

A WHOLE NEW GAME

The effects of climate change on hunting,
fishing, and outdoor recreation in Minnesota



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Written by:

Nancy Lange, Clean Air Program Coordinator
nlange@iwla.org
(651) 649-1446

Editor:

Cindy Han and Gwen Steele

Layout by:

Jeremy Morris

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Contact:

Izaak Walton League of America, Midwest Office
1619 Dayton Avenue, Suite 202
St. Paul, Minnesota 55104
(651) 649-1446

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Mission statement:

To conserve, maintain, protect, and restore the soil, forest, water, and other natural resources of the United States and other lands; to promote means and opportunities for the education of the public with respect to such resources and their enjoyment and wholesome utilization.

Founded in 1922, the Izaak Walton League of America is dedicated to common-sense conservation that protects America's hunting, fishing, and outdoor heritage relying on solution-oriented conservation, education, and the promotion of outdoor recreation for the benefit of our citizens. The League has 40,000 members and supporters nationwide. Our headquarters are in Gaithersburg, Maryland, and we have a regional office in St. Paul, Minnesota


Near-record lows in Lake Superior, April 2007. Duluth-Superior Harbor from Park Point looking toward the Park Point Recreational Boat Area.

WE know that the earth has natural climate cycles. Some, like the advancing and receding of glaciers, take tens of thousands of years. Other more local events like the El Nino in the Pacific occur every few years. Plants, animals and people have proved very adaptable to such natural changes over the millennia. But the changes underway today are different. They are happening more rapidly and the long-term trend is in the same direction - getting warmer.

In 2007, the scientific community, represented through the Intergovernmental Panel on Climate Change, issued its defining assessment that the warming of the climate is unequivocal and that human actions are responsible for most of the warming that has occurred in the last half century. Field observations from the deep oceans to high mountaintops are documenting changes in life cycles, ranges, and most surprisingly, in the genetic makeup of the world's plants and animals.

Treasured fish and wildlife and their required habitat are explicitly threatened by a warmer, more erratic climate. For sportsmen and sportswomen, these effects could mean lasting changes not only

to their favorite recreational pastimes, but also in the very culture and traditions that many sporting families have known for generations.

 Those of us who hunt and fish are already experiencing the changes brought about by a warmer world. If we lose the vulnerable parts of our natural world, like moose and trout and pine forests, we've failed to be good stewards. Hunters' and anglers' voices should be among the loudest calling for action on global warming."

— Bill Grant, Associate Executive Director, Izaak Walton League of America

The Legislature and the Governor agreed that now is the time to begin deep reductions in global warming pollution. Interim and long-term goals for reducing Minnesota's emissions of global warming pollution by 80 percent from current levels by 2050 were established in 2007. An economy-wide climate change action plan to reduce pollution from cars and trucks, homes and businesses, the utility sector and other industries will be submitted to the Legislature for action in 2008.

Public demand and urgency for solutions require continued action if we are to achieve the necessary reductions in global warming pollution. By taking these bold steps,

Minnesota will lead the transformation to a clean, modern efficient energy system, support the health of our economy and protect Minnesota's bountiful natural heritage.

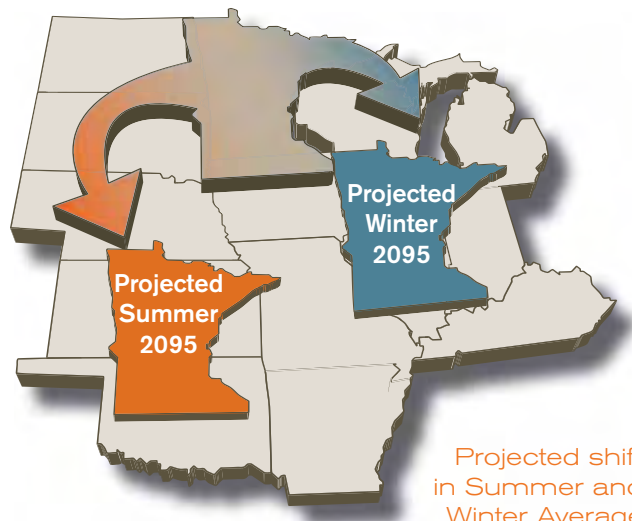


The Star of the North Gets Warmer

MINNESOTA, the Land of 10,000 Lakes, is defined by its water—from Lake Superior to thousands of inland lakes to the headwaters of the Mississippi River. In addition to its abundance of water, Minnesota’s location produces a climate and landscapes of great variation. Sitting at the North American crossroads of three major biomes, the prairie, the eastern broadleaf forest and the northern boreal forest, bestows Minnesota with a rich diversity of wildlife and natural beauty.

Minnesota’s climate has warmed over the last century, with wintertime temperatures rising fastest. The effects are evident: spring arrives a week or more earlier, growing seasons are longer, average wintertime temperatures have increased, ice cover on lakes has diminished, and some wildlife has already shifted its range northward.

Current climate models predict a much warmer Minnesota by the end of the next century. While predictions range from less moisture to a slight increase in precipitation for Minnesota, it is expected that higher temperatures will bring about more drought, drier soils, less ice cover, and lower lake levels. The rainfall that does come is likely to arrive in more frequent heavy rainstorms, and other extreme weather events are projected to increase. Some scientists describe a Minnesota summer that will resemble current-day Kansas and winters more like those of Illinois.



Projected shift in Summer and Winter Average Temperatures by 2095

Based on map by The Union of Concerned Scientists and The Ecological Society of America, 2003

The effects are evident: spring arrives earlier, growing seasons are longer, average wintertime temps have increased, ice cover on lakes has diminished, and some wildlife has already shifted its range northward.



Minnesota's continental location makes it particularly sensitive to changes in the climate. As temperatures rise, the plants and animals living in the transition zones between prairies to hardwood forests to conifer forests, literally at the borders of their preferred habitat, must be able to adapt in order to survive.

Leaders at the Minnesota Department of Natural Resources believe that global warming is underway and affecting Minnesota's plant and animal life. Biologists speculate that some Minnesota fish and wildlife may benefit from a warmer climate, such as deer, pheasants and bear. With less-severe winters, Minnesota's white-tailed deer population has flourished and increased hunting harvests reflect this growth. Wild turkeys and pheasants, living at the northern edge of their range in Minnesota, are also finding more favorable conditions. Black bears will probably make the necessary adjustments. Their ability to survive in many climates and on a variety of food sources demonstrates their adaptability.

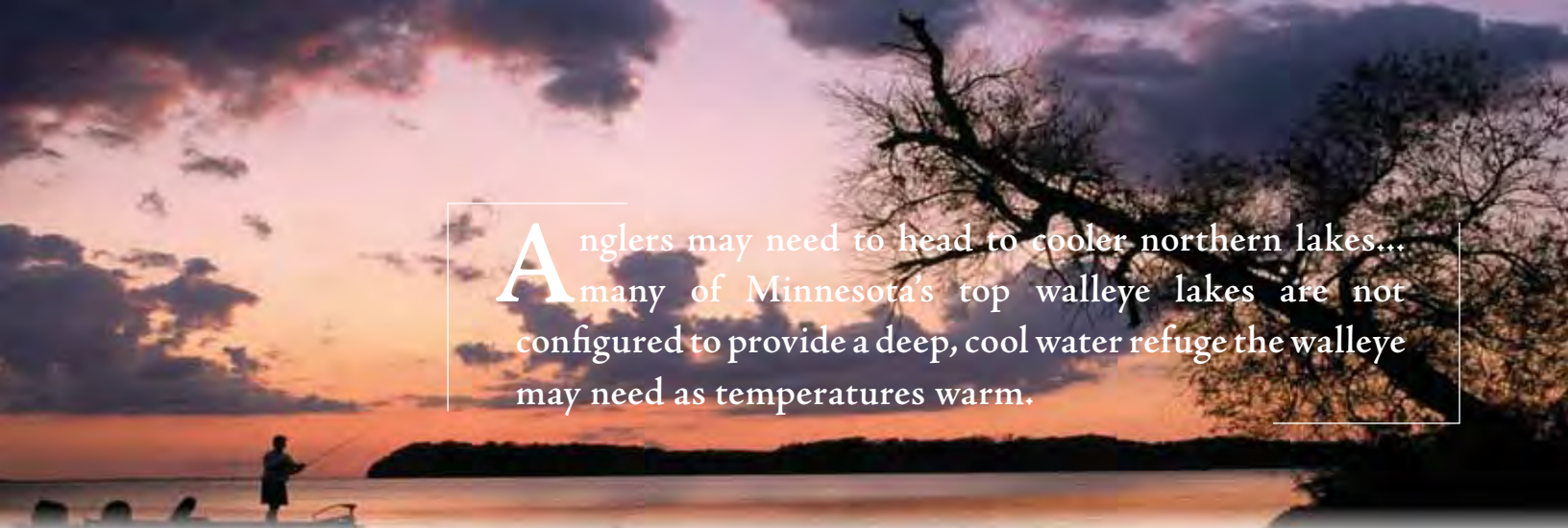
But unlike these other animals, moose are not tolerant of hotter temperatures and a diminished northern forest. The state's largest, most productive herd once numbering 4,000 in northwestern Minnesota, fell within about twenty years to just 250 moose. The northeastern Minnesota herd suffered a 25 percent loss in the last year alone. Biologists believe that higher temperatures have stressed the moose, making them more susceptible to disease and parasites and requiring them to expend too much energy just keeping cool. Considered a premier symbol of Minnesota's north woods, their very survival in the state is in question. Their livable range may well move out of the state, along with other northern species, like lynx, pine marten and fisher.

Bill Berg, an Izaak Walton League member and a Minnesota Department of Natural

Resources wildlife biologist who retired in 2001, observed these changes in the field during his 31-year career. He saw opossums advancing northward from the Twin Cities to northern Minnesota, the southern range limit of snowshoe hares receding about 40 miles northward, ruffed grouse drumming about 10 days earlier in spring, and cottontail rabbits became common in towns along the Canadian border. "The northern limits of many species' ranges are advancing north, while the southern range limits of many northern species are receding north," says Berg.¹

Higher temps have stressed the moose. A premier symbol of Minnesota's north woods, their very survival in the state is in question.





Anglers may need to head to cooler northern lakes... many of Minnesota's top walleye lakes are not configured to provide a deep, cool water refuge the walleye may need as temperatures warm.

Fish in Hot Water

The foundation of Minnesota's natural heritage is its water, with more than 12,000 lakes, 92,000 miles of rivers and streams, and its border along Lake Superior. About one fifth of the state is covered with surface water, and global warming is a direct threat to Minnesota's waters. Rising summer and winter air temperatures along with loss of winter ice cover will increase water temperatures, leading to more evaporation and lower water levels.

Minnesota lakes already face a number of challenges: over-development, overuse, invasive plants and animals, and pollution from sources like leaky septic systems, agricultural runoff, and storm-water runoff. With warming temperatures, only the healthiest lakes will have the resilience to weather the changes from global warming. Warmer lake water temperature creates earlier summer stratification —a yearly changeover in which a warm surface layer of water develops over cooler, deeper water. Earlier summer stratification can increase the formation of oxygen-depleted, deepwater dead zones for fish and other lake life, producing toxic algae blooms and summerkill.

The state's premier game fish, the walleye, requires cooler waters and a plentiful supply of ciscos —a cold-water fish that is food for gamefish, including northerns and lake trout. The amounts of ciscos present in lakes have been declining over the past two decades due to a greater die-off in

warmer summer lakes. In some lakes, this die-off will accelerate with global warming. According to Don Pereira, Fisheries Research and Policy Manager of the Minnesota Department of Natural Resources, there are currently about 650 lakes with the water quality conditions necessary to maintain an adequate population of ciscos. Within 50 years, he estimates that only 50 to 100 lakes will remain healthy enough to support ciscos.² Anglers may need to head to cooler northern lakes that retain the conditions needed for good growth of walleye or northern pike.

In addition, many of Minnesota's top walleye lakes are not configured to provide a deep, cool water refuge that walleye may need as temperatures warm. In Lake Pepin, a walleye lake along the Mississippi River, warm summer temperatures have already had an effect on the size and reproduction of some walleye. At water temperatures greater than 77 degrees F, walleye become stressed and stop growing. It seems unlikely to biologists that enough of Lake Pepin can maintain water temperatures below 77 degrees during hot summer months. Challenges like these will make efforts to restore quality angling in Minnesota only more difficult.

Pereira gave his diagnosis for hanging on to as much of Minnesota's walleye as possible: "What's



Lake trout

important is that we keep the lakes clean so that they can continue to support important prey species like cisco. Any decline in water quality is going to make the situation worse. Climate change is going to take our current habitat issues and magnify them.”³

But like the lakes and fish, anglers will also need to adapt and accept other game fish species like bass and panfish, which may increase in abundance in many of Minnesota’s prime fishing lakes. As a consequence, natural resource agencies may need to reevaluate the current fish stocking programs to adjust to these changes.

Cisco



Walleye



Walleye won’t be the only fish affected by warmer temperatures. Minnesota is home to two native trout species: brook trout, which need cold streams, and lake trout, which live in Minnesota’s deepest, coldest northern lakes. The survival of both is in question. For lake trout, the probability is quite high that they will not be able to persist in lakes that are unable to provide an oxygen-rich environment in the deepest, coldest portions.

Brook trout



Brook trout require cold, clean, highly oxygenated water and are currently found only in the southeastern and northeastern regions of the state. The spring-fed trout streams in southeastern Minnesota can sustain trout only as long as shallow aquifers can provide a source of cold water. But stream and aquifer temperatures are related to air temperatures, which will be rising. More extreme storms and rain events that are predicted to come along with global warming challenge trout streams with rapid influx of runoff and shoreline disruption. The north shore trout streams are not fed by coldwater springs but by snowmelt, surface water runoff and flow from lakes. Temperatures are maintained in part by a dense shoreline cover of spruce, which provide



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—Don Pereira,
Fisheries and Policy Manager, MN DNR

cool enough stream conditions for trout survival. As warmer climates shift northward, spruce cover is expected to decline, surface water temperatures will rise and trout streams may warm—a situation that does not bode well for brook trout survival, and a loss that many anglers find hard to contemplate. Dave Zentner, past national president of the Izaak Walton League, believes “brook trout could disappear more quickly than anyone ever imagined.”⁴

Changes have already occurred in Minnesota’s coldest lake, Lake Superior. The great lake has already warmed twice as much as air temperatures, which scientists theorize may be due to a lack of ice cover. As a result, Lake Superior’s levels are the lowest in recorded history.



Near-record lows: Duluth Superior Harbor from Park Point, looking toward the High Bridge, April 2007

“The loss of wetlands in the east provides no insurance for duck production that we’ve had in the past... The message to us as managers and planners is that we’re going to need every wetland we can get to keep this kind of negative change to a minimum.”

—Carter Johnson, South Dakota State University

Fowl Territory

MINNESOTA is located in the southeastern corner of the prairie pothole region. This vast region stretching from northern Iowa to central Alberta was formed 12,000 years ago by retreating glaciers that melted and filled millions of shallow depressions. The wetlands and prairies that were created provide ideal waterfowl habitat that has been called America’s duck factory, estimated to produce 50 percent of North America’s ducks. But many other grassland and migrating birds depend on the prairie pothole region. Shallow wetlands filled with aquatic and plant life and the surrounding grasslands provide vital habitat for shorebirds, wading birds, passerines, hawks, owls, and songbirds.

The loss of habitat in the entire pothole region is now extensive. Minnesota alone has lost more than 90 percent of its prairie wetlands due to agricultural and urban development. Prairie grasslands have suffered an even more extensive decline.

The prairie region is very sensitive to variability in the climate; when drought has occurred in the past, duck populations have plummeted.⁵ Scientists believe that under most climate change projections, the prairie pothole region will experience increased drought, along with milder winters, hotter summers and longer growing seasons. Under these conditions, up to 90 percent of the wetlands in the prairie potholes may be lost, which in turn will reduce the abundance of breeding ducks by estimates as high as 69 percent.⁶

This pothole drought will shift duck breeding sites to smaller, less productive locations in the east where drought may not be as severe. “The problem with that is that the loss of wetlands in the east provides no insurance for duck production that we’ve had in the past,” according to Carter Johnson, an ecologist at South Dakota State University. “The water will be there. The basins won’t be there. In the west where we have the basins, we won’t have the water.”⁷ This eastern shift in waterfowl habitat places increased importance on Minnesota’s efforts to preserve and restore healthy wetlands and grasslands for the myriad of bird species that rely on prairie potholes. “The message to us as managers and planners is that we’re going to need every wetland we can get to keep this kind of negative change to a minimum.”⁸



The prairie pothole region will experience increased drought.

Forests on the March

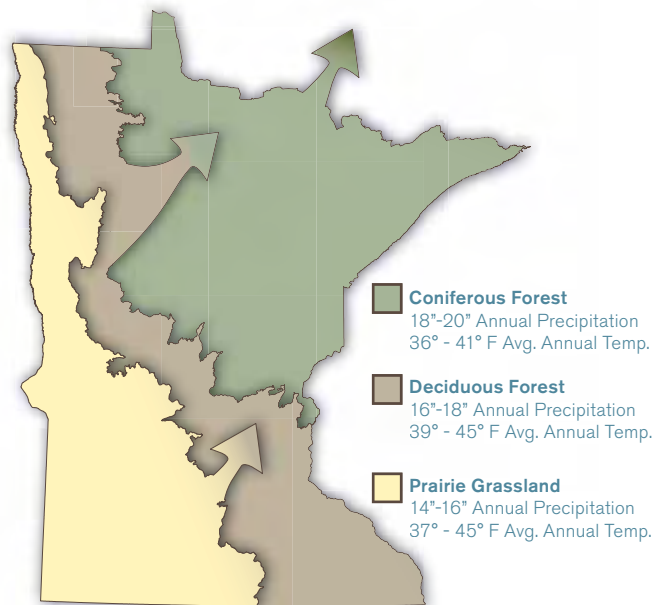
Over time, warmer summers and milder winters will create conditions that gradually push out northern species... grasslands will likely expand even further northward.

ALONG with its lakes, Minnesota's signature landscape is its northern forest. Driving northward from the Twin Cities to Duluth and points beyond, the transitions unfold as farm fields convert to hardwood forests of maple and ash and then to the forests of spruce and pine mixed with aspen and birch. But what appears to Minnesotans as a sturdy, immovable landscape is, in reality, at great risk from global warming.

Over time, warmer summers and milder winters will create conditions that gradually push out northern species such as jack pine, red pine, balsam fir and spruce. These boreal species will be replaced with more hardwood trees like red maple and oak. If inadequate rainfall is unable to support these more southern trees, grasslands will likely expand even further northward.

Forest scientists speak about the strong possibility that in 50 years, northern Minnesota forests may bear little resemblance to what Minnesotans currently know and love.

John Pastor, Professor of Biology at the University of Minnesota, Duluth, believes that "within my son's lifetime, the northern boreal forests will be gone." Pastor says "under the more moderate scenario of warming, conditions may be able to support a northern hardwood forest like you find in northern Wisconsin. But if we experi-

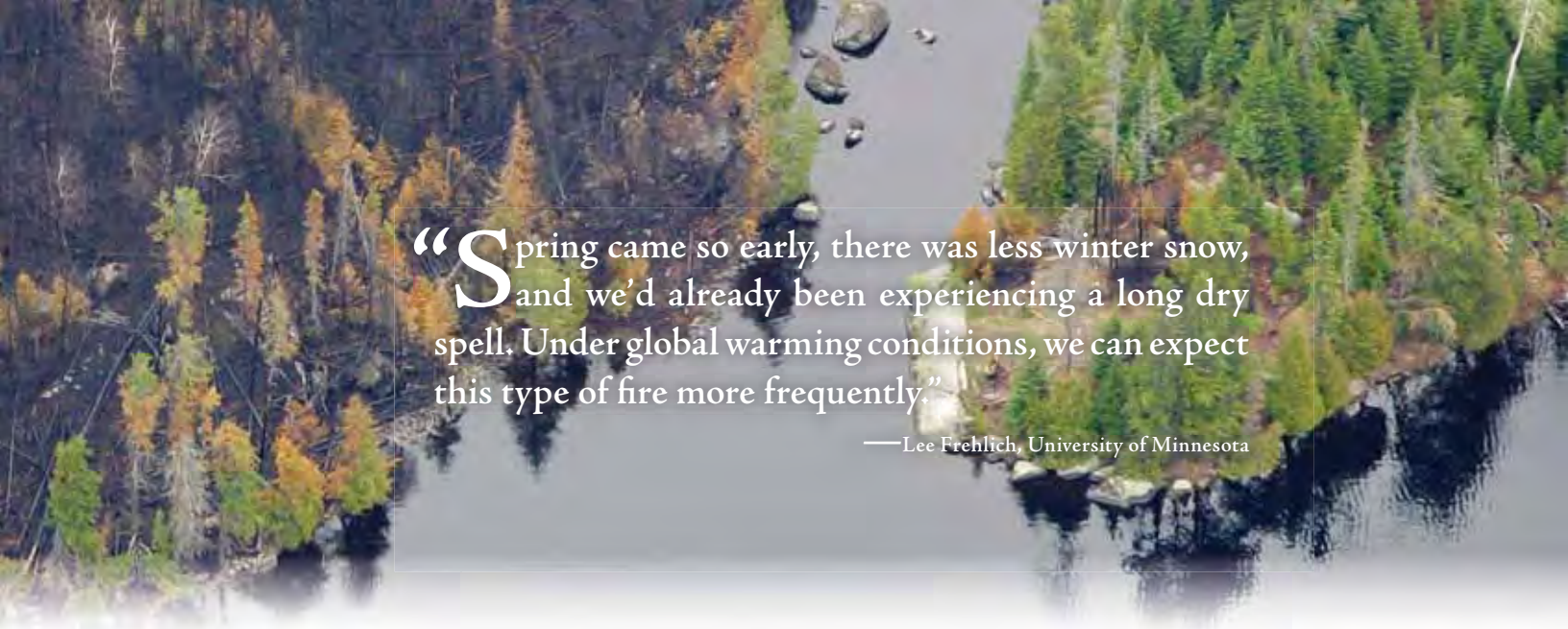


Ecological biomes in Minnesota
Based on map by Minnesota DNR, 2007

ence greater warming and drying, we'll have thin oak and prairie savannah everywhere."⁹

Forest scientists speak about the strong possibility that in 50 years, northern Minnesota forests may bear little resemblance to what Minnesotans currently know and love.

In 1995 and 1999 severe storms blew down millions of trees in the Boundary Waters forests. Scientists believe these blowdowns are a harbinger of more frequent storm damage. "Blowdowns aren't a normal part of the natural history of the boreal forest the way fires are," says Lee Frelich, Director for the Center for Hardwood Ecology at the University of Minnesota. "The 1999 blowdown is pushing the forest forward to a state it wouldn't otherwise reach for 100 years."¹⁰



“Spring came so early, there was less winter snow, and we’d already been experiencing a long dry spell. Under global warming conditions, we can expect this type of fire more frequently.”

—Lee Frelich, University of Minnesota

The May 2007 Ham Lake forest fire, which burned tens of thousands of acres in northeastern Minnesota and Canada, was driven largely by the very dry conditions in the forest. Frelich added up the variables that created fire conditions: “Spring came so early, there was less winter snow, and we’d already been experiencing a long dry spell. Under global warming conditions, we can expect this type of fire more frequently.”¹¹

A warmer climate will expand the range of pests that are already causing widespread damage to forests in other regions, and droughts will reduce the ability of trees to fight off pest damage. Warmer winters make it easier for many of these pests to survive and thrive. Even the earthworm, which is not native to Minnesota, poses a threat. Under warmer conditions, they spread more quickly, consuming more of the duff layer that insulates the forest floor, which in turn dries the soil further, promotes loss of soil nutrients and encourages the growth of invasive plants like buckthorn.

Visitors to the northern forests already observe these changes around them. Stranded for a time during the Ham Lake fire at a campsite on Seagull Lake, Frelich observed that “we were surrounded by red maples that are growing about 4 feet each season and there was no duff on the forest floor.”¹²

The number of deer in northern Minnesota is expected to grow with milder winter condi-

tions. A burgeoning deer population will create widespread destruction of white pine, white cedar and yellow birch seedlings, a favorite food of deer. Other species, such as raccoon, opossum and skunk, are also finding more favorable conditions in the northern forests and pose a direct threat to nesting songbirds and other small prey.

Forests and the animals that live in them have evolved together. As the forest changes, wildlife living within the forest must also adapt, migrate or die off. Many northern species living at the southern boundary of their range, such as boreal chickadees, spruce grouse, moose, fishers, lynx and northern hawk owls, may well be forced to leave Minnesota in search of forests in which they can survive. Most trees species, however, will not be able to migrate fast enough.

“We define ourselves as Minnesotans by our big pines, our spruce, the loon calls and the moose. If we lose these, are we still the people of the north woods?” asks Pastor.

Pastor believes there is a chance to save these treasures of our state, but only if we act now. “There is no time. If you want to see the north woods stay, this week you must take action.”¹³

“We define ourselves as Minnesotan’s by our big pines, our spruce, the loon calls and the moose. If we lose these, are we still the people of the north woods? There is no time. If you want to see the north woods stay, this week you must take action.” —John Pastor, University of Minnesota Duluth

A Call to Arms

Sportsmen and women have risen to the call for stewardship countless times in order to protect our natural heritage. The Izaak Walton League itself began when a group of fishermen banded together in 1922 to preserve the threatened ecosystem of the Upper Mississippi River.

Today, the call for stewardship has reached a volume that must be heeded. The solutions are at hand and we need to get to work.

Make your voice heard

Let city council members, the mayor, state representatives and your member of Congress know that we must enact strong policies to achieve the level of emission reductions scientists tell us is necessary – an 80 percent reduction in global warming pollution from current levels by mid-century.

Help wildlife weather the coming changes

When we work to restore wetlands and streams, maintain natural habitats, prevent the spread of invasive species and create wildlife buffers, our individual actions add up to help wildlife weather the coming changes. These actions also bolster the ability of wetlands, forests and other natural systems to absorb and store carbon.

State fish and wildlife agencies listen to their stakeholder groups. Encourage them to take proactive steps in protecting Minnesota’s fish and wildlife resources from global warming.

Join the Ikes!

The Izaak Walton League of America has chapters all over the country, with members who work together to protect the soil, air, woods, and water in their region. The League’s mission is to promote common-sense conservation through community-based efforts. Our members typically enjoy hunting, fishing, and outdoor recreation, and they appreciate the importance of protecting our natural resources for future generations.

Sources

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Photos (clockwise from top)

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Individual actions add up to global warming solutions

- ♦ Electricity contributes about one third of the global warming pollution in Minnesota;
 - Replace your standard light bulbs with compact fluorescent bulbs
 - Get an energy audit to reduce the heating and cooling demand in your home
 - Buy efficient appliances
- ♦ Our vehicles release about one quarter of Minnesota's global warming emissions;
 - Drive less and drive smart with a well tuned vehicle.
 - Buy used or hybrid vehicles
 - Buy local products when possible.
- ♦ While using less energy is the first step, it also helps to use a renewable, sustainable fuel instead of a fossil fuel.
 - Check to see what green power purchase program your local electric utility offers. You can pay a little extra to make sure that the electricity you use is coming from a renewable source such as wind or solar.

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For more information, visit www.iwla.org or call 800-IKELINE.