



MINNESOTA  
FOREST  
RESOURCES  
COUNCIL

# CLIMATE CHANGE AND MINNESOTA'S FORESTS

A REPORT PREPARED FOR THE MINNESOTA FOREST RESOURCES COUNCIL  
BY THE RESEARCH ADVISORY COMMITTEE | SEPTEMBER 16, 2020

## EXECUTIVE SUMMARY

The purpose of the Minnesota Forest Resources Council (MFRC) is to “develop recommendations to the governor and to federal, state, county, and local governments with respect to forest resource policies and practices that result in the sustainable management, use, and protection of the state’s forest resources” (MN Statutes 89A.03). Pursuant to this statutory obligation, the MFRC tasked the Research Advisory Committee (RAC) with the development of a report assessing the impacts, challenges, and opportunities associated with climate change for Minnesota’s forests. The RAC, under MN Statutes 89A.08, exists to “identify and initiate priority forest resources research” by encouraging collaboration, linkages, and communication between those conducting forest research in various disciplines and for various organizations, practitioners in the use of forest resources research, and the legislature. This report is the culmination of the RAC’s effort to assess the potential effects of climate change on Minnesota’s forests and forest management.

Climate change poses a major threat to our environment and natural resources. In Minnesota, there is increasing interest in how climate change will affect our forest ecosystems. Forests, which compose about one-third of the state’s land area, perform highly important ecological, economic, and social services, including the protection and improvement of our water, air, and soil, providing habitat to numerous animal species, and helping the economy of our rural and tribal communities through the recreation and forest products industries. In addition to these services, our forestlands play a crucial role in sequestering and storing carbon. In this capacity, Minnesota’s forests provide our state with a potential tool for mitigating emissions and building a comprehensive climate strategy.

This report is structured in four sections. **Section 1** assesses the crucial services provided by Minnesota’s forests, the likely climate change outcomes we will experience in the coming years, and how those outcomes might affect forest health and management. **Section 2** focuses on the role of forest cover in the carbon cycle, how to maximize carbon storage in our forests through forestation strategies and management practices,

and innovative market solutions which may go hand-in-hand with a forest carbon strategy.

**Section 3** reviews the resilience of five important Minnesota forest cover types and assess how they might be managed to increase climate adaptability. Lastly, **Section 4** provides concrete recommendations for actions that Minnesota could take to prepare for future climate change and its effects on our forests.

The major findings and recommendations from each of the four sections of this report are summarized below and on the next page.

## SECTION 1: CLIMATE CHANGE CHALLENGES FOR FOREST MANAGEMENT

Climate change threatens Minnesota’s forests and the goods and services those forests provide to families, communities, and businesses who depend on them.

- Minnesota’s forests provide numerous environmental, social, and economic services to the state.
- Minnesota has already been experiencing the effects of climate change, with warmer temperatures (particularly in the winter), more severe rainfall events, and periods of water stress.
- The climate trends we have already experienced are expected to continue and exacerbate in the coming years if sufficient action is not taken to combat climate change.
- The effects of these changes will create numerous challenges for our forests and their management, including altered species composition, decreased access for management and recreation, and increased disturbance from extreme weather events, wildfire, and pests and pathogens. Importantly, these changes may also negatively affect the forest products industry, which in turn would reduce our capacity to effectively manage forest resources to increase their adaptability to changing conditions.

## SECTION 2: FOREST CARBON STORAGE AND SEQUESTRATION

One of the most important services that forests provide is carbon sequestration: the absorption of atmospheric carbon dioxide and storage of carbon in trees’ woody biomass and in forest soils. We have an opportunity in Minnesota to boost carbon

sequestration through specific forest management strategies, thereby contributing to our state's carbon emissions reduction goals and mitigating climate change.

- Maintaining and increasing forest cover will enhance carbon storage on the Minnesota landscape, increasing the emission mitigation potential of our forestlands.
- Certain forest management strategies may be utilized to maximize carbon in forests.
- Maintaining and developing forest products industries which amplify the storage of carbon through long-lived wood products, mitigate the use of fossil fuels (e.g., bioenergy and biomaterials), and/or fund the enhancement of our forest cover (e.g., carbon markets) will be an essential component of any forest carbon strategy.

### SECTION 3: CLIMATE CHANGE ADAPTATION STRATEGIES BY COVER TYPE

We also have an opportunity to design and implement forest management strategies that help family forest owners, public land managers, tribes, and the forest products industry adapt to and mitigate the adverse effects of climate change on forest goods and services.

- Understanding the innate resilience and vulnerability of Minnesota's diverse forest types is essential to developing effective forest management strategies for maintaining healthy forests.
- Various strategies may be employed which may help increase the climate adaptability of Minnesota's forests; the best strategy will vary by forest type, landscape, and other factors.

### SECTION 4: KNOWLEDGE GAPS AND NEXT STEPS FOR MINNESOTA

We propose several immediate actions that should be pursued to prepare Minnesota's forests for our climate future and their role in a climate change mitigation strategy.

- Keep forests forested, e.g., maintaining existing forest cover.
- Increase nursery capacity to ensure adequate access to and production of a diverse suite of conservation-grade tree seedlings for

reforestation and afforestation strategies, particularly species considered climate "winners."

- Update the MFRC's Million Acre Report, which assesses afforestation opportunities within Minnesota, in light of new science and changing markets since the report's original publication in 2010.
- Enhance collaboration amongst stakeholder groups, including across agencies, organizations, states, and even countries to enhance forest health, productivity, and the effectiveness of management.
- Develop markets for the use of forest residuals as a bioenergy feedstock.
- Encourage the production of long-lived woody products, including innovative engineered-wood products and construction materials.
- Assess the feasibility of the development of a Minnesota-based carbon market, such as a regulatory cap-and-trade program or voluntary market, which may increase the competitiveness of Minnesota forests in carbon market opportunities.
- Refer this report to the MFRC's Policy and Information Committee (PIC) for generation of strategic issues and policy recommendations.

In this paper, we provide in-depth analysis of the scientific literature and current understanding of the likely impacts of climate change on Minnesota's forests, the potential opportunity for increasing forest cover on our landscape, and how we might manage our forests to ensure they continue to thrive and provide essential services to our environment, residents and visitors, and economy. We also identify key research needs and questions that should be answered in order to develop a comprehensive and science-based approach to managing our forests in the face of a changing climate.

While climate change will present us with numerous challenges, through effective, strategic, and science-based management, Minnesota's forests may provide us with the opportunity to meet this threat while amplifying the benefits our forests have provided – and will continue to provide – to our communities and the environment.

**Lead Author**  
Hannah Friesen

**MFRC Research Advisory Committee and Contributors**

Rob Slesak | MFRC  
Marissa Schmitz | UMN  
Greg Cuomo | UMN  
Alan Ek | UMN  
Peter Reich | UMN  
Rolf Weberg | NRRI  
Amanda Kueper | DNR Division of Forestry  
Ann Pierce | DNR Ecological and Water Resources Division  
Robert Haight | USFS  
Mark Weber | St. Louis County  
Erik Schilling | NCASI

Minnesota Forest Resources Council  
Research Advisory Committee  
1530 Cleveland Ave N., Green Hall 201A and C,  
St. Paul, MN 55108  
651-603-6761  
[mfrc.info@state.mn.us](mailto:mfrc.info@state.mn.us)  
[mn.gov/frc](http://mn.gov/frc)

Upon request, this material will be made available in an alternative format such as large print, Braille or audio recording.

Printed on Minnesota-made paper.

