100 years ago to more than 1,000 years in the past.[12]

Knife Lake Quarries

11,000 years ago, indigenous people were excavating quarries around Knife Lake to make stone tools and points. Archaeologists with St. Cloud State University and the Superior National Forest have located several quarries and nearby workshop areas, finding large amounts of flakes, chips, discarded tools and quarrying debris. It is believed to be the oldest documented human-associated site in Minnesota. The tools were probably used to hunt caribou and even mammoth and mastodon.[13,14]

European Exploration and Fur Trade

The first European known to visit the Boundary Waters region was Jacques de Noyon in 1688. In the 1730s, Frenchman Pierre Gaultier de Varennes, sieur de La Vérendrye established forts and trading posts in the region. The chain of lakes along the Minnesota-Ontario border was a highway for canoes carrying trade goods and beaver furs, powered by French–Canadian voyageurs. Outposts were found on Basswood Lake, Moose Lake and elsewhere.[15]

Resorts and Cabins

Numerous resorts and fishing camps once operated in what is now the Boundary Waters. The businesses were largely located on Basswood and Crooked Lakes. Starting in 1948, the federal government began purchasing them to restore the area's wild character, ultimately removing more than 40 resorts and 90 private homes.[16] Almost all evidence has been erased today, but the careful eye might notice hints of this history.

Two individuals living in the Wilderness when it was established have gained wider public attention. Dorothy Molter and Benny Ambrose were allowed to live out their lives in their Wilderness homes under a 1972 federal law designating them special volunteers to help in Wilderness emergencies. Molter was the last person to live in the Boundary Waters, passing away in 1986. She sold root beer and entertained legions of paddlers from her island on Knife Lake. After her death, her cabins were dismantled and moved to Ely, where they were rebuilt and opened as the Dorothy Molter Museum.[17] Ambrose was a World War I veteran, prospector, trapper and fishing guide who lived on Ottertrack Lake until he passed away in his cabin in 1982.[18]

WILDERNESS EXPERIENCE

Status: While traditional canoe trips remain popular, people experience the Boundary Waters in varied ways and during all seasons.

CANOEING, FISHING AND CAMPING

The most common reason people visit the Boundary Waters is to canoe, fish and camp. The landscape is perfectly suited to such activities, with its beautiful, portage-connected lakes. Overnight canoe trips continue to be the most popular option for visiting the Boundary Waters, and about 20,000 groups paddle the wilderness each year. Nearly three in four Wilderness visitors cast a line for fish during their trip in lakes renowned for lake trout, smallmouth bass, walleye and other game species.[19]

HIKING AND HUNTING

The BWCAW has several hiking trails, with a growing number of people taking the opportunity to experience the Wilderness on foot. While overnight hiking still makes up the smallest number of Wilderness permits, between 2009 and 2015 it increased by more than 30 percent.[19]

Hunting is permitted in the Boundary Waters and is popular. For many, it provides the purest hunting experience, where hunters must work hard for the harvest. Popular prey include whitetail deer, ruffed grouse, snowshoe hare, black bear and waterfowl such as mallard, wood duck, scaup and goldeneye.

Gerry Epp

FALL AND WINTER MONTHS

For those prepared to deal with colder weather, fall and winter in the Wilderness offer a level of solitude and beauty quite different from that found in the peak summer season. Between 2009 and 2015, the number of people visiting the Boundary Waters between October and April rose slightly. Almost 12,000 people visited the Wilderness during these months in 2015.[19] Visitors in this season hike, snowshoe, ski and dogsled.

WILDERNESS AND THE ARTS

The Boundary Waters is the inspiration for a great many artists. Wilderness photographers like Jim Brandenburg, Les and Craig Blacklock and Gary Fiedler have shared the beauty of the BWCAW with people across the country. Photographer Dawn LaPointe's photo of her husband canoeing on the North Kawishiwi River under a stunning autumn sunset was included in the Smithsonian National Museum of Natural History's Wilderness Forever exhibit in 2014. The annual Blueberry/Art Festival in Ely, with its 260 artists and 40,000 attendees, celebrates the Boundary Waters, the abundance of summer and the people who are inspired by it.[20]

WILDERNESS AND WELL-BEING

The Boundary Waters has been scientifically shown to increase creativity and reduce stress and anxiety. College students on a six-day canoe trip who underwent psychological evaluations before, during and after their excursion experienced 100 percent improvement in their cognition.[21]

The benefits are thought to be caused by decreased amounts of a stress hormone called cortisol, and reduced activity in parts of the brain related to anxiety. Researchers believe wilderness immersion provides opportunities free of distractions, allowing individuals to have their attention pulled outward, where they can appreciate and benefit from the beauty of their surroundings. Studies indicate it requires about three days in a wilderness setting before subjects experience the full benefits.[22]

YOUTH ENGAGEMENT

Thousands of youth visit the Boundary Waters each year through wilderness camps and programs, building confidence, experiencing the wild and developing life-long love of the Boundary Waters. Many adult BWCAW users got their introduction to the Wilderness through these invaluable programs. These camps include: the Voyageur Outward Bound School; YMCA Camps Menogyn, Widjiwagan and Du Nord; the Boy Scouts of America's Charles L. Sommers Canoe Base; Wilderness Canoe Base; and Wolf Ridge Environmental Learning Center.

James Belmont

In 2009 *National Geographic Traveler* identified the BWCAW as a "treasured destination" and put the Wilderness on its "50 Places of a Lifetime" that "every curious traveler should visit."[23]

PUBLIC SAFETY

Status: A visit to the Boundary Waters is not risk-free, as it involves time in remote areas where severe weather and accidents may occur. Visitors can take simple steps to remain safe.

Wilderness recreation requires careful planning, self-reliance, good judgment and preparation. It involves some risk while offering the reward of personal freedom and the wonders of wild places. Visitors face inherent risk of adverse weather conditions, isolation, physical hazards and lack of rapid communication. Emergency response understandably takes longer in the Wilderness than in an urban setting. All visitors should leave a copy of their itinerary with someone before embarking.

SEVERE STORMS

Powerful wind storms occasionally strike the Boundary Waters in mid-summer. They threaten visitor safety primarily by blowing down trees at campsites.

The most famous such summer storm was the 1999 *derecho*, in which straight-line winds peaked at 90 mph, felling trees over an area of 470,000 acres (one-third of the Wilderness). In 2016 three campers were killed and several others were injured in two separate storms.[24,25,26]

Photo courtesy of Minnesota Incident Command System

Destruction from the 1999 Boundary Waters–Canadian Derecho Event, also known as the Boundary Waters Blowdown.

THE SEARCH FOR SOLITUDE

Status: Ensuring people can experience Wilderness solitude requires careful stewardship, visitor data collection and managing permit numbers.

Opportunity for solitude is one of the most sought-after wilderness characteristics. Between 1969 and 2007, however, visitors to the Boundary Waters reported encountering other travelers twice as often as previously. And the number of large groups encountered increased by a factor of eight.[4] The change is likely due to more intensive use of lakes at the edge of the Wilderness. This is the nation's most popular wilderness, and many people, pressed for vacation time, choose shorter travel itineraries and easily accessible campsites.

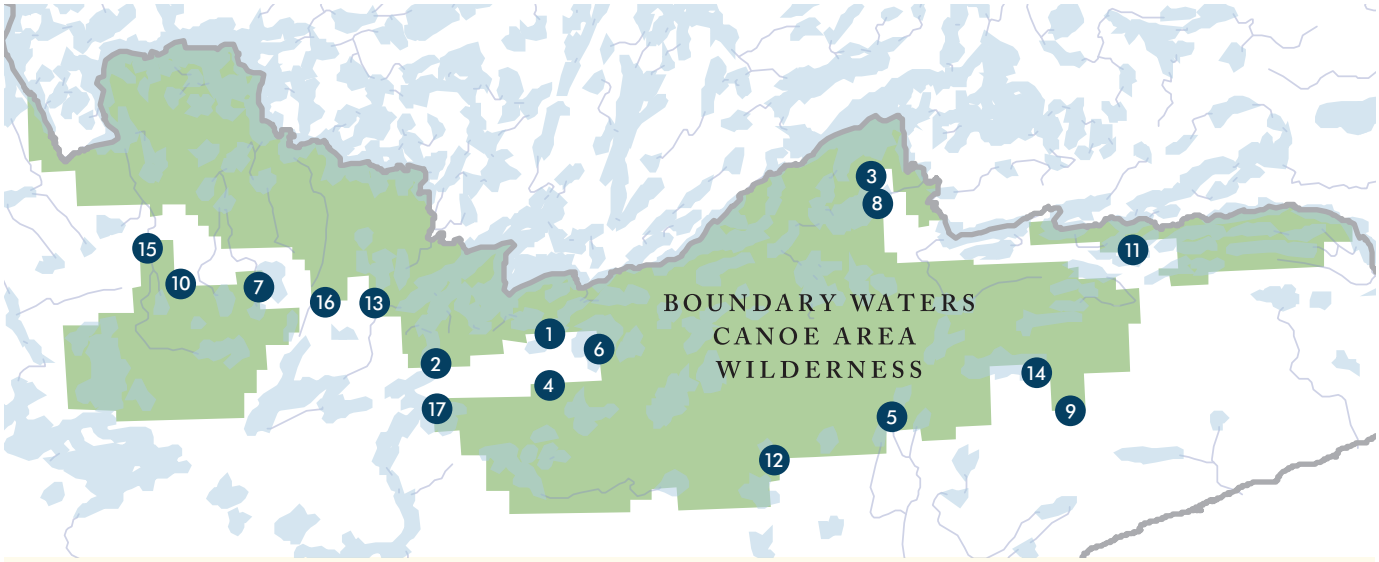
While visitors report seeing more people, their feelings about crowding did not change significantly. Today's visitor may have lowered expectations of solitude. In a 2007 survey, about half of BWCAW visitors encountered as many people as they expected, 11 percent saw fewer, and 34 percent saw more than they thought they would.[4]

Encounters

YEAR	GROUPS SEEN	LARGE GROUPS SEEN
1969	4.1	0.5
1991	4.2	0.1
2007	8.6	4.2

The average number of large groups seen has increased 8-fold between 1969 and 2007.

Parts of the BWCAW may be experiencing higher encounter rates than called for in the Forest Plan. The Superior National Forest is assessing and monitoring conditions and will use the information in the next Forest Plan Revision. The Forest Service encourages visitors seeking solitude to select less popular entry points *(see map, below)* and travel farther into the Wilderness, which also helps distribute human impacts.



The 17 Most Popular BWCAW Entry Points 2004–2006[4]

Listed in descending order

1. Moose Lake
2. Fall Lake
3. Saganaga Lake
4. Lake One (Affected by Pagami Creek Fire)
5. Sawbill Lake
6. Snowbank Lake
7. Trout Lake
8. Seagull Lake
9. Eagle Mountain
10. Moose River
11. Duncan Lake
12. Kawishiwi Lake
13. Mudro Lake
14. Brule Lake
15. Little Indian Sioux
16. South Hegman
17. Farm Lake

MANAGEMENT AND PRESERVATION

Status: The Boundary Waters is recognized as one of the best-managed wilderness areas in the U.S. Forest Service system. An updated Wilderness management plan is needed to continue to safeguard Wilderness character.

Wilderness is managed to preserve and prioritize its "untrammeled" condition — which Wilderness Act author Howard Zahniser defined as being free from "human controls and manipulations that hamper the free play of natural forces."[27] Before taking any management action within the BWCAW, the Forest Service uses a decision tool, the Minimum Requirements Decision Process, to ensure that this wilderness objective is fulfilled.

Part of thoughtful management within the Wilderness is working from an overarching management framework. The Superior National Forest has a management plan for the BWCAW, but this plan has not been updated since 1986. A new plan is needed for stewardship of the Wilderness to be responsive to dynamic conditions and emerging threats. At this time, the Forest Service has no timeframe for when they would start preparing a new BWCAW management plan.

To measure and improve wilderness management across the country, the U.S. Forest Service implemented a 10-Year Wilderness Stewardship Challenge from 2004 to 2014. The goal was to bring every wilderness under Forest Service management to a minimum stewardship level by 2014 — the 50th Anniversary of the Wilderness Act. The effort assessed a variety of qualities such as opportunities for solitude and the management of invasive species.

The BWCAW, under the management of the Superior National Forest, was the only wilderness in the country to achieve a 100 percent score. This is a testament to the dedication and efforts of the Superior National Forest and to just how special a place the Boundary Waters is. In addition, in 2015 the Superior National Forest received the Forest Service's Aldo Leopold Award for Overall Wilderness Stewardship Program, recognizing that "The Superior National Forest has consistently driven its program forward striving for outstanding wilderness stewardship."[29]

The Existing Management Plan Partitions the Boundary Waters into Four Management Zones:[28]

Pristine 113,700 ACRES

Trails, portages, and campsites are not constructed or maintained; visitors will experience a high degree of freedom, challenge and risk

Primitive 299,760 ACRES

Off main travel routes for those who are seeking a high degree of solitude and challenge

Semi-primitive non-motorized 345,233 ACRES

Along main travel routes, where a visitor expects to encounter others more frequently, and solitude is not a high priority

Semi-primitive motorized 51,916 ACRES

Visitors should expect to see a high number of boats with motors and will experience considerably less solitude, freedom and challenge than found in other management areas

Steph McPhail, Disappointment Lake

BWCAW ECONOMIC IMPACT

Status: Visitors to the Boundary Waters spend time and money in the communities surrounding the Wilderness, making the BWCAW a major economic contributor to the area.

A visit to the BWCAW often includes time spent in the communities at the edge of the Wilderness. Travelers frequently need to purchase gas, rent canoes, spend a night or two in a hotel and buy supplies for their trips. How much this spending collectively means for gateway communities was not well understood. In 2016 Friends of the Boundary Waters Wilderness hired independent economists to quantify the BWCAW's economic contribution to the region. The economists surveyed 513 summertime Boundary Waters visitors about their spending.

The study found that visitors from outside the region spent more than $56 million in the three counties surrounding the Wilderness. This spending in turn generated $78 million in total economic output when indirect and induced spending effects were included. More than 1,100 full- and part-time jobs resulted from BWCAW visitor spending. It also generated $16.23 million in local, state and federal taxes.[30]

Because this study had a tight focus on spending in three counties during three summer months in a single year, it may under-represent tourism spending and the economic contribution of the Wilderness. It does, however, begin to uncover the significant economic foundation that the BWCAW is to the region.

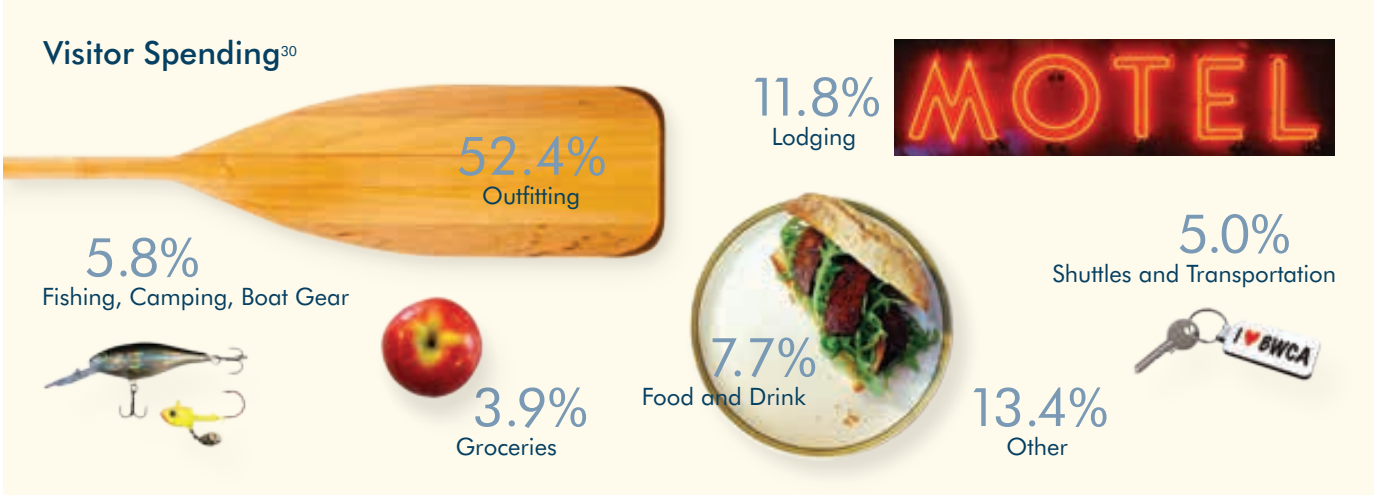
NATIONAL AND INTERNATIONAL RECOGNITION

The Boundary Waters Wilderness sits in the heart of a 5 million-acre area of public lands on the Minnesota-Ontario border. In 2007 Friends of the Boundary Waters Wilderness helped found the Heart of the Continent Partnership, a coalition of U.S. and Canadian businesses, organizations and government agencies promoting the economic, cultural and natural health of the region's lakes, forests and communities.

The Heart of the Continent public lands include:[31]

- Quetico Provincial Park
- Superior National Forest
- Voyageurs National Park
- Grand Portage National Monument
- Numerous state and provincial parks and lands

National Geographic partnered with the Heart of the Continent Partnership to develop a comprehensive online MapGuide for tourists interested in visiting the region. Travel the Heart includes 600 entries in its interactive database, with the goal of promoting tourism and increasing connections people have with this place. With the launch of the MapGuide, the BWCAW region joins 11 other Geotourism sites around the globe.[32] Visit *traveltheheart.org* to learn more.



Paddle: iStock; Motel sign: Geoffrey Gallaway CC-BY-SA-2.0; Plate: Onay Davus CC-BY-2.0

Section 6

FUTURE FACTORS

"But one thing I have learned:
The Canoe Country really does have a lot of Friends,
and another generation will always rise to
protect our beloved Wilderness."

—MIRON L. HEINSELMAN

FOUNDING CHAIR, FRIENDS OF THE BOUNDARY WATERS WILDERNESS

Long-term health of the BWCAW depends on advocates, natural resource managers and other stakeholders quickly identifying and responding to changes and threats. We also know that effective stewardship of the BWCAW requires broad public engagement and support.

As the Wilderness faces new challenges such as intensive resource extraction at its borders, will a constituency exist that knows it, loves it and is ready to stand up for it?

Volunteers maintain portage trails and campsites in the BWCAW.

Previous page landscape: Matt Stroozas, Whiskey Jack Lake
Previous page inset: Ed Baggenstoss, Kawishiwi River
Photo above: Friends of the Boundary Waters Wilderness, Superior Wilderness Volunteer Connection Program.

SCHOOL TRUST FUND LANDS

Status: Under a plan by the State of Minnesota and the U.S. Forest Service, more than 30,000 acres of federal land surrounding the BWCAW could be transferred to the state for mining, logging or development. Intensive resource extraction like this can affect wildlife, water quality and ecological functions, with broader impacts possible for the Wilderness.

Although the BWCAW is a federal wilderness area managed by the U.S. Forest Service, about 86,000 acres within it are State School Trust Fund lands. Between 1858 and 1866, the federal government gave the state of Minnesota more than 8 million acres of land to generate income from use, sale and investment to fund public education. While School Trust Lands elsewhere in Minnesota are managed by the Department of Natural Resources for "maximum long-term economic return," lands within the BWCAW cannot be, and are effectively managed as federal wilderness.[1,2]

For more than 40 years, the inability of these lands to generate direct revenue for the School Trust has frustrated some stakeholders. Various attempts have been made to exchange these lands for lands outside the Wilderness that could be logged, leased or mined. Other stakeholders have pushed for the federal government to purchase the state lands within the BWCAW, and invest the income for the School Trust. To date, neither approach has succeeded.

In recent years, state and federal governments have explored a hybrid arrangement in which one-third of the school trust lands in the BWCAW would be exchanged for acres outside the BWCAW, and another two-thirds would be purchased federally. In early 2018 Congress appropriated $4 million to begin the purchase of these lands.

The hybrid arrangement would not change the way the lands inside the BWCAW are managed. But lands acquired by the state outside the Wilderness, within the Superior National Forest, could be opened to intensive resource extraction or development. These are lands within the same ecosystem as the Wilderness, sometimes within the same watershed. Activities on these lands have the potential to create broader impacts — possibly within the Wilderness as well. This is a complex issue that deserves careful consideration and robust public engagement to ensure an outcome that is ecologically sound and in the public's interest.

Tracy Knapp; Isabella Lake

DIVERSITY, EQUITY AND INCLUSION

Status: While the Wilderness belongs to all Americans, its typical users do not reflect our nation's diversity. The Boundary Waters' main constituency is largely a white population, with far too few people of color or those from diverse cultures venturing into its waters.

About 38 percent of the country's population identify as people of color. By 2060 that number will be 57 percent.[3] But BWCAW visitors surveyed in 2007 were 97 percent white. And while women make up about 51 percent of the United States population, they comprise only 25 percent of Boundary Waters' visitors.[4]

Preserving the BWCAW will be nearly impossible unless the Wilderness is valued and relevant to a broad cross-section of America. While studies show that minority populations care about the environment, their representation as visitors to national parks and wilderness areas, and as staff, board and members of environmental organizations has not noticeably increased in more than 50 years of the modern environmental movement.[5]

Those who spend time in the BWCAW are often changed by it. Time in the Wilderness touches hearts, calms and centers people, brings families closer and awakens previously unknown confidence. This experience must be shared and accessible to new and diverse audiences if we are to preserve what we value about this place.

Many organizations and institutions are initiating efforts to make the Boundary Waters a more inclusive landscape. Friends of the Boundary Waters Wilderness, YMCA Wilderness Camps and others have launched efforts to increase diversity of those who travel to the BWCAW and who work and volunteer within their own organizations. The Superior National Forest and the Conservation Corps of Minnesota have programs to prepare diverse young adults for natural resource careers. These programs need to have a long-term commitment to the goal of inclusivity and a willingness to incorporate new perspectives into their institutions for the BWCAW to be successfully defended into the future.

2017–2018 Conservation Fellows, Betsy Daub


2016–2017 Conservation Fellows, Betsy Daub


YMCA Camp Menogyn

"When people experience the wilderness, it changes their perspective on the world as a whole. As many people as possible should have the opportunity to gain this perspective."[6]

—BILL HANSEN

Section 7

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"Wilderness provides a place where one can go to find peace within oneself and to remember the important things in life."

—BARBARA MANAHAN

Previous page landscape: David Bradford Kane, Crooked Lake
Previous page inset: Teresa Klecker

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when one can feel its deep magic,
feel its rhythms and mysteries as tangibly
as though they were rain or wind."

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