



# CROW WING COUNTY MN

2024

## Community Wildfire Protection Plan

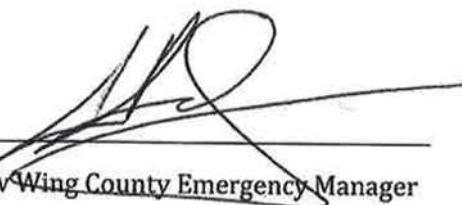
# Crow Wing County Community Wildfire Protection Plan 2024

CROW WING COUNTY EMERGENCY MANAGEMENT



## Adoption

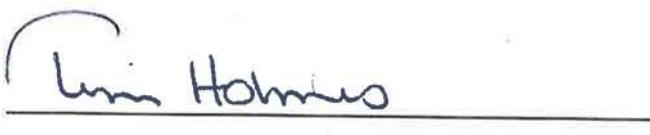
The Minnesota Department of Natural Resources has reviewed this Community Wildfire Protection Plan, approved its content, and certified that it meets or exceeds CSFS Community Wildfire Protection Plan minimum standards. The planning group signatories below adopt the following plan.



Clayton Barg, Crow Wing County Emergency Manager

9-10-2024

Date

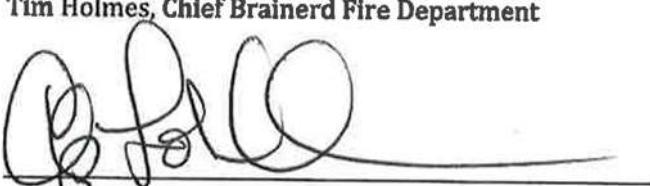


Tim Holmes

9-10-2024

Date

Tim Holmes, Chief Brainerd Fire Department

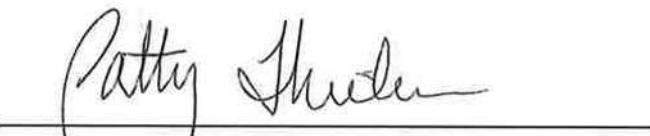


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9-10-2024

Date

Chip Lohmiller, Chief Crosslake Fire Department



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Date

Minnesota Department of Natural Resources

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## Acronyms

CR	County Road
CWCSO	Crow Wing County Sheriff's Office
CWDG	Community Wildfire Defense Grant
CWPP	Community Wildfire Protection Plan
FAC	Fire Adapted Community
FEMA	Federal Emergency Management Agency
HIZ	Home Ignition Zone
HOA	Homeowner's Association
IAFC	International Association of Fire Chiefs
IIBHS	Insurance Institute for Business & Home Safety
IRPG	Incident Response Pocket Guide
ISO	Insurance Services Office
MNDNR	Minnesota Department of Natural Resources
NFPA	National Fire Protection Association
NWCG	National Wildfire Coordinating Group
RAWS	Remote Automatic Weather Stations
RSG	Ready, Set, Go
USFS	U.S. Forest Service
WUI	Wildland-Urban Interface

Refer to the [Glossary](#) for definitions of the words and phrases used throughout this document.

# 1. Introduction

## 1.a. Purpose of a Community Wildfire Protection Plan

The development of the Crow Wing County Community Wildfire Protection Plan (CWPP) is a crucial initiative aimed at safeguarding the county's residents, infrastructure, and natural resources from the threat of wildfires. Located in central Minnesota, Crow Wing County boasts a diverse demographic landscape, comprising both rural and urban areas. With a population that reflects a mix of ages, occupations, and lifestyles, the county's demographics play a significant role in shaping the wildfire protection strategies outlined in the CWPP.

Understanding the demographics of Crow Wing County is essential for tailoring wildfire mitigation and response efforts to meet the needs of its residents. Factors such as population density, socioeconomic status, and geographical distribution influence the level of vulnerability to wildfires and the capacity for community engagement in prevention and preparedness activities. By analyzing demographic data, the CWPP can identify high-risk areas, prioritize resource allocation, and implement targeted outreach programs to educate and empower residents to take proactive measures against wildfires.

Moreover, the Crow Wing County CWPP recognizes the importance of collaboration and coordination among various stakeholders, including government agencies, community organizations, and residents. By fostering partnerships and leveraging resources, the plan aims to enhance wildfire resilience across the county while promoting sustainable land management practices and fostering a culture of preparedness. Through ongoing monitoring, evaluation, and adaptation, the CWPP will help to ensure that wildfire protection efforts remain responsive to the evolving needs and demographics of Crow Wing County, ultimately strengthening the community's ability to mitigate and withstand the impacts of wildfires now and in the future.

Wildland and wildland urban interface fires have become more prevalent, more destructive, and more in need of address in recent years. In 2022 and 2023 a Wildland Fire Mitigation and Management Commission was formed to examine the issue of wildland and wildland urban interface fire and recommend actions to be taken nationally to address this emerging issue. In the resulting report, "wildland fire" was defined as planned and unplanned fires that burn in the natural environment. Moreover, the term "wildland-urban Interface (WUI)" is defined as any area where wildland fuels (trees, brush and vegetative materials) interact with homes, structures, communities, and other infrastructure that supports communities. Because people and natural elements interact in the wildland-urban interface, expanding development and recreational use is creating an increasingly complex landscape in many places, including Crow Wing County. Increasing WUI development is accompanied by problems specific to these natural areas, such as the threat of catastrophic wildfire. Moreover, changing weather patterns and trends are changing the way fires burn in these areas, and the overall effects on communities.

## Plan Integration

A CWPP is a strategic plan that identifies specific wildland fire risks facing communities and neighborhoods and provides prioritized mitigation recommendations designed to reduce those risks. Once the CWPP is certified and adopted, it is the community's responsibility to move forward, implement the action items, and maintain the currency of the CWPP content. Implementation may require further planning at the project level, acquisition of funds, continued collaboration with public agencies, or simply motivating homeowner associations (HOA), property owner associations (POA), and individual homeowners to take action on their individual properties and to think of the community as a whole when it comes to wildfire risk.

CWPPs are authorized and defined in Title I of the Healthy Forests Restoration Act (HFRA) enacted in 2003. The HFRA places renewed emphasis on community planning by extending a variety of benefits to communities with a wildfire protection plan in place. Critical among these benefits is the option of establishing a localized definition and boundary for the WUI and the opportunity to help shape fuels treatment priorities for surrounding federal and non-federal lands.

The CWPP, as described in the Act, brings together diverse local interests to discuss their mutual concerns for public safety, community sustainability, and natural resources. It offers a positive, solution-oriented environment in which to address challenges such as local firefighting capability, the need for defensible space around homes and subdivisions, and where and how to prioritize land management – on both federal and nonfederal land. The implementation of effective wildfire mitigation is a dynamic process as the characteristics of forests and interface communities are constantly changing. Flexibility is designed into the CWPP implementation process in order to accommodate this changing landscape. Regular plan maintenance and annual updates can document these changes and highlight progress.

The goals of this project are to:

- Goal 1: Identify and prioritize WUI areas within Crow Wing County (including State, County, Federal and private lands) for risk reduction and recommend methods for achieving risk reduction.
- Goal 2: Outline measures for reducing fire danger to communities, improve fire adaptation and recommend strategies for completing such measures throughout Crow Wing County.
- Goal 3: Educate home owners of wildfire risk in their communities helping reduce human caused wildfires.

This plan also supplements the wildfire hazards section and is adopted by reference within the Crow Wing County Natural Hazards Mitigation Plan.

As fire history has demonstrated, large wildfires are not uncommon in Crow Wing County. The threats to life and property, the assets lost, and the cost of fighting fires are escalating. As wildfires affect more people, active public involvement becomes integral to the success of any wildfire management initiative. By being proactive, Crow Wing County communities can work together to reduce the dangers associated with wildland and wildland urban interface fires. While it is impossible to stop all wildfires from occurring, appropriate mitigation measures CAN make a difference. Wildfire and structure protection are everybody's responsibility!

## CWPP Description

The Crow Wing County CWPP is a community-based plan and was developed collaboratively amongst individuals, local communities, local fire departments, businesses, and land management agencies working together to achieve a common goal. This guide is not a legal document, although recommendations contained here carefully conform to both the spirit and the letter of the Healthy Forest Restoration Act (HFRA). The goal of the HFRA is to reduce wildland fire risk to firefighters, communities, and important landscapes while meeting the overall goal of improved forest health on a landscape scale. Implementation of all fuels reduction and hazard mitigation projects developed through this plan will follow County, State, and Federal land management plans and policies.

Completion of this CWPP can help communities within Crow Wing County tap into national funding resources which help states and communities with community fire planning, hazardous fuel reduction, and wildfire prevention across the nation. It also earns communities' priority for funding hazardous fuels reduction projects carried out under the auspices of the HFRA. A County or community at risk must prepare a CWPP if it is to take full advantage of these opportunities.

The Crow Wing County CWPP defines the steps and recommendations developed by a core planning team, and the final recommendations as edited, reviewed, and prioritized by the local community. This plan is a working document and will be enhanced collaboratively by the communities which it serves. The Core Team (which is responsible for plan creation and implementation) will actively seek community input to help develop localized hazard reduction and mitigation projects. Community members wishing to comment and give suggestions to the implementation of the plan should contact their local fire chief, MN Department of Natural Resources (MNDNR) or any of the individuals involved with the core team.

This plan will be implemented through the guidance of the Crow County CWPP Core Team composed of representatives from the Crow Wing County Board of Commissioners, the Crow Wing County Emergency Management Director, the MNDNR, the US Army Corp of Engineers, and Crow Wing County fire departments. Adjunct Core Team members may also include: members from affected communities, technical specialists, and other representatives as deemed appropriate.

The specified requirements for a CWPP as listed in the HFRA include the following objectives:

1. It must be developed collaboratively: Local and State government representatives must collaboratively develop the Plan and must consult with federal agencies and other interested parties.
2. It must set priorities to reduce fuels: The Plan must identify and prioritize areas for treatments that will reduce hazardous fuels. It must also recommend treatment types and methods that will protect one or more at risk communities and essential infrastructure.
3. It must recommend treatment measures to reduce structural ignitability: The Plan must recommend measures that homeowners and communities can take to reduce the ignitability of structures throughout the area addressed by the plan.

In development of the Crow Wing County CWPP, communities discussed and refined priorities for protecting life, property, and critical infrastructure within the County. The focus areas are (in order of priority):

- Evacuation Planning - Roads with no second means of egress.
- Reducing the negatives effects of Wildfires in the Wildland Urban Interface areas.
- Ownership of individual and community risk by embracing Firewise or similar standards.

Complex interactions among wildland fuels, weather, and topography determine how wildfires behave and spread. Many aspects of wildfires are predictable based on known scientific research on the physical processes driving fire. Much of the work in this CWPP is based on scientific research and computer models of wildfire behavior. A basic understanding of fire behavior aids in interpreting the findings and recommendations reported herein. See [Appendix A. Introduction to Wildfire Behavior and Terminology](#) and the [Glossary](#) for the definition of key terms.

### **Community Members - Why is the CWPP relevant to me?**

Becoming a fire adapted community that can safely coexist with wildland fire takes a concerted, ongoing effort by everyone who lives, owns property, protects, or manages land in and around this community. Conditions in Crow Wing County share some risk factors common to past catastrophic wildfires across the country. This CWPP provides recommendations for how to prepare your family to safely evacuate during a wildfire, how to mitigate your home ignition zone to give your house a fighting chance at surviving wildfires and protect the lives of firefighters engaged in protecting your community.

Work you do to reduce fire risk on your property can amplify the work that your neighbors do on theirs, resulting in greater protection for everyone. Removing trees from along roadways can increase the visibility of your property to firefighters, increase the accessibility of your property for fire engines, and reduce the chance that non-survivable conditions can develop and entrap residents and first responders during wildfires.

This CWPP is a call to action to do your part to continue making Crow Wing County a beautiful and safe community. Land management partners, your local fire department and the Crow Wing County Emergency Management are here to support your individual efforts, and they are committed to taking action to reduce wildfire risk and increase emergency preparedness for the benefit of this amazing community.

## 1.b Community and Partner Engagement

Collaboration is an essential part of CWPPs. Community engagement, partner commitment, and follow-through are what make a CWPP successful. Representatives from Crow Wing County engaged partners from across the County to develop the recommendations set forth in this CWPP.

The Core Team would like to thank the following partners for their time and effort in developing, providing data, providing feedback, and planning implementation projects for this CWPP:

- Crow Wing County Sheriff's Office
- Brainerd Fire Department
- Crosslake Fire Department
- Minnesota Department of Natural Resources
- Crow Wing County Highway Department
- Xcel Energy
- Crow Wing Power
- Minnesota Power (ALLETE)
- Brainerd Public Utilities
- United States Army COE
- Bureau of Indian Affairs
- County and City Government Officials
- Local Fire Chiefs

## CWPP - General Responsibilities

### State Foresters (MN Department of Natural Resources):

- The HFRA (Healthy Forest Restoration Act) gives State Foresters a unique and critical role by designating them as one of the three entities, along with local government and the local fire authority, who must agree on the final contents of the Crow Wing County CWPP.
- To Provide statewide leadership in encouraging local, state, federal, and non-governmental stakeholders in development of the Crow Wing County CWPP and facilitate the participation of state personnel in the development process.
- Through established relationships with Crow Wing County city and county officials, local fire chiefs, state and national fire organizations, federal land management agencies, private homeowners, and community groups:
  - Assist in bringing together diverse community partners.
  - Assist in the identification and implementation of priority actions across ownership boundaries.
  - Bring specialized natural resource knowledge and technical expertise into the planning process.
  - Provide statewide leadership in developing and maintaining a database (Northeast-Midwest Wildfire Risk Explorer), which maps communities at risk within the state then work with partners to establish priorities for action.
  - When allocating federal grant funds (such as the mitigation portion of State Fire Assistance) for projects on nonfederal lands, to the maximum extent possible give priority to communities that have adopted a CWPP.

**Federal Agencies (USDA FS Regional Foresters, US Army COE's Directors, and Regional Directors of the US Fish & Wildlife Service and National Park Service):**

- Provide federal leadership in encouraging Crow Wing County to develop a CWPP.
- Convey the importance of CWPPs to federal line officers and encourage their active participation in their development and implementation.
- In planning fuel reduction projects on federal land:
  - Ensure full collaboration with local communities, state agencies, and all interested parties.
  - Give priority to projects that provide for the protection of at-risk-communities or watersheds, or that implement recommendations in a CWPP.
- Bring specialized natural resource knowledge and technical expertise into the planning process, particularly in the areas of GIS and mapping, vegetation management, assessment of values and risks, and funding strategies.
- Assist the community in identifying and prioritizing areas for hazardous fuel reduction treatments on federal lands, and in determining the types and methods of treatment that, if completed, would reduce the risk to the community.
- Provide funding priority to projects and activities identified in a CWPP.
- Promote economic opportunities in rural communities where possible.

**Bureau of Indian Affairs (BIA) Regional Foresters:**

- Encourage Tribes to develop and implement, as appropriate, CWPPs (often referred to as wildland fire prevention plans) for landscapes at high-risk to wildland fire.
- Collaborate with Tribes to plan and implement WUI and/or HFRA treatments that meet tribal goals.
- Facilitate coordination with local communities and state and other federal agencies with land adjacent to reservation / tribal boundaries.
- Communicate the unique role of tribal governments to partners involved in developing CWPPs and assist with appropriate incorporation of tribal participants and interests in the resulting documents.

**County and City Government Officials:**

- The HFRA gives local government officials a unique and critical role by designating them as one of the entities, along with state land management agencies and the local fire authority, which must agree on the final contents of a CWPP.
- Convene the core decision-making team that will be responsible for either developing the plan or guiding its development.
- Engage local community leaders and stakeholders in the planning process.
- Along with local fire chiefs, provide local leadership in assessing community fire protection needs and determining the complexity of planning necessary.
- Enlist state and federal agency assistance and support for the planning effort.
- Ensure that the CWPP is collaboratively developed. Local officials must meaningfully involve state government representatives, federal agencies that manage land in the vicinity of the community, and other interested parties.

- In conjunction with local fire chiefs, clearly communicate to home and business owners their responsibility to reduce the ignitability of their homes and other structures, and to create defensible space around them.

### **Local Fire Chiefs:**

- The HFRA gives local fire chiefs a unique and critical role by designating them as one of the entities, along with local government and the state forestry agencies, which must agree on the final contents of a CWPP.
- As trusted community members and leaders, take the lead in encouraging diverse local understanding of and support for the development of a CWPP, in organizing the planning process, and in ensuring meaningful participation from other community leaders and diverse stakeholders.
- Use local fire protection expertise to lead the assessment of community fire protection needs and to determine the necessary complexity of fire preparedness and response planning.
- In conjunction with local government officials, clearly communicate to home and business owners their responsibility to reduce the ignitability of their homes and other structures, and to create defensible space around them.
- Consider using the “Leaders Guide for developing a Community Wildfire Protection Plan”, developed by the International Association of Fire Chiefs (IAFC), to guide the process.

## **Crow Wing County CWPP Engagement**

The development of the Crow Wing County CWPP has been a collaborative effort involving various planning partners and stakeholders committed to ensuring the safety and resilience of the community in the face of wildfire threats.

- Leading this initiative are the Crosslake and Brainerd Fire Chiefs who took the initiative to apply for grants to spur the development of a CWPP. Local fire departments, including Crosslake Fire and Brainerd Fire, play a crucial role in the CWPP, providing frontline firefighting capabilities and expertise in wildfire response. Their input and participation in the planning process helped tailor strategies to address the unique challenges posed by wildfires in Crow Wing County.
- MNDNR brings its expertise in wildfire management and mitigation strategies to the table. The DNR's guidance and resources assisted in shaping the CWPP and designing effective wildfire prevention measures.
- The Crow Wing County Sheriff's Office is another key partner in the CWPP, responsible for coordinating emergency response efforts and ensuring public safety during wildfire incidents. Working closely with fire departments and other agencies, the Sheriff's Office plays a pivotal role in implementing evacuation plans, and disseminating critical information to residents.
- The Crow Wing County Highway Department is actively involved in the CWPP, contributing expertise in road infrastructure management and emergency access planning. By identifying and maintaining critical evacuation routes and firebreaks, the Highway Department helps enhance the community's resilience to wildfire events.
- Crow Wing County Land Services is engaged in the CWPP process, focusing on land use planning and zoning regulations to minimize wildfire risk and promote responsible

development practices in high-risk areas. Their collaboration ensures that land management decisions align with wildfire mitigation goals and community safety objectives.

- Utilities providers are essential partners in the CWPP, as they play a vital role in infrastructure resilience and emergency response coordination. By working with utility companies, the CWPP aims to enhance the reliability of power and communication systems during wildfire events, ensuring timely and effective emergency communications and resource allocation.
- The Brainerd Lakes Chamber of Commerce is actively involved in the CWPP, representing the business community's interests and promoting economic resilience in the face of wildfire threats. Their engagement ensures that the CWPP considers the broader socioeconomic impacts of wildfires and incorporates strategies to support business continuity and recovery efforts.
- The Crow Wing County Historical Society contributes to the CWPP by preserving and sharing knowledge of past wildfire events and their impacts on the community. By learning from history, the CWPP can better anticipate and mitigate future wildfire risks, ensuring a more resilient and prepared community.
- The Minnesota Department of Transportation (MnDOT) collaborates with local partners in the CWPP to address transportation infrastructure challenges and enhance evacuation routes and traffic management strategies. MnDOT's expertise in roadway design and maintenance is critical for ensuring safe and efficient evacuation procedures during wildfire events.
- Finally, non-governmental organizations such as the Red Cross and the Salvation Army provide invaluable support and resources during wildfire emergencies, offering shelter, supplies, and assistance to affected residents. Their partnership in the CWPP ensures a coordinated and comprehensive approach to wildfire response and recovery efforts, fostering community resilience and unity in times of crisis.



Pictures above: (Left) Wildfire Tabletop exercise with County partners. (Right) Initial CWPP kick-off meeting, and establishment of Core Team)

*Caption. Photo credit: Chip Lohmiller*

## 1.c. General Description

Crow Wing County, situated in central Minnesota, encompasses a vast area of approximately 1,157 square miles, making it one of the largest counties in the state. Its expansive territory is punctuated by numerous lakes, rivers, and forests, contributing to its reputation as an outdoor paradise. Established in 1857, Crow Wing County has a storied history intertwined with the development of the region. Initially inhabited by Native American tribes, the area later attracted European settlers drawn by its natural resources and fertile land. Over the years, the county has played a significant role in Minnesota's growth, particularly during the logging and railroad eras. Today, Crow Wing County preserves its rich heritage through various historical sites and museums, providing a glimpse into its past while embracing its present as a thriving community with a deep appreciation for its natural surroundings.

Crow Wing County, nestled in the heart of Minnesota, beckons tourists with its abundance of outdoor adventures and cultural attractions. Boasting over 400 lakes and pristine forests, the county is a haven for fishing, boating, hiking, and camping enthusiasts. The charming town of Brainerd serves as a gateway to the region, offering visitors access to renowned golf courses, scenic bike trails, and family-friendly attractions like Paul Bunyan Land. History buffs can explore sites such as the Crow Wing State Park and the Minnesota Military Museum, while wine aficionados can indulge in tastings at local vineyards along the Brainerd Lakes Wine Trail. Throughout the year, Crow Wing County hosts festivals, fairs, and events that celebrate its heritage and vibrant community spirit. Whether seeking outdoor adventures or cultural experiences, tourists flock to Crow Wing County to immerse themselves in its natural beauty and rich history.



*Caption. Photo credit: Crow Wing County Lakes and Rivers.*



*Figure 1.a.2. Boundary of Crow Wing County in Minnesota.*

Source : [https://en.m.wikipedia.org/wiki/File:Map\\_of\\_Minnesota\\_highlighting\\_Crow\\_Wing\\_County.svg](https://en.m.wikipedia.org/wiki/File:Map_of_Minnesota_highlighting_Crow_Wing_County.svg)

## 2. Fire Policies and Programs

This CWPP is not a legal document. There is no legal requirement to implement the recommendations herein. Actions on public lands will be subject to federal, state, and county policies and procedures such as adherence to the HFRA and National Environmental Policy Act (NEPA). Action on private land may require compliance with county land use codes, building codes, and local covenants.

### Federal Policy

There are several federal legislative acts that set policy and provide guidance to the development of the CWPP for Crow Wing County:

1. Healthy Forest Initiative (2002)

<https://www.fs.usda.gov/projects-policies/hfi/field-guide/web/page02.php#:~:text=The%20Administration%20launched%20the%20HFI,improve%20forest%20health%20and%20vigor.>

- Inspired the creation of new regulations under the Endangered Species Act for National Fire Plan projects to streamline consultation with federal regulatory agencies.
- It set the stage for discussion between the administration and Congress resulting in new legislation addressing forest health.
- Impetus behind establishing new procedures provided for under the National Environmental Policy Act to allow priority fuel treatment (thinning and prescribed fire) and forest restoration (reseeding and planting) projects, identified through collaboration with state, local and tribal governments and interested persons, to proceed quickly without the need for lengthy environmental documentation.
- Improved the agencies' administrative appeal rules to expedite appeals of forest health projects and encourage early and more meaningful public participation.
- Provided guidance to Federal agencies to make consultations under the Endangered Species Act timelier while emphasizing long-term benefits to threatened and endangered species, and proposing new regulations under the Endangered Species Act (Section 7) to expedite consultation for forest health projects that are unlikely to harm threatened or endangered species or their habitat.
- Provided guidance from the Council on Environmental Quality to improve environmental assessments for priority forest health projects by preparing assessments for fifteen pilot fuels treatment projects.
- Precursor to the Healthy Forest Restoration Act of 2003 which contains a variety of provisions to expedite hazardous-fuel reduction and forest-restoration projects on specific types of Federal land that are at risk of wildland fire or insect and disease epidemics. The act helps rural communities, States, Tribes, and landowners restore healthy forest and rangeland conditions on State, Tribal, and private lands.

2. Stewardship Contracting

[https://www.fs.usda.gov/restoration/Stewardship\\_Contracting/overview.shtml](https://www.fs.usda.gov/restoration/Stewardship_Contracting/overview.shtml)

Stewardship contracting authority allows Federal agencies to enter into long-term (up to 10 years) contracts with small businesses, communities and nonprofit organizations to reduce wildfire risk and improve forest health. Stewardship contracts emphasize the vital role of local residents, though strong partnerships with federal land managers in formulating the

goals of forest stewardship while accomplishing the necessary work. Stewardship contracts focus on

desirable end results on the ground that improve forest health and provide benefits to communities. Stewardship contracting helps agencies achieve key land-management goals to:

- improve, maintain, and restore forest and rangeland health;
- restore and maintain water quality;
- improve fish and wildlife habitat;
- re-establish native plant species and increase their resilience to insects, disease and other natural disturbances; and
- Reduce hazardous fuels that pose risks to communities and ecosystem values through an open, collaborative process.

Stewardship contracts allow private companies, communities and others to retain forest and rangeland products in exchange for the service of thinning trees and brush and removing dead wood. Long-term contracts (up to 10 years) foster a public/private partnership to restore forest and rangeland health by giving those who undertake the contract the ability to invest in equipment and infrastructure. This equipment and infrastructure are needed to productively use material generated from forest thinning, such as brush and other woody biomass, to make wood products or to produce biomass energy, at savings to taxpayers.

3. Healthy Forests Restoration Act (2003)

<https://www.agriculture.senate.gov/imo/media/doc/Healthy%20Forests%20Restoration%20Act%20Of%202003%204.12.18.pdf>

Key provisions:

- Provide tools and additional authorities to treat acres quickly in order to expedite restoration goals. Strengthen public participation and provided incentives for local communities to develop community protection plans.
- Limit environmental analyses complexity for hazard reduction projects
- Provide a more effective appeal process
- Instructs the Courts when considering legal challenges to halt projects, to balance the short-term effects of implementing the projects against the harm from undue delay and long-term benefits of a restored forest.
- Encourages biomass removal from public and private lands.
- Provides technical, educational, and financial assistance to improve water quality and address watershed issues on non-Federal lands.
- Authorizes large-scale silvicultural research.
- Authorizes acquisition of Healthy Forest Reserves on private land to promote recovery of threatened and endangered species, and improve biodiversity and carbon sequestration.
- Directs the establishment of monitoring and early warning systems for insect or disease outbreaks.

4. Wildfire Crisis Strategy (2022)

[https://www.fs.usda.gov/sites/default/files/fs\\_media/fs\\_document/WCS-Chronicle.pdf](https://www.fs.usda.gov/sites/default/files/fs_media/fs_document/WCS-Chronicle.pdf)

The U.S. Department of Agriculture (USDA), Forest Service 10-year strategy and comprehensive

implementation plan for working with partners across jurisdictions to reduce wildfire risk to people, communities, and natural resources while sustaining and restoring healthy, resilient fire-adapted forests. The implementation plan will focus on changing the trajectory of risk by:

- Identifying the right locations and tools for fuels and forest health treatments that are science-based and equitable.
- Developing needed workforce capacity and investing in the enabling conditions required for success.
- Working with partners across jurisdictions to develop and implement projects that are landscape scale, outcome-driven, and community ready.
- Supporting planning and investments in fire-adapted communities and on partnerships to restore and reforest areas already impacted by fire and mitigate risks associated with postfire disaster events.

5. National Cohesive Wildland Fire Management Strategy Addendum Update (Cohesive Strategy - 2023)  
<https://www.forestsandrangelands.gov/documents/strategy/natl-cohesive-wildland-fire-mgmt-strategy-addendum-update-2023.pdf>

The Cohesive Strategy is a strategic push to work collaboratively among all stakeholders and across all landscapes, using best science, to make meaningful progress towards the three goals:

- Resilient Landscapes
- Fire Adapted Communities
- Safe and Effective Wildfire Response

6. Federal Emergency Management Agency Disaster Mitigation Act (2000)  
[https://www.fema.gov/sites/default/files/2020-11/fema\\_disaster-mitigation-act-of-2000\\_10-30-2000.pdf](https://www.fema.gov/sites/default/files/2020-11/fema_disaster-mitigation-act-of-2000_10-30-2000.pdf)

Federal Emergency Management Agency (FEMA) lists requirements under Title 44 CFR Part 201 of the Disaster Mitigation Act of 2000. This legislation specifies criteria for state and local hazard mitigation planning which require local and Indian tribal governments applying for Pre-Disaster Mitigation funds to have an approved local mitigation plan. These may include county-wide or multi-jurisdictional plans as long as all jurisdictions adopt the plan. Activities eligible for funding include management costs, information dissemination, and planning, technical assistance and mitigation projects.

## Fire Suppression Responsibilities

Suppression activities are governed by documents such as the Interagency Agreement for the Minnesota

Interagency Fire Center, the MN-DNR Fire Suppression Handbook, the National Interagency Mobilization Guide, the Eastern Area Interagency Mobilization Guide, National Wildfire Coordinating Group standards, International Border Agreement Operating Guidelines for Wildfires in the Common Zone, the Governors Executive Order(s), the Superior National Forest Fire Management Plan, the Fireline Handbook, and the MNICS Mobilization Plan. These plans and handbooks guide actions whenever a fire is detected.

Minnesota land management agencies have produced a Fire Preparedness Plan for Northeastern Minnesota which addresses pre-positioning of resources, fuels assessment and reductions, fire prevention, communications infrastructure, and fire department coordination. This preparedness plan is also supported by detailed aviation plans.

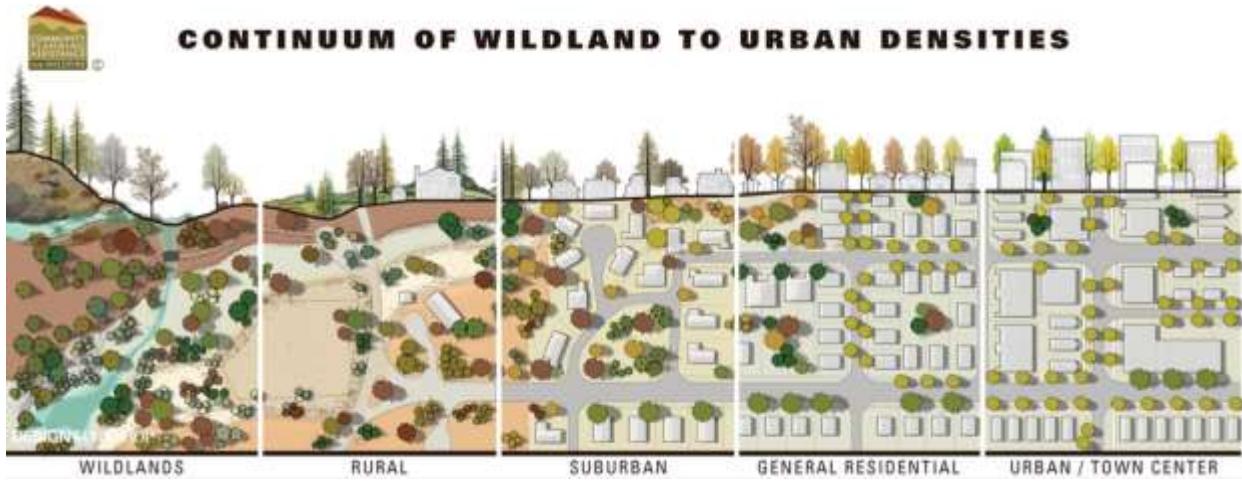
The Superior National Forest annually revises its Fire Management Plan and Forest Aviation Plan to reflect current suppression strategies, fuel conditions, changing policies, and adjusts resources availability according to current funding levels.

The members of the Minnesota Incident Command System (MNICS) have also entered into an agreement with the Ontario Ministry of Natural Resources concerning wildfire response along the US-Canadian border. These plans and associated changes have been integrated into standard operating procedures for the wildland fire response agencies and fire departments in northeastern Minnesota.

Interagency Agreement R9-9-96-IA-46 (MIFC Agreement) speaks to the purpose of providing effective and economical protection of life and property. An Operating Plan outlines cooperative fire suppression between the Minnesota DNR Forestry, Chippewa National Forest, and the Superior National Forest on intermingled lands. It identifies zones of protection within intermingled lands where an individual agency provides fire suppression response on all lands. Despite massive changes in fire suppression demands due to a changed condition, these zone agreements will be maintained. This decision will be supported by expanded interagency resources, stronger communication, and as necessary, a unified command structure in addressing wildfire incidents.

### 2.a. Definition and Identification of Wildland-Urban Interface

The WUI is any area where the built environment meets wildfire-prone areas—places where wildland fire can move between natural vegetation and the built environment and result in negative impacts on the community (Forge, 2018). People that live and work in the WUI must be aware of the effect that ecosystem processes and disturbances, such as wildland fire, have on their lives. WUI exists along a continuum of wildland to urban densities (**Figure 2. a.1**).



**Figure 2. a.1.** The wildland-urban interface exists along a continuum of wildland to urban densities.  
Source: Community Planning Assistance for Wildfire.

The WUI in Crow Wing County is a combination of Interface and Intermix. Wildland Urban Interface is where a community boundary comes into contact with a wildland environment similar to the suburban example above in Figure 2.a.1. Wildland Urban Intermix is where homes are scattered about the Wildlands similar to what you see in the Rural Example in Figure 2.c.1 above. Due to the amount of development. Are all residents in the WUI? Just some

For the purpose of this CWPP, the Crow Wing County WUI includes the entire county.

See methodology in [Appendix B](#). Strategic wildfire mitigation across the WUI can increase the safety of residents and wildland firefighters and can reduce the chances of home loss.

[Northeast-Midwest Wildfire Risk Explorer - Basic Viewer \(northeastmidwestwildfirerisk.com\)](http://northeastmidwestwildfirerisk.com)

The conditional risk to potential structures (CRPS) dataset represents the potential consequences of fire to a home at a given location, if a fire occurs there and if a home were located there. It is a measure that integrates wildfire intensity with generalized consequences to a home on every pixel, but does not account for the actual probability of fire occurrence.

## Northeast-Midwest Area of Interest Summary Report

The Area of Interest tool allows users of the Advanced Viewer application to define a specific location to further explore its wildfire risks. This information can be then be exported, providing a detailed summary using attributes selected by the Northeast-Midwest State Foresters Alliance. The data layers for many of these map products were created with publicly available data and information submitted by volunteer fire departments. These map products have been summarized explicitly for the active Area of Interest. To access all data layers as a GIS file, users must “export data as a .zip file” after creating an area of interest.

Examples include, but are not limited to, Community Wildfire Protection Plans, Local Fire Plans, Fuels Mitigation Plans, Hazard Mitigation Plans, Homeowner Risk Assessments, and Forest Management or Stewardship Plans.

The Northeast-Midwest Wildfire Risk Assessment provides a consistent, comparable set of scientific results to be used as a foundation for wildfire mitigation and prevention planning in the Northeast-Midwest region.

Results of an assessment can be used to help prioritize areas in the region where mitigation treatments, community interaction, and education or tactical analyses might be necessary to reduce risk from wildfires.

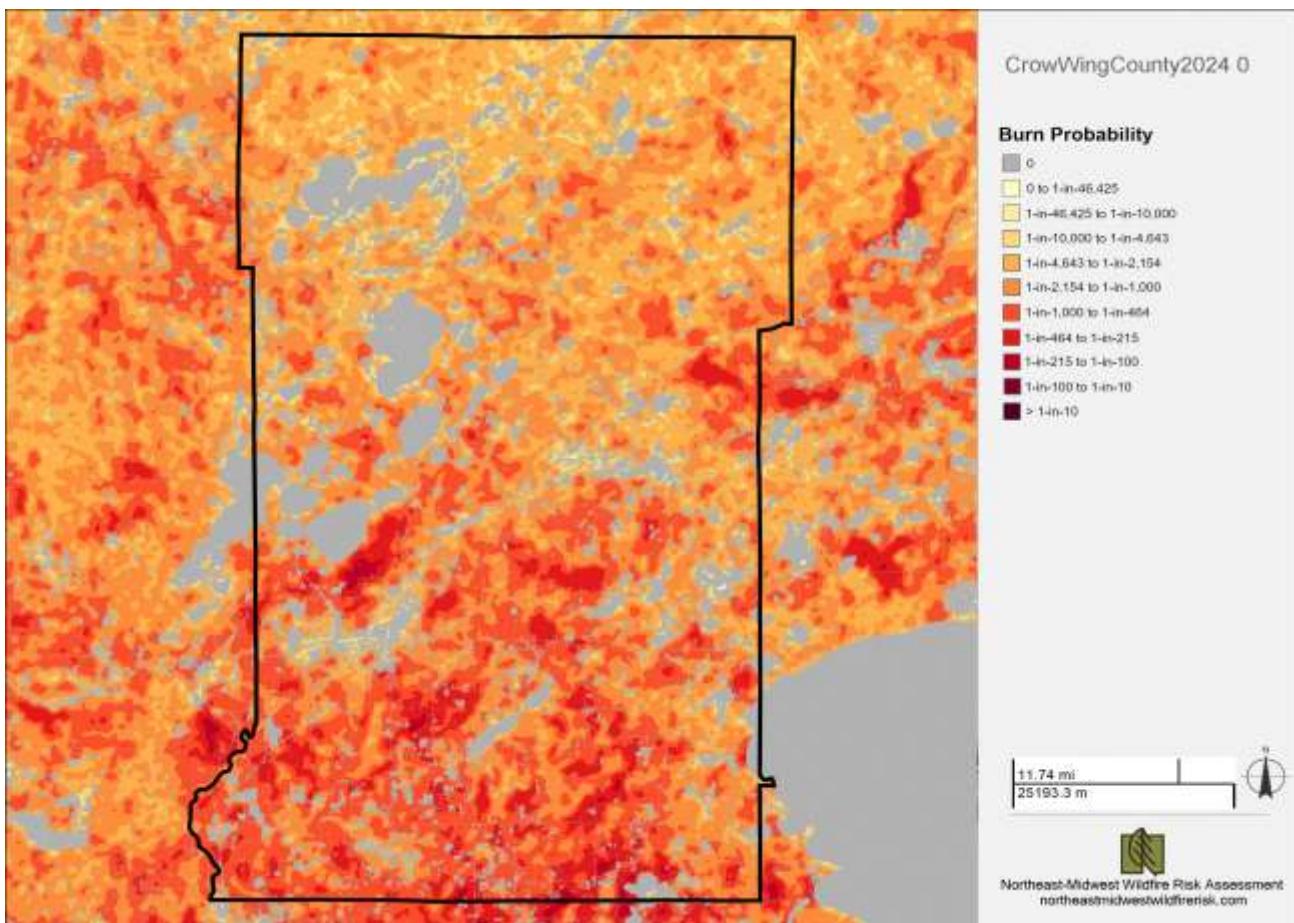
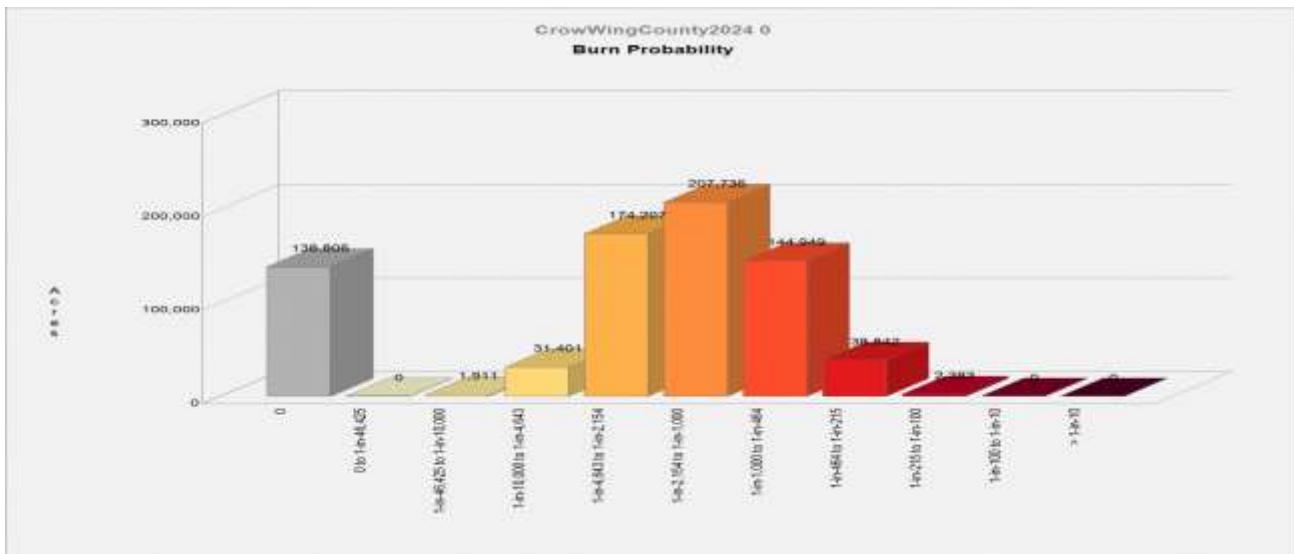
The Northeast-Midwest Wildfire Risk Explorer's map products and descriptions included in this summary report are designed to provide the information needed in support of the following key priorities:

- Identify areas that are most prone to wildfire.
- Plan and prioritize fuel treatment within programs.
- Allow agencies to work together to better define priorities and improve emergency response, particularly across jurisdictional boundaries.
- Increase communication with local residents and the public to address community priorities and needs.
- Identify areas where additional tactical planning may be desirable, specifically related to mitigation projects and Community Wildfire Protection Planning.
- Provide the information necessary to support resource, budget, and funding requests.
- Plan for response and wildfire suppression resource needs

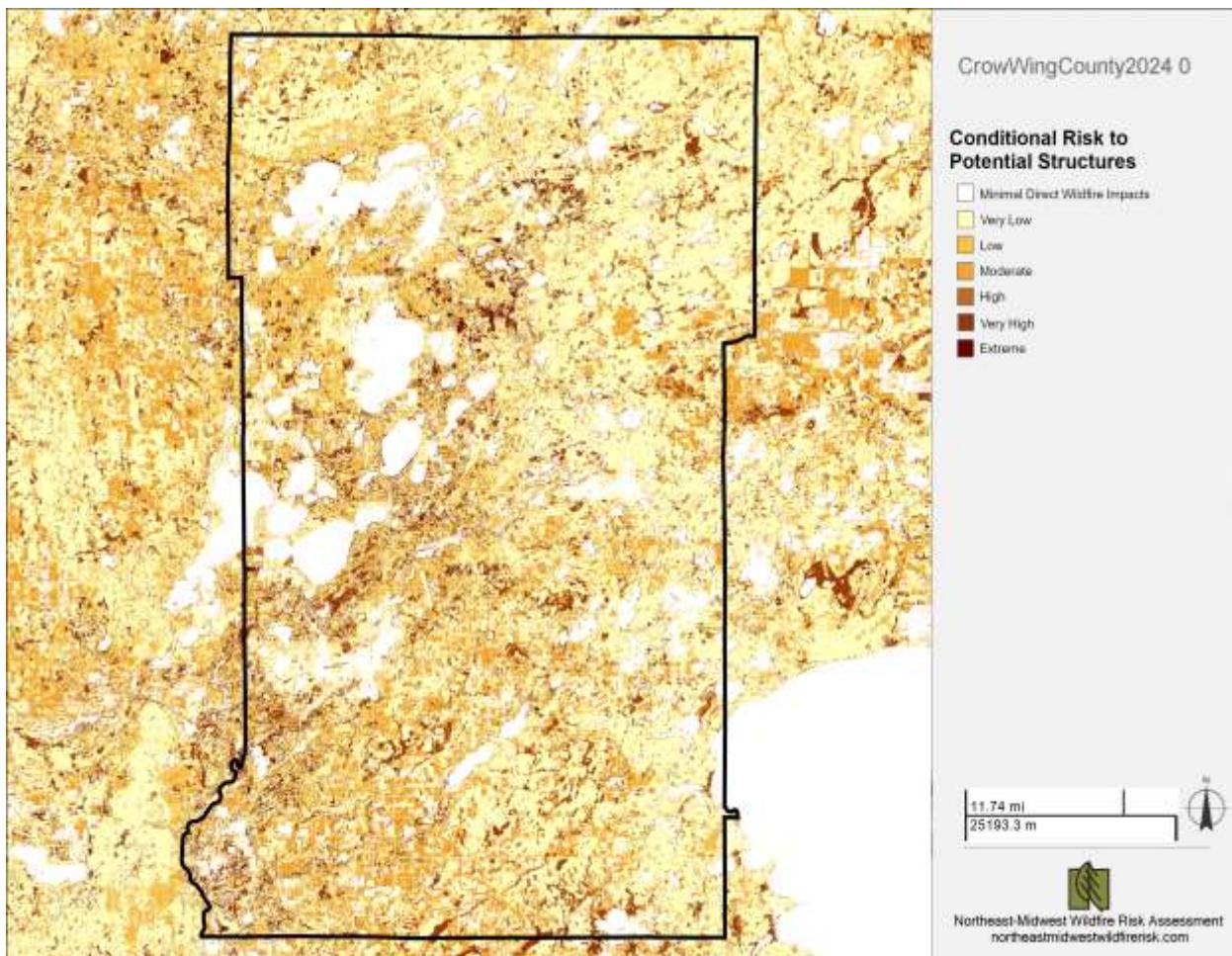
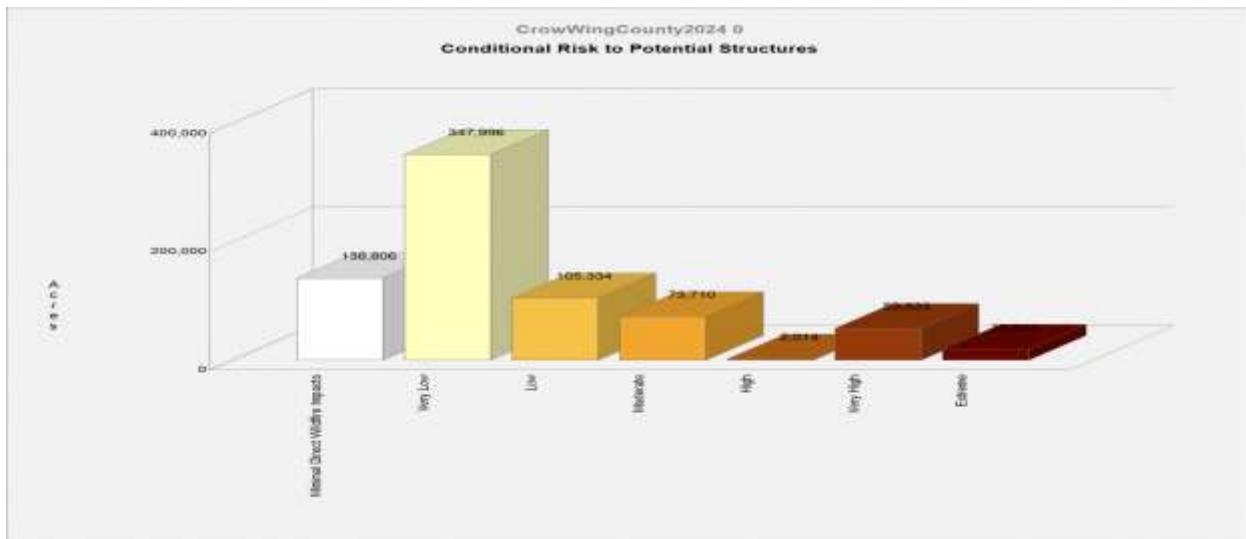


#### Northeast-Midwest State Foresters Alliance

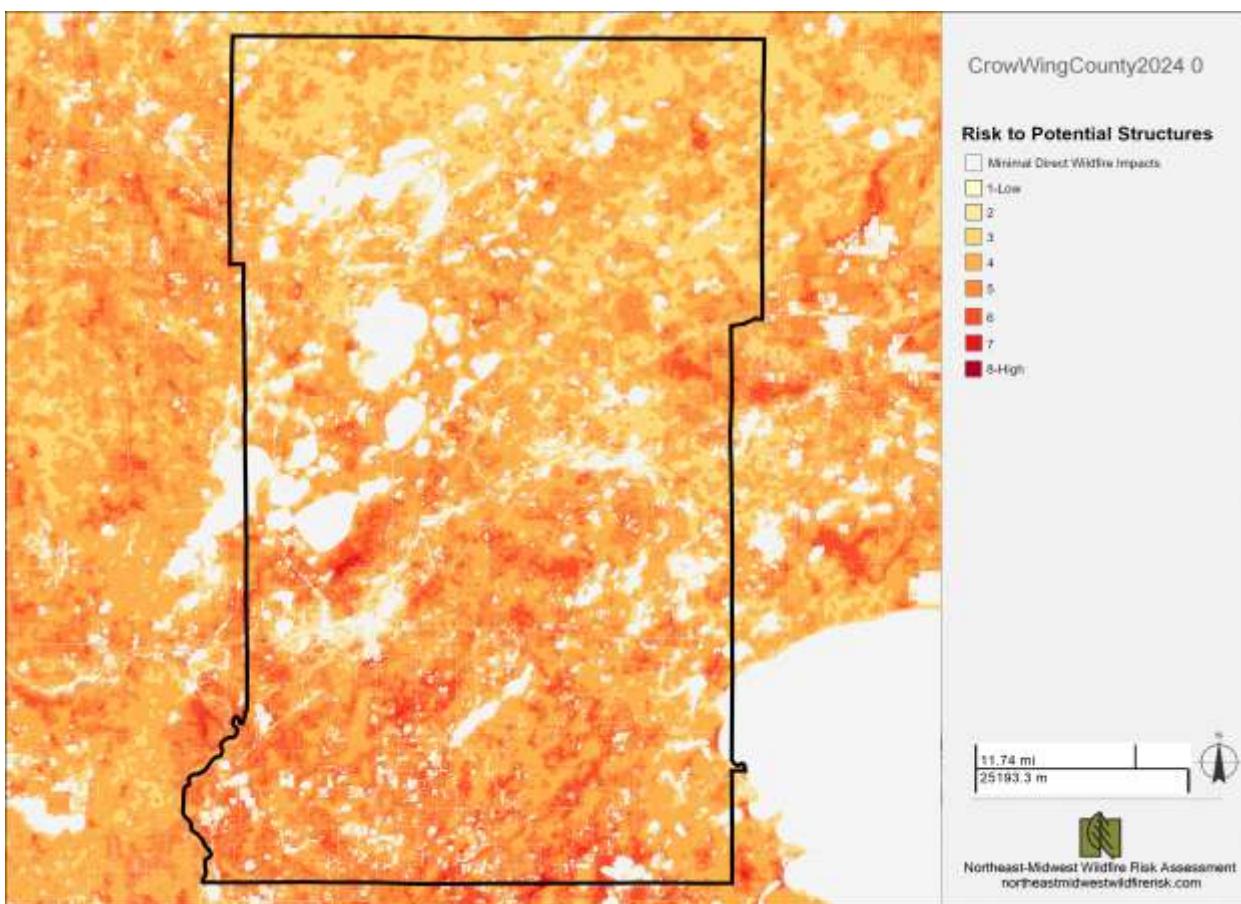
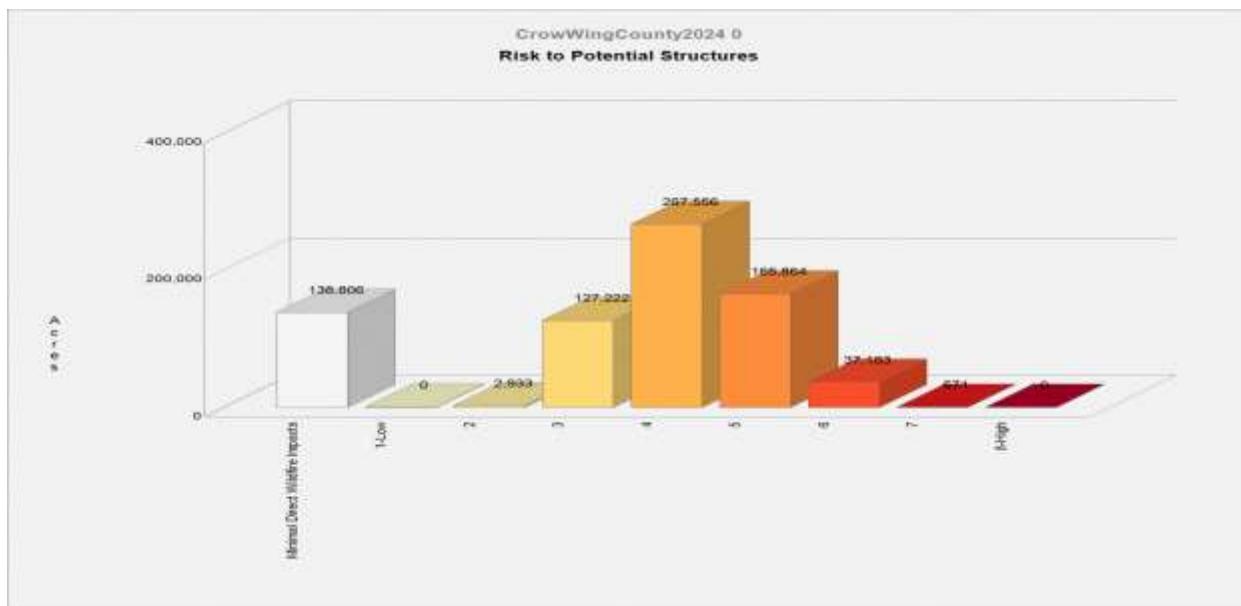
Burn probability is the annual probability of wildfire burning in a specific location. At the community level, burn probability or wildfire likelihood is averaged where housing units occur. Burn Probability is based on fire behavior modeling across thousands of simulations of possible fire seasons. In each simulation, factors contributing to the probability of a fire occurring, including weather, topography, and ignitions are varied based on patterns derived from observations in recent decades.



The conditional risk to potential structures (CRPS) dataset or “Risk to Homes” represents the potential consequences of fire to a home at a given location, if a fire occurs there and if a home were located there. It is a measure that integrates wildfire intensity with generalized consequences to a home on every pixel, but does not account for the actual probability of fire occurrence.



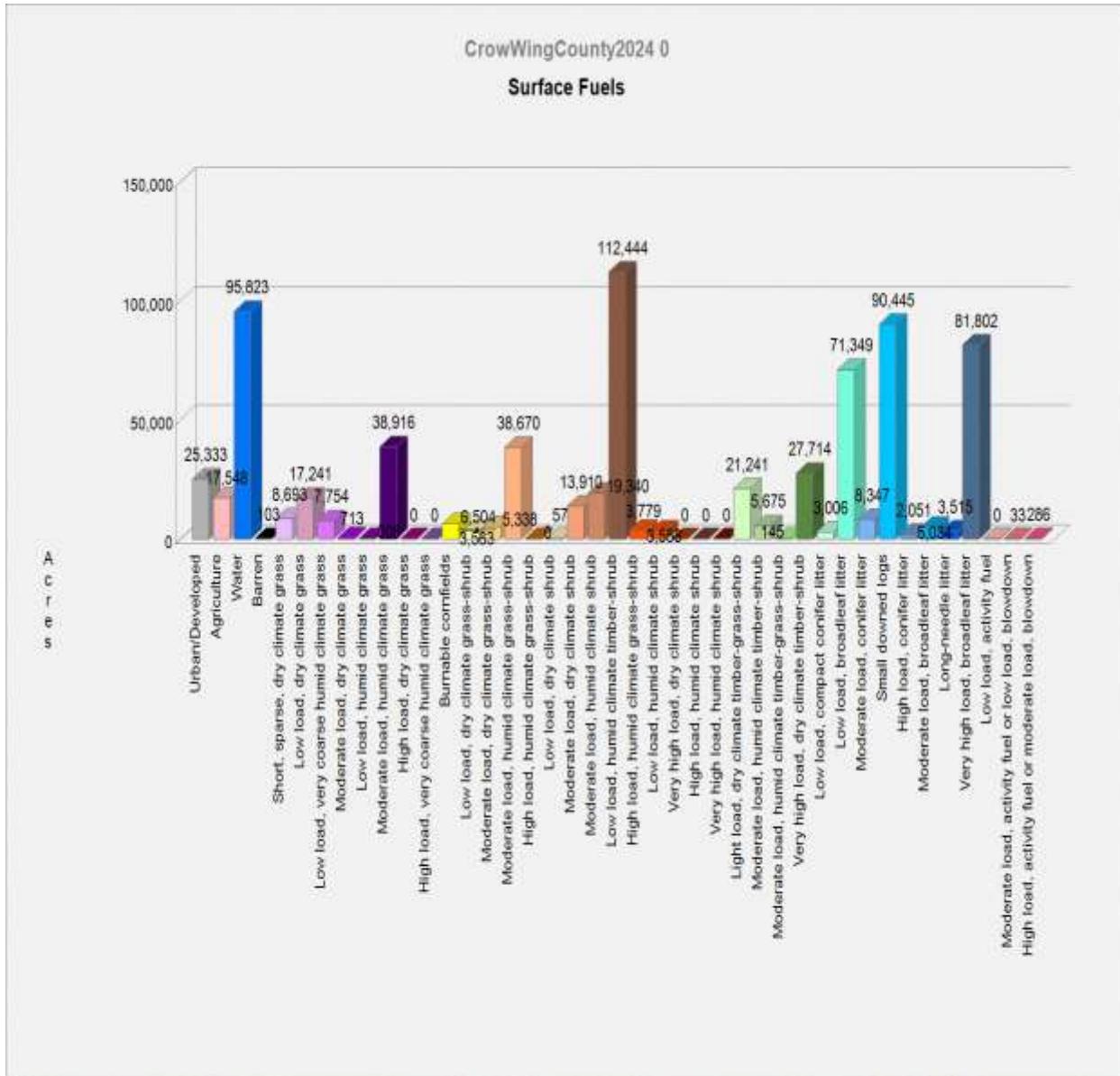
The expected risk to potential structures (RPS) dataset represents a measure that integrates wildfire likelihood and intensity with generalized consequences to a home on every pixel. For every place on the landscape, it poses the hypothetical question, "What would be the relative risk to a house if one existed here?" This allows comparison of wildfire risk in places where homes already exist to places where new construction may be proposed.

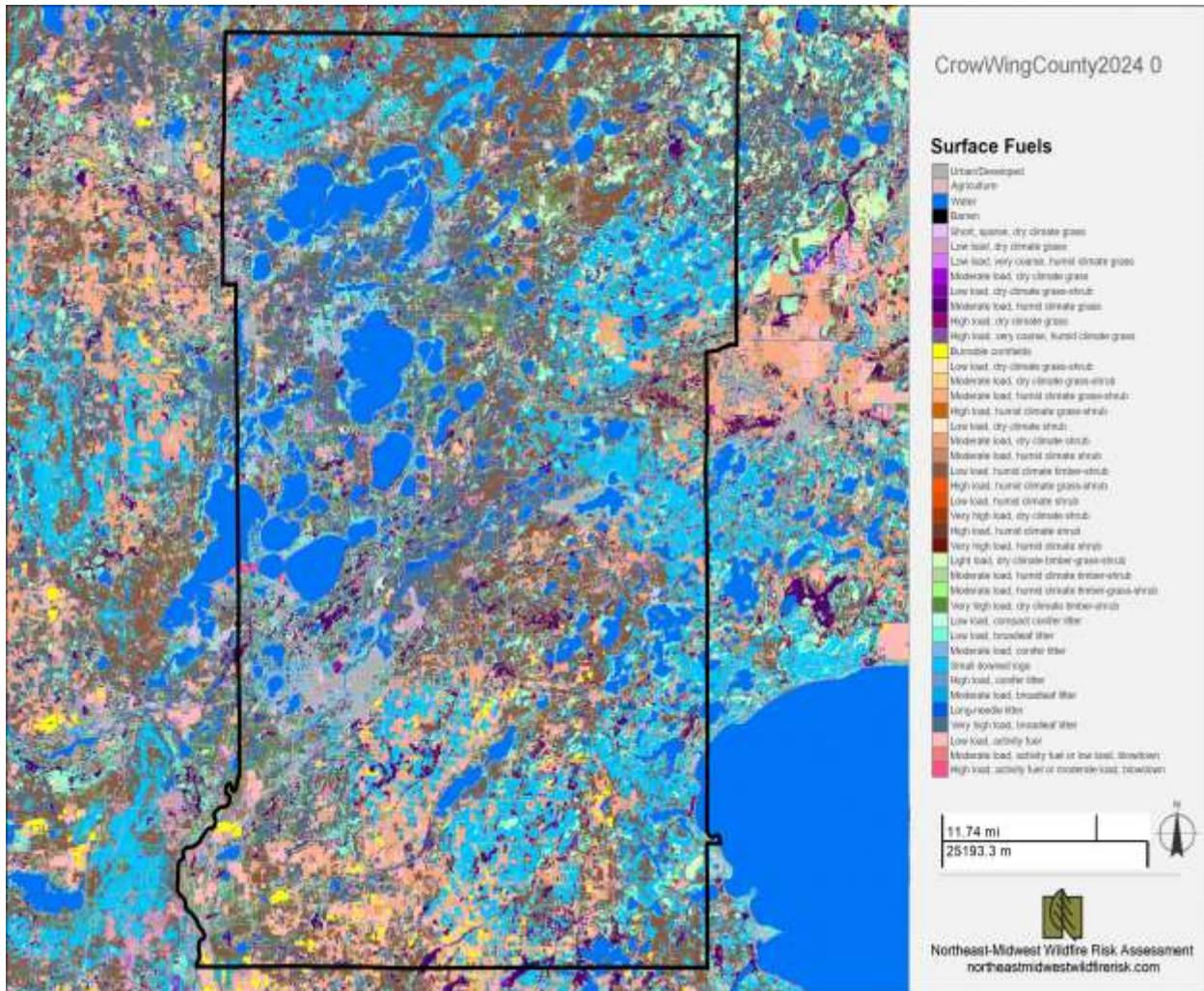


Surface fuels are defined by fire behavior fuel models (Scott & Burgan 2005). A fuel model contains the parameters required by the surface fire spread model to compute surface fire behavior characteristics, including rate of spread, flame length, Fireline intensity, and other fire behavior metrics. As the name might suggest, surface fuels account only for surface fire potential and surface fuels are generally defined to be less than six feet in height off the ground. Surface fuels typically are categorized into one of

six primary fuel types based on the primary carrier of the surface fire: 1) Grass, 2) Grass/Shrub, 3) Shrub, 4) Timber/Understory, 5) Timber Litter, and 6) Slash. These surface fuel models provide the input parameters needed to compute surface fire behavior.

LANDFIRE 2016 Remap 2.0.0 (LF Remap) data was leveraged to generate a calibrated fuelscape for this regionwide assessment. The fuelscape consists of geospatial datasets representing surface fuel model (FM40), canopy cover (CC), canopy height (CH), canopy bulk density (CBD), canopy base height (CBH), and topography characteristics (slope, aspect, elevation). The FM40 dataset can be seen below in groups of similar fuel types.





## 2.b Fire History



The Paul M. Thiede Fire Tower Park is located in Pequot lakes which is the home of the 100-foot Pequot Fire Lookout Tower. The Fire Tower is listed on the National Register of Historic Places by the United States Department of the Interior and was originally built in 1935 by the Civilian Conservation Corps.

The Fire Tower protected resources critical to one of the state's most important recreation areas, and played an instrumental role in protecting timber resources critical to the area's commercial forestry.

Crow Wing County purchased the 40 acres of land thanks to Paul M Theide's vision and constructed many trails within the acreage providing the diverse history of wildfires and forest management in Minnesota.



## Close To Home... Area Historic Wildfires

Although the fires noted on this panel are not considered among the most significant in the state's history, this area has experienced some harrowing and memorable wildfires. Over the years, the specialists we count on to deal with wildfires draw on more than a century of experience, scientific advance, and also on the growing knowledge and preparedness of the general public in our collective effort to prevent wildfire from its destructive course.



Nels Norquist, Brainerd Daily Dispatch

### BADOURA FIRE

In 1976, triggered by the worst drought in 40 years, wildfires began occurring early in the spring. By October, over 3,400 wildfires had been recorded in the state. On September 7, a column of smoke was spotted from the Nisswa Fire Tower. The fire grew quickly. As fire crews on the ground and in the air battled the blaze, it spread to five miles in four hours. MNDNR Forester Alan Wickman, who was helping fight the fire, wrote that it grew so quickly, it raced the next four miles in one hour, reaching over 8 miles in length by 4:30 pm. The wind kept shifting, causing the fire to move and grow. The fire slowed during the evening, but pest in the bugs continued to smolder. Fire crews brought the fire under control after it had burned 23,000 acres. Special thanks goes to over 550 firefighters, foresters, National Guard troops and volunteers who battled the fire and helped bring it under control.

### BARROWS FIRE

A fast-moving fire occurred south of Brainerd on May 31, 2002. The fire burned 720 acres as it raced eastward from the Mississippi River and across Minnesota Highway 371 near the town of Barrows. Area residents remember not only the fearful power of the wildfire, with flames shooting over 100 feet high, but also the quick and efficient action taken by firefighters to bring it under control. More than 200 firefighters included those from area Fire Departments, the Minnesota Department of Natural Resources, National Guard, private contractors and law enforcement officers. The fire threatened 60 homes and over 100 buildings. No one was injured in the fire. DNR officials note that this fire occurred in what is known as the "urban-forest interface" where residential area meets into natural forest land. This type of fire often requires evacuation of homes. Firefighters are training for fires in this interface, as more homes are built at the edge of the forest.

### GREEN VALLEY FIRE

A wildfire that started near Menahga on May 15, 2013 burned 7,100 acres at the intersection of Hubbard, Wadena, and Becker Counties. The fire destroyed 12 homes, 43 outbuildings, and 3 commercial structures. Three water-dropping aircraft, 15 fire engines, 7 dozers, 9 water-tender trucks, 2 tracked vehicles, and 6 helicopters, along with firefighters from the DNR, National Guard and 40 fire departments battled the blaze. Due to the success of the firefighters, many homes and structures were saved. The Minnesota Incident Command System noted that the fire threatened 158 structures, including 50 homes, 100 outbuildings and 8 commercial buildings.



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## Historic Minnesota Wildfires



Brainerd Daily Dispatch

Hinckley Fire: MHS



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# Minnesota's Most Devastating Wildfires

## BAUDETTE-SPOONER FIRE

Fire conditions in northern Minnesota were extreme in the autumn of 1918. Several small fires developed in the dry slash left in the wake of logging operations throughout Lake of the Woods County. The fires rapidly became a massive blaze. In less than two hours, the fire spread throughout the towns of Baudette and Spooner. By the day's end, over 300,000 acres had burned. Homes across the area were destroyed and 42 people lost their lives.

## RED LAKE FIRE

Often called the "Dust Bowl" era, climatologists list this hot, dry period as the single most significant weather-related event in Minnesota's history. Indeed, it is perhaps the most devastating weather event in our nation's history. Abnormally dry and hot weather lasting the better part of two decades turned Minnesota's farmland into fields of dust, and northern forests into a veritable tinderbox. On September 11, 1931, a wildfire started near Red Lake and blazed all the way to the Canadian border. Nearly one million acres burned in what has been called Minnesota's Dust Bowl Fire.

## HINCKLEY FIRE

The summer of 1894 was a dry one in the Hinckley area. Only 2 inches of rain had fallen between May and September, and small fires in the woods were common, often starting in the "slush piles" where branches had been cut off logged trees and left in place. On September 1, several small fires came together and formed two larger wildfires. The day was oppressively hot, and a rare temperature inversion created conditions that would develop into a single, massive "firestorm". The fire was so intense that survivors witnessed flames reaching heights of 200 feet. Temperatures reached over 1,600 degrees in the town of Hinckley, melting barrels of nails and fusing train car wheels to the tracks. In just four hours the Hinckley Fire had burned over 350,000 acres. The towns of Hinckley, Mission Creek, Brook Park, Sandstone, Miller, Partridge, and Pokegama were all destroyed, as were the homes of many living in the nearby forest. The official count of people who perished in the fire was over 400. Many historians believe the number to have been much higher. An unknown number of Native Americans and others living in the backcountry perished in the fire.

## PAGAMI CREEK FIRE

A lightning strike about 13 miles east of Ely started a small fire along Pagami Creek in the Boundary Waters Canoe Area Wilderness. The small fire was first noticed on August 18, 2011, as it smoldered in a bog for several days, giving off a little smoke. Weather conditions, including very low humidity and strong winds, caused the fire to quickly become of historic proportions. Before the fire was contained, it burned 93,000 acres. In the driest autumn in over a century, numerous fire crews worked continuously for a month to contain the fire. Earlier in September firefighters had preemptively burned areas at the interface of the BWCAW and populated areas.

## CLOQUET-MOOSE LAKE FIRE

What is often called the Cloquet Fire actually began as over 40 smaller fires that came together as a single event. Because the collective wildfire was so far-ranging, it is also called the Cloquet, Duluth and Moose Lake Fire. The summer of 1918 was exceptionally dry, and around noon on October 10, a fire began along the railroad northwest of Cloquet. The fire moved both eastward toward Duluth and southeastward toward Cloquet. By early evening the fire had reached the Fond du Lac community and 45 minutes later it came through Cloquet. Winds reached over 60 miles per hour. Survivors described flames reaching over 100 feet in the air, exploding houses, and a roar like continuous thunder. Just enough warning allowed thousands to escape on four evacuation trains. The Cloquet-Moose Lake Fire burned 960,00 acres, destroyed 36 towns, and over 4,000 homes. At least 450 people died.



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## Traditional Landscape



Centuries of fire helped shape the forest we enjoy today. Scientists examining sediment cores from lakes in the Boundary Waters Canoe Area Wilderness found pollen and charcoal dating all the way back to the retreat of the glaciers. They noted that fire occurred regularly, and that fire has been an important factor in determining the composition of the forest for at least the past 10,000 years.

Forests are important to the people of Minnesota, in ways that seem to transcend economics and aesthetics. There is a growing body of research showing the benefits of forests for the physical and emotional well-being of all people.

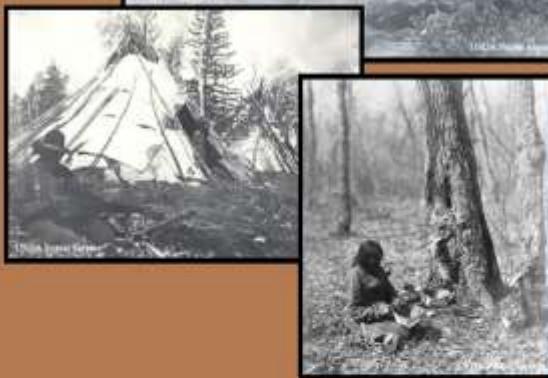
Traditionalists among Minnesota's Ojibwe people note a spiritual significance, a connection, with natural forest lands, fostering a sense of stewardship that is considered a personal commitment to conserve and protect forest resources for future generations.



Fire has been used as a land management tool by Native Americans for centuries. Over the years, anthropologists have documented over 70 different uses of controlled fire, including clearing travel routes, pest control, and enhancement of harvestable plants. Fire was used to both drive and attract game herds. Zebulon Pike wrote of witnessing this practice along the Mississippi River in 1805.



Back in the 1800s, Ojibwe harvesters were observed burning a rocky ridge on Basswood Lake, on the northern border of Minnesota, to improve blueberry production. Members of the Mille Lacs Band of Ojibwe inform us that this form of fire management has been practiced around here for generations as well.

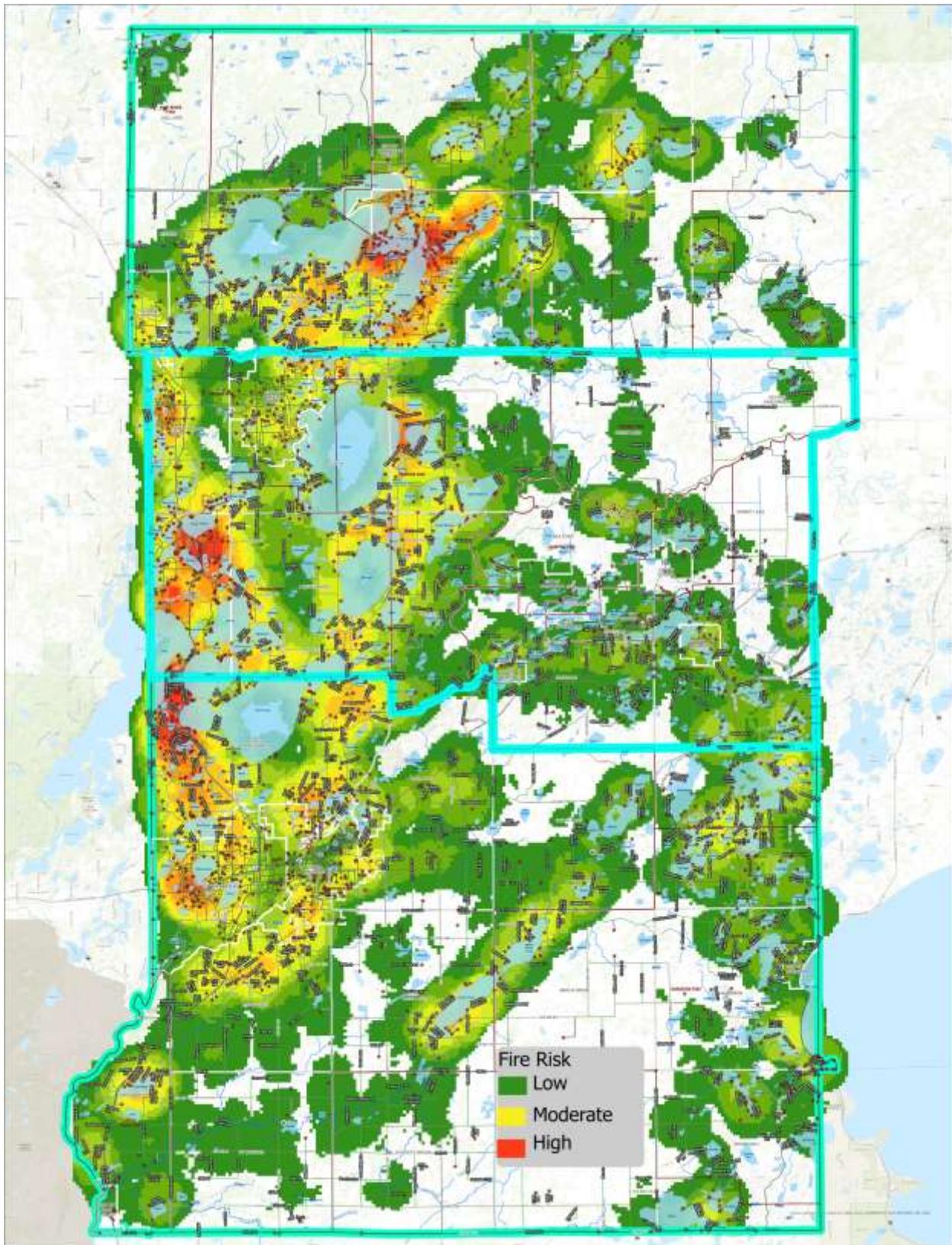


From the 1700s to the present, Ojibwe families have traveled the lakes and harvested a bounty of food, medicine and other resources from the forests and meadows of central Minnesota. Knowledge of harvest skills and locations, as well as fire management philosophy and practice has been handed down through generations.



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## 2.c Fire Risk in Crow Wing County



## **Homes and other buildings in Crow Wing County are predominantly in the Direct Exposure Zone**

Risk Reduction Zones are the areas where mitigation activities will be most effective at protecting homes and other buildings from wildfires.

Homes with minimal exposure are unlikely to be subjected to wildfire. Homes with indirect exposure may be ignited by embers or home-to-home ignition. Homes with direct exposure may be ignited by adjacent vegetation, flying embers, or nearby structures.

Effective wildfire risk-reduction activities will vary depending on the zone

According to the 2020 [Wildfire Risk to Communities](#) analysis by the U.S. Forest Service, homes in Crow Wing County and the surrounding areas have a 43 % higher risk than communities in the United States. Risk Reduction Zones are the areas where mitigation activities will be most effective at protecting homes and other buildings from wildfires. 79% of the buildings in Crow Wing County have direct exposure and are subjected to wildfire risk.

Crow Wing County Fire Risk link: [Crow Wing County Community Wildfire Protection Plan CWPP \(arcgis.com\)](#)

### **Take Away Message**

Crow Wing County is at risk for large, high-severity wildfires due to dense forest conditions, dry and hot weather, and strong, gusty winds. Increasing drought and warming temperatures exacerbate wildfire risk in the area. **Residents in Crow Wing County must prepare for large wildfire events. Proactive work is imperative to protect lives and property.**



*Fuel type and fuel loads greatly influence fire behavior, intensity, and rate of spread. Fuel loads are variable across central Minnesota*

*Photos credit: MNDNR.*

## 2.d. Fuel Treatment History in and Around Crow Wing County

Fuel treatments reduce the amount of fuel in strategic locations, reducing fire risk to nearby communities. This also decreased fire intensity, which can create tactical opportunities for wildland firefighters to engage and be successful in suppression.

Pile Burning in Winter after logging operations.



Rx burning in Pine Understory.



Rx Burning in areas throughout county



Rx burning as wildfire prevention tool in problematic Arson areas.



*Photos credit: MNDNR.*

An important component of this CWPP was identifying locations for fuel treatments to protect the community. **Section 4** outlines these priority locations and the land management agency or other party that will lead these efforts in the coming years.

### 3. Recommendation to Increase Community Fire Adaptation

#### 3.a. Defining Fire Adaptation

It is recommended that Crow Wing County communities, HOAs, and residents embrace the concept of [Fire Adapted Communities \(FAC\)](#), which is defined by the National Wildfire Coordinating Group as “a human community consisting of informed and prepared citizens collaboratively planning and taking action to safely coexist with wildland fire”. This concept can guide residents, fire practitioners, and communities through a holistic approach to become more resilient to fire (**Figure 3.1**).

Your community’s CWPP sets the stage for fire adaptation, and the next step is on-the-ground action and an ongoing commitment to risk mitigation at all levels of the community, from individual homeowners to neighborhoods and HOAs to Crow Wing County as a whole, to land managers and other partners.

This section of the CWPP includes recommendations and resources for mitigating wildfire risk and enhancing emergency preparedness.



**Figure 3.1.** The Fire Adapted Communities graphic provides specific programs and activities that communities can take to reduce their wildfire risk and increase their resilience. Source: [Fire Adapted Community Learning Network](#).

## 3.b. MN Firewise®

The following excerpts are from the Minnesota Firewise Handbook (2024). Content is printed with the permission of MNDNR. The entire guide is attached as Appendix B for reference, and the following is a link to the MN website: <https://www.dnr.state.mn.us/firewise/index.html>.

### Homeowner Options

Home protection begins with understanding the dynamics of fire, then using those principles to assess the home's surroundings and eliminate hazards that make a structure more susceptible to wildfire. The more hazards that can be eliminated, the better the chance a home will be able to survive a wildfire. All homes, regardless of age, benefit from being Firewise.



Photos: Minnesota Department of Natural Resources

Three steps homeowners can do:

1. Complete a hazard assessment.
2. Create a defensible space around their home by completing Firewise practices.
3. Organize a minimum of ten different homeowners, or your greater community, and apply for a grant to help cover the costs of completing a community wildfire protection plan or wildfire mitigation work.

#### Creating a Defensible Space

Homeowners can help protect their home and property by creating a "defensible space." This area has reduced fuels between your home and the untouched wildland and extends up to 100' in diameter around your home or cabin.



A homeowner hazard assessment guides homeowners through a series of questions designed to rate the ignition hazard and the defensible space around the home and outbuildings. This will help homeowners understand what improvements can be made. Once the assessment has been completed, homeowners may want to discuss options with a Regional Firewise Specialist.

Homeowners can also contact their local forestry office to request a Level 2 assessment where a professional does an on-site assessment to determine the home's wildfire risk.

Creating a defensible space around your home and community can also include:

- Organize or join a group focused on protecting homes from fire. Cooperatives have been formed to develop protection strategies to prevent future fires and the related losses.
- Review and choose mitigation projects to complete from *Will Your Home Survive? 50 Things You Can Do*.
- Contact the local fire department to ask about the wildfire risk on the landscape or an overview of areas of concern in your community.
- Contact the local DNR Regional Firewise Specialist for information on how to reduce the threat of wildfires

## Community Options

Firewise offers various home risk assessments that can be completed by community members, organizations, schools, or fire departments, and can be supported through grants to the community from the Firewise program.

## Level 1 Assessment

Level 1 assessments use map analysis and aerial photos to make a quick and coarse assessment of wildfire risk. If a school or community wants to pursue Level 1 assessments, they can contact the local DNR Regional Firewise Specialist for assistance. Level 1 assessments are scored from 1 to 5:

1. No risk - the structure has no or very few trees near the building.
2. Low risk - there are trees nearby but are at least 30 feet from the structure.
3. Moderate risk - structures have trees within the 30-foot defensible zone.
4. High risk - trees are not only within the 30-foot zone, but they obscure at least part of the building on at least one side.
5. Extreme risk - trees within the 30-foot zone obscure the view of the structure on multiple sides, but particularly the south and west sides.

Once completed, the assessment team can present the findings to the local community.



Photos: Minnesota Department of Natural Resources

## Level 2 Assessment

Level 2 assessments are completed onsite by your local Firewise representative, fire department, or local volunteer organization using an application called Survey123. Survey123 assesses an individual homeowner's wildfire hazard and associated risk. It creates and manages Firewise assessments, exports the collected data, then analyzes and sends the individual homeowner the assessment results. Homeowners can use these results to decide how to mitigate their risks. Grant funds may be available to cover the cost of assessments and possibly some of the mitigation projects for communities. For more details, see the Firewise Community Grant information below.

## Path to successful mitigation

Mitigation can take many forms. Unfortunately, fires do not have to be huge to destroy structures. All it takes is the right combination of temperature, wind, humidity, and fuels. Just as there are many ways a home can ignite from a wildfire, there isn't one correct way to reduce hazards, but mitigation can help prevent the unthinkable. Some of the most successful efforts have been chipper days and access improvements. Communities should consider taking advantage of group efforts when possible. Uncoordinated efforts have higher costs, as do contracted services completed individually rather than collectively.

**Chipper Days** A neighborhood can efficiently coordinate hazard fuel reduction efforts through "Chipper Day" events. When groups of at least 5-10 neighbors plan and hire a chipping contractor, either independently or through a Firewise coordinator, the effects are multiplied and the entire community benefits. A helpful tip for success is finding an individual to organize the day and provide information to others in the neighborhood, as well as working with a local organization or fire department to act as the financial officer.



Photo: Minnesota Department of Natural Resources

When using grant funds, the process to complete a chipper day may look like this:

1. Residents meet with a Firewise Specialist or Fire Department member for an on-site Home Risk Assessments, or Level 2 Home Assessment to identify priority fuel hazards within the 30-foot and 100-foot home ignition zone.
2. Neighbors coordinate plans to complete work and encourage other neighbors to participate.
3. Participants work to remove brush, dead trees, and other fuel hazards from their property, by a pre-set date. Work time can be tracked for the in-kind match.
4. Materials are stacked at a predetermined location- either central within the neighborhood, or along the roadway.
5. A community-hired chipping vendor collects and chips the debris, either leaving chips on site, or hauling away.
6. Project expenses are submitted to DNR for reimbursement, per the executed grant contract.

**Access improvements** Better access creates efficient evacuation of residents and effective deployment of firefighting resources. Replacement of substandard culverts to permit passage of fire engines and clear signage are important factors when a wildfire threatens. Mutual aid agreements require clear signage, both during the day and at night, which is critical if firefighters from other communities need to find homes. Completing an access project benefits many homeowners when it coincides with other road maintenance projects. All the planning and work is completed at the community level with little to no cost to homeowners.



Photos: Minnesota Department of Natural Resources

## Become a Firewise USA® Site

Firewise USA® provides communities with the knowledge to maintain fire readiness, while ensuring firefighters can use equipment more efficiently during a wildland fire. The program draws on a community's spirit, resolve, and willingness to take responsibility for ignition potential.



Activities under Firewise USA® involves assisting individuals, neighborhoods, and residential communities with actions to help prevent home ignitions from wildfire. These may include construction, landscaping, maintenance, and helping communities become recognized Firewise USA® sites. Communities can apply for grant funds to become a registered site and to create a CWPP.

To become recognized, communities complete five actions:

1. Form a Firewise board or committee and nominate a lead community contact.
2. Complete a community wildfire risk assessment.
3. Use the risk assessment plan, develop a multi-year action plan to prioritize actions that reduce wildfire risk in the community.
4. Hold a Firewise education event and risk reduction event in the community.
5. Work with your Regional Firewise Specialist or County Firewise Specialist to apply through Firewise USA®.
6. Once a community becomes a Firewise USA® site, it must renew its status annually.

While counties are not eligible for recognition, they can assist in all aspects of a community's recognition process, including assisting with community assessments, helping create an action plan, participating in an annual Firewise Day, and guiding local wildfire mitigation projects. Counties can also act as a liaison with the state and federal programs.

## Firewise Community Grants

The Minnesota Firewise Program works with communities by granting funds for CWPP development and wildfire risk reduction projects and activities.

Community groups such as fire departments, organized townships, cities, counties, and nonprofit groups with 501(3)(c) status can apply for project funding. A community qualifies for Firewise grants by having:

1. Be recognized or use part of the requested grant funds to become a Firewise USA® Community.
2. A Wildfire Action Plan such as a CWPP\*.
3. Advanced preparation in the event a wildfire threatens.
4. Community education programming on fire prevention.

\*At a minimum, a community should have a Wildfire Emergency Action Plan. In most cases, Emergency Operations Plans (EOP) prepared by emergency management agencies or fire departments/districts can be used if it contains specific information on wildfire emergencies, preparations, and education.

If no plan exists, the grant request should be for the development of a CWPP, or modifications and additions to an EOP to address wildfire concerns.

Grant requests can include activities in one or more of the following categories:

1. Planning and Assessment Activities
  - a. Planning Activities should also current, existing conditions and future concerns posed by continued development. Activities may include community staffing, printing, materials, distribution, etc.
  - b. Assessment activities include a detailed assessment of structures either independently or with direct support from the DNR. Communities can include Level 1 and 2 or only Level 2 assessments. Applications can also include the improvement of an existing assessment as part of their planning activities.
2. Mitigation Activities can include hazardous fuel reduction practices and risk mitigation activities.
  - a. Hazardous fuel reduction modifies the fuel complex near structures so a wildfire will not exhibit erratic, aggressive behavior. Practices including tree removal, stand reduction, reduce vertical fuels (i.e., pruning low conifer branches), fire behavior reduction treatment, fuel break construction and maintenance, piling and burning slash, and brush disposal.<sup>11</sup>
  - b. Risk mitigation activities focus on the reduction of damage to structures and other assets when a wildfire occurs. Activities center on making the suppression response more effective or to making the structure self-defensible by mitigating specific risks. Activities include the creation of defensible space, relocation of permanent flammable assets, access improvement, and signage.
3. Information and Education Activities are a large component of creating a self-sustaining program. These types of activities may include:
  - a. Materials preparation, procurement, and distribution
  - b. Public meetings and special events (e.g., fairs, shows, school visits)
  - c. Improved wildland fire training for firefighters

**Grant Details** The Firewise Community Grant webpage has eligibility requirements, project examples, application, and timeline. In addition to Firewise grants, fire departments can also apply for Volunteer Fire Assistance grants or other assistance such as low-cost equipment, technical assistance, and wildland fire training.

### 3.c. Ready, Set, Go!

The Ready, Set, Go! (RSG) Program is one of the International Association of Fire Chiefs (IAFC) fire-adapted resources that supports developing and improving dialogue between the fire service and the residents they serve. The program helps departments teach individuals who live in high-risk wildland fire areas and the WUI how to best prepare themselves, their families and their properties against outdoor fire threats.

Through the trusted voice of the fire service, the program and associated resources encourage residents/property owners to be **Ready** by taking personal responsibility and action—preparing long before the threat of a wildland fire. RSG provides tips on creating defensible space, assembling emergency supplies, planning escape routes and identifying safety zones. RSG educates audiences how to be **Set** with situational awareness by staying up to date on the latest news and information about the fire and the ability to receive local emergency notifications. The program also encourages those in threatened areas to **Go** and act early following their Personal Wildland Fire Action Plan. Promoting cooperation and early action not only supports the safety of community members, but allows fire and emergency response agencies to utilize their resources where they are most needed.

The following excerpts are from the Ready, Set, Go! Action guide. Content is printed with the permission of IAFC. The entire guide is attached as Appendix C for reference, and the following is a link to the RSG website: <https://www.iafc.org/topics-and-tools/resources/resource/ready-set-go-program>

Ready,

*Ready* begins with property owners taking action.



**Consider This** Unmanaged and overgrown vegetation between and around homes increases the risk of wildland fire spreading throughout the community and endangering lives and property. Pre-fire planning through mitigation and vegetation management allows firefighters the ability to fight wildland fires more safely. The work you complete today may save your home and protect a firefighter tomorrow.

**Homes on the Wildland Boundary are at Risk** If your home is within one mile of a natural area, it may be considered part of an ember zone. Keep in mind, embers can destroy homes or neighborhoods far from the actual front of the fire. Use the information in this Guide to help you prepare your property.

**Red Flag Warning** A Red Flag Warning is issued by the National Weather Service when low humidity, warm temperatures, dry fuels, and strong winds could combine to produce extreme fire behavior. Fires occurring during a Red Flag Day can be very dangerous and spread rapidly. You should always follow the instructions provided by your local emergency response organizations and be prepared to take immediate action.

**Defensible Space and Fire-Resistant Landscaping Can Protect Your Home** If you live next to a dense vegetation area, the WUI, you should provide defensible space to better protect your home. This will create a safer area for firefighters to operate if they have the capacity to defend your home. Creating a buffer zone by removing weeds, dried grass, brush, and other vegetation helps keep the fire away from your home and reduces the risk of ignition from flying embers.



## Defensible Space

Defensible space is the area around your home in which vegetation, debris, and other combustible fuels have been removed to slow the spread of fire to and from the home. It can better protect the home from igniting due to direct flame contact and radiant heat. Defensible space is essential to help protect a structure and create a safer area for firefighters during a wildland fire. You should create defensible space by removing weeds, brush, and firewood, and by spacing out vegetation around your property. Although this might seem like a daunting task, we recommend starting in Zone 1 and working your way out. Follow the considerations below for each zone and your property can become safer with each step.

ZONE 1	ZONE 2	ZONE 3
<p>0-5 feet around your home or to property line</p> <ul style="list-style-type: none"> <li>■ Use hard scape such as concrete or noncombustible rock mulch around your home.</li> <li>■ Clean roofs and gutters of dead leaves, debris, and pine needles.</li> <li>■ Store firewood and other combustible materials away from your home, garage, or attached deck.</li> <li>■ Prune away touching or over-hanging branches from the roof to a distance of at least 10 feet.</li> <li>■ Replace or repair any loose or missing shingles or roof tiles to prevent ember penetration.</li> <li>■ Rake and remove flammable vegetation, such as leaves and needles or wood mulch, from underneath your deck and away from your home.</li> <li>■ Use non-wood, low-growing herbaceous vegetation. Succulents, or other fire-resistant plants, are recommended choices.</li> </ul>	<p>5-30 feet around your home or to property line</p> <ul style="list-style-type: none"> <li>■ Create vegetation groups or islands to break up continuous fuels around your home.</li> <li>■ Remove ladder fuels to create a separation between low-level vegetation and tree canopies to keep fire from climbing into trees.</li> <li>■ Remove leaf and needle debris from the yard.</li> <li>■ Keep lawns, native grasses, and wildflowers less than four inches in height.</li> <li>■ Store firewood and other combustible materials away from outbuildings such as a shed or barn.</li> <li>■ Move trailers, recreational vehicles, storage sheds, and other combustible structures out of this zone and into Zone 3. If unable to move, create defensible space around them as if they were a part of your home.</li> </ul>	<p>30-200 feet around your home or to property line</p> <ul style="list-style-type: none"> <li>■ Create and maintain a minimum of 10 feet between the tops of trees.</li> <li>■ Safely remove ladder fuels up to a height of 10 feet, while retaining at least 75 percent of the foliage, to create separation between the ground and tree branches. This keeps fire from climbing into the tree canopies.</li> <li>■ Store firewood in this area, keeping it a safe distance from your structure.</li> <li>■ Create space between shrubs and trees to eliminate a continuous fuel bed at the ground level.</li> <li>■ Remove dead trees, shrubs, and all other dead or dry vegetation.</li> <li>■ Create separation between your property and your neighbors. Consider that your trees may pose a greater risk to your neighbor's home than to your own.</li> </ul>

**Ember Zone** An ember is a small, glowing fragment from a wildland fire that is carried by the wind. Embers are light enough to travel long distances and are the primary reason homes ignite, often at significant distances from the actual flame front of a wildland fire. Embers travel inside your home through vents, windows, and other openings.

### Remember the Ember Zone

Embers are burning pieces of airborne material that can be carried more than a mile by the wind. Research points to embers and small flames as the main ways homes ignite in wildland fires.



## Make Your Home Fire Resistant - Harden Your Home

Construction materials and the quality of the defensible space surrounding the structure are what increases the chance of survival in a wildland fire. Embers from a wildland fire will find the weak spot in your home's fire protection scheme and can easily lodge in small, overlooked, or seemingly inconsequential areas. Look at where snow drifts form on your roof and deck and around your home - these are the areas where embers will collect.

Below are some home hardening measures you can take to safeguard your home.

**Balconies and Decks** Construct your balconies or decks with noncombustible materials, and do not store combustible items underneath them. If there is a fire threat, bring any furniture into your home. Embers can collect in or on combustible surfaces, or beneath decks and balconies, igniting the material and giving a path for the fire to enter your home. Remove pine needles, leaves, grass, or any other flammable materials from underneath your deck.

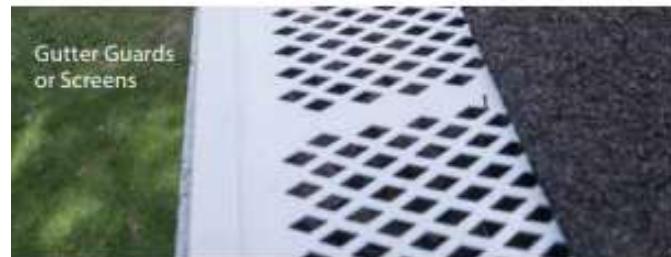
**Roofs** Roofs are vulnerable to embers that become lodged and can start a fire, especially anywhere on the roof with litter buildup. Roof valleys, open ends of barrel tiles, and rain gutters are all points of entry. Block off all open spaces, and regularly inspect these areas. Remove any combustible material.

**Eaves** Embers can gather under open eaves and ignite combustible material. Enclose your eaves with noncombustible or ignition-resistant materials to prevent ember intrusion, and regularly clear away debris that collects here.

**Vents** Embers can enter the attic or other concealed spaces and ignite combustible materials through open and unscreened vents. Vents in eaves, gables and cornices are particularly vulnerable if not properly screened with wire mesh. Use corrosion resistant metal mesh to screen all vents, and check them regularly to remove any debris that collects in front of the screen.

**Walls and Fencing** Combustible siding or fencing provides surfaces and crevices for embers to nestle and ignite. Ensure wooden fences do not connect directly to the house. Create a break in the fence by using a gate or noncombustible substitute to connect to the house. Build or remodel with noncombustible or ignition-resistant materials wherever possible, regularly clear away debris from any crevices, and perform annual upkeep.

**Windows and Doors** Embers can enter gaps in doors, including garage doors. Install weather proofing around your garage door; and if your garage is attached to your home, make sure the interior door is solid and on self-closing hinges. Plants or combustible storage near windows can be ignited from embers and generate heat that can break windows and/or melt combustible frames. Wherever possible, use dual-paned windows with tempered glass, as they are less likely to shatter from radiant heat.



## Create Your Own Action Plan

Your Wildland Fire Action Plan must be prepared with all members of your household well in advance of a wildland fire. Use these checklists to help you get Ready and Set with situational awareness in the threat of wildland fire.

Ready Get Ready	EMERGENCY SUPPLIES LIST FOR GO KIT
<ul style="list-style-type: none"><li><input type="checkbox"/> Create an Action Plan that includes evacuation meeting locations and communication plans - rehearse it regularly. Include the evacuation of all pets and large animals, which may include horses and livestock, in your plan.</li><li><input type="checkbox"/> Sign up for your local emergency notification system. Check your local fire department or emergency management agency websites for information on the system used in your area.</li><li><input type="checkbox"/> Designate an emergency meeting location outside the wildland fire hazard area.</li><li><input type="checkbox"/> Plan and practice several different evacuation routes.</li><li><input type="checkbox"/> Have fire extinguishers on hand and teach your household how to use them.</li><li><input type="checkbox"/> Ensure that everyone in your household knows where your gas, electric, and water main shut-off controls are located and how to use them.</li><li><input type="checkbox"/> Assemble a Go Kit as recommended by the American Red Cross. Keep an extra kit in your vehicle. Check this page for a list of recommended emergency supplies.</li><li><input type="checkbox"/> Check this page for a list of recommended emergency supplies.</li><li><input type="checkbox"/> Have a portable radio or scanner so you can stay updated on the fire and weather emergency announcements.</li></ul>	<p>The American Red Cross recommends every household have an emergency supply kit assembled long before a wildland fire or other emergency occurs. Use the checklist below to help assemble yours. For more information on emergency supplies visit <a href="http://redcross.org/get-help">redcross.org/get-help</a>.</p> <ul style="list-style-type: none"><li><input type="checkbox"/> Three-day supply of water (one gallon per person, per day) and non-perishable food for household members (3 day supply).</li><li><input type="checkbox"/> First aid kit and sanitation supplies, including toilet paper and baby wipes.</li><li><input type="checkbox"/> Flashlight, battery-powered radio, and extra batteries.</li><li><input type="checkbox"/> An extra set of car keys, credit cards, cash, or traveler's checks.</li><li><input type="checkbox"/> Extra eyeglasses, contact lenses, prescriptions, and medications.</li><li><input type="checkbox"/> Important household member documents and contact numbers, including insurance documents.</li><li><input type="checkbox"/> Map marked with evacuation routes. It is important to have a printed map in case your phone dies. It may also be easier to see the printed map than a phone screen under smokey conditions.</li><li><input type="checkbox"/> Easily carried valuables and irreplaceable items.</li><li><input type="checkbox"/> Personal electronic devices and chargers.</li><li><input type="checkbox"/> Keep a pair of old shoes and a flashlight handy in case of a sudden evacuation at night.</li></ul>

# Set

## Prepare and Be Aware

- ❑ Monitor fire weather conditions and fire status. Check your local fire department or emergency management websites and social media accounts for wildland fire information. Stay tuned to your TV or local radio stations for updates, including Red Flag Warnings in your area.
- ❑ Alert household and neighbors.
- ❑ Dress in appropriate clothing (i.e., clothing made from natural fibers, such as cotton, and work boots). Have goggles and a dry bandana or particle mask handy.
- ❑ Ensure your Go Kit includes all necessary items, such as a battery powered radio, spare batteries, emergency contact numbers, and drinking water.
- ❑ Remain close to your house, drink plenty of water, and ensure your household members and pets are accounted for and ready to leave.

### INSIDE CHECKLIST, IF TIME ALLOWS

- ❑ Close all windows and doors.
- ❑ Remove all shades and curtains from windows and ensure all blinds remain open, unless you have metal blinds. Close all metal blinds.
- ❑ Move furniture to the center of the room, away from windows and doors.
- ❑ Turn off pilot lights and air conditioning units.
- ❑ Leave your lights on so firefighters can see your house in smoky conditions

### OUTSIDE CHECKLIST, IF TIME ALLOWS

- ❑ Make sure combustible items are a safe distance away from the exterior of the house (e.g., patio furniture, children's toys, door mats, etc.) If you have time, place these items inside your garage or home where they will not become a hazard.

- ❑ Turn off propane tanks and other gas at the meter.
- ❑ Don't leave sprinklers on or water running. They can affect critical water pressure.
- ❑ Leave exterior lights on.
- ❑ Back your car into the driveway to facilitate a quick departure. Shut doors and roll up windows.
- ❑ Have a ladder ready to use to cover attic vents. Use pre-cut plywood or commercial seals. Use the same for ground vents. Do so in a safe manner, and only if time permits.
- ❑ Patrol your property and extinguish small fires, if you can do so safely, until you leave.

### IF YOU ARE TRAPPED: SURVIVAL TIPS

- ❑ If you have become trapped and cannot evacuate, call 9-1-1 immediately.
- ❑ Stay in your home, sheltering away from walls, until the fire passes or emergency personnel tell you differently. Follow their instructions and commands.
- ❑ Look for spot fires and extinguish if found inside house.
- ❑ Wear long sleeves, long pants, and a bandana made of natural fibers, such as cotton.
- ❑ Stay hydrated.
- ❑ Ensure you can exit the home if it catches fire. Remember, if it's hot inside the house, it is four to five times hotter outside. Be prepared.
- ❑ Fill sinks and tubs for an emergency water supply.
- ❑ Place wet towels under doors to keep smoke and embers out.
- ❑ After the fire has passed, check your roof and extinguish any fires, sparks, or embers if you are able to safely do so. Check the attic as well.

## Go! Act Early

Leaving early gives you and your household members the best chance of surviving a wildland fire. You also help firefighters by keeping roads clear of congestion, enabling them to move more freely and do their job in a safer environment. Be sure to follow the direction of your local authorities.

### WHEN TO LEAVE

Do not wait to be advised to leave if there is a possible threat to your home or evacuation route. Leave early enough to avoid being caught in fire, smoke, or road congestion. If you are advised to leave by local authorities, do not hesitate!

### WHERE TO GO

Go to a predetermined, low-risk area such as a relative's house, a Red Cross shelter or evacuation center, motel, etc.

### HOW TO GET THERE

Have several travel routes in case one route is blocked by the fire or by emergency vehicles. Choose the safest route away from the fire.

### WHAT TO TAKE

Take your Go Kit containing your household members' and pet's necessary items.

### REMEMBER THE 8 P'S!

- People & Pets
- Pictures & Photo Albums
- PC's
- Papers (important)
- Prescriptions & Medications (for your pets too)
- Plastics (credit cards)
- Personal Devices (phones and chargers)
- Passports & IDs



### 3.d. Evacuation Preparedness

#### Crow Wing County ALERT



The best way to get out quickly and safely during an evacuation is to be prepared by registering your mobile devices to receive emergency notifications, having a go-bag ready, and making a family emergency plan **before** the threat of wildfire is in your area. Visit the Crow Wing County Website for information on emergency notifications and evacuation planning.

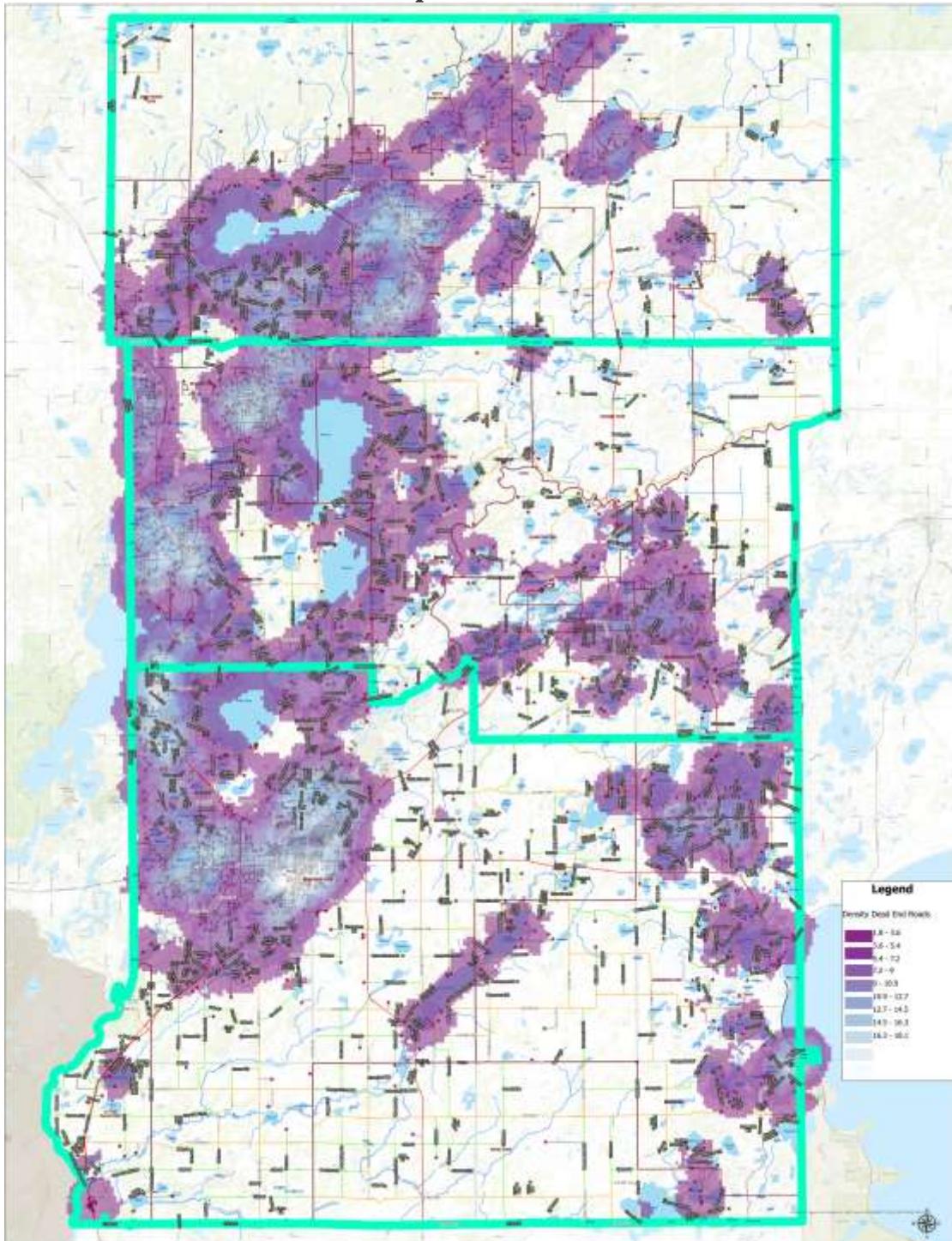


Get emergency alerts and optional community alerts by ***signing up*** for the Crow Wing County Emergency and Community Alerts program. This provides a means for County and City officials to notify you by phone, email, SMS TXT, and/or TTY/TDD, as elected by you. You create and control your profile. You have the ability to make changes or delete your profile at any time. Your information is protected by a username and a password that you also create.

Crow Wing County Sheriff's Office will be able to notify you directly of emergencies including requirements or recommendations for residents and property owners. This program is used for County-wide, Cities, Townships or other localized emergencies. If you so select, this program will also provide a way for the County and Cities to notify you of important information such as snow plowing or snow emergencies, road projects and other community events and information.

Powered by Everbridge, this system broadcasts messages at exceptionally high speed (thousands of calls per minute), going through your contact paths until it gets feedback that someone on your end has acknowledged receipt of the message. Crow Wing County relies on individuals to enroll themselves. If you don't enroll, you will not receive the alerts. Click ***here*** for additional information or to sign up.

Crow Wing County has many dead-end roadways. This is illustrated on the map below.



Crow Wing County Link: [Dead End Roads- Crow Wing County Community Wildfire Protection Plan CWPP \(arcgis.com\)](http://Dead End Roads- Crow Wing County Community Wildfire Protection Plan CWPP (arcgis.com))

**Special or vulnerable populations** Some residents have family members or neighbors with physical limitations who might struggle to evacuate in a timely manner. Family members or individuals living alone also need to address the unique needs and vulnerabilities that arise from mobility or hearing impairments during an evacuation. Other residents are concerned about school-aged children who might be home alone during an evacuation. Parents should work with their neighbors to develop a plan for how their children would evacuate if they were to be home alone. Families with these concerns should put extra time into having go bags ready and using the earliest evacuation warnings to leave in the event of a wildfire, rather than waiting for mandatory evacuation orders. Having a plan in place ahead of time can ensure prompt evacuations and save lives during wildfires.

**Large animal evacuation** Residents with livestock trailers or large camper vehicles should plan to leave during voluntary evacuation notices to allow time for their preparations and create more space on the roads for other residents during a mandatory evacuation. It is important to have a plan for where to take livestock to reduce some of the chaos and uncertainty created by wildfire evacuations.

### 3.e. Accessibility and Navigability for Emergency Personnel

Some actions to increase access to your home include installing reflective address numbers, widening driveways to accommodate fire engines and other equipment.

**Address signs** Installing reflective address numbers can save lives by making it easier for emergency personnel to navigate to your home at night and under smoky conditions. Reflective signs are available from many stores, making it an easy and inexpensive action you can accomplish to protect emergency personnel and your family. Mount reflective address signs on noncombustible posts, not on stumps, trees, wooden posts, or chains across driveways. Make sure the numbers are clearly visible from both directions on the roadway. Reflective numbers should be at least 4 inches tall.

**Driveways** It is important to ensure emergency responders can locate and access your home. Emergency personnel often have to make rapid decisions during a wildfire and unsafe driveway conditions could turn firefighters and law enforcement personnel away from attempting to defend homes or assist with evacuation. Examples include: narrow driveways without turnarounds, overhanging tree limbs, and lots of dead and down trees next to the driveway. Chains across driveways might be removed during wildfire suppression to facilitate access to your property. According to the National Fire Protection Association, driveways should have a minimum of 20 feet of horizontal clearance and 13.5 feet of vertical clearance to allow engines to safely access the roads (O'Connor, 2021).

**Shared Driveways and Community Roads** Residents, HOAs, and Crow Wing County can work together to ensure emergency responders are able to locate and access everyone's home. Narrow roads without turnarounds, tree limbs hanging over the road, and lots of dead and down trees by the road may make firefighters choose to not defend your home during a wildfire event and prevent law enforcement personnel from assisting with evacuation. (Brown, 1994). Where feasible, partners should improve roadway access by widening road networks in filings with narrow roads and creating turnarounds and pullovers to accommodate fire engines and two-way traffic during evacuation. Residents can remove trees along driveways and prune low-hanging branches to increase horizontal and vertical clearance. According to the National Fire Protection Association, driveways and roads should have a minimum of 20 feet of horizontal clearance and 13.5 feet of vertical clearance to allow engines to safely access the roads (O'Connor, 2021).

## 3.f. Neighborhood Recommendations

The CWPP is a useful planning document, but it will only affect real change if residents, neighbors, other community groups, and agency partners come together to address shared risk and implement strategic projects. This section of the CWPP discusses the concept of linked defensible space and mosaic landscapes. CWPP plan units are groups of neighborhoods with shared fire risk. We encourage residents within CWPP plan units to organize and support each other to effectively reduce wildfire risk and enhance emergency preparedness.

### Linked Defensible Space

The home ignition zone of individual residents can overlap that of their neighbors, so wildfire hazards on one property can threaten adjacent properties. Structures that are on fire can emit significant radiant heat and embers and endanger homes and structures near them.

Neighbors can increase their homes' chances of survival during a wildfire if they work together to create linked defensible space. Defensible space projects that span ownership boundaries are better candidates for grant funding due to their greater strategic value.

How can you help inspire action by your neighbors?

- Start by creating defensible space and hardening your own home.
- Invite your neighbors over for a friendly conversation about the risk assessment in this CWPP. Review resources about defensible space together, discuss each other's concerns and values, and develop joint solutions to address shared risk.
- Invite wildfire professionals to come educate your community about the benefits of defensible space and home hardening.
- Schedule home assessments for multiple adjacent homes in your neighborhood.
- Participate in neighborhood ambassador programs or encourage them to start one.
- Help organize walking tours in your neighborhood to visit the property of residents with exemplary defensible space.

## Roadway Survivability

Mitigation actions along sections of road with high risk for non-survivable conditions during a wildfire can increase the chances of survival for residents stranded in their vehicles and decrease the chance that the roadways become impassable due to flames.

Open and Mitigated Roadways	Potentially Hazardous Roadways
	
	

*Some roads in Crow Wing County have been well mitigated by removing tall trees and saplings, removing limbs on the remaining trees, and keeping grass mowed (example - left images). Other roads could experience potentially non-survivable conditions because they are lined by thick forests that have an abundance of ladder fuels (example - right images).*

## Evacuation Notification, Planning, and Capacity

This CWPP recommends the following steps for residents, HOAs, community groups, and the Crow Wing County Sheriff's Office to address evacuation concerns.

- Coordinate with Crow Wing County Everbridge to increase participation in the local emergency alert system, Everbridge across Crow Wing County.

<https://member.everbridge.net/892807736729514/login>



- Prioritize the roads with the most traffic and congestion and work out to the less congested roads. Conduct tree removal, cut low limbs, and mow grass along roadways to increase the likelihood of survivable conditions during a wildfire.
- Coordinate with the Crow Wing County Sheriff's Office to conduct evacuation drills to practice safe and effective evacuation.
- Regularly test the local alert system to ensure timely and accurate communication could occur during an evacuation.
- Educate residents about warning systems, protocols for evacuation orders, and evacuation etiquette prior to the need to evacuate the community. Communicate the importance of following evacuation orders; failing to leave the community in a timely manner during a wildfire emergency can put residents and first responders at risk.
- Encourage residents to leave with one vehicle per household to reduce congestion for everyone.
- Encourage all households to develop family evacuation plans and to pack go-bags that are ready.
- Encourage residents to work with their neighbors to develop a plan for helping each other with evacuation if a resident is not at home, school-aged children or pets might be home alone, or residents have mobility impairments and need special assistance.
- Encourage residents to evacuate whenever they feel unsafe, even before receiving mandatory evacuation orders. All residents should leave promptly when they receive a mandatory evacuation order. This means having a family emergency plan already in place and having go-bags pre packed.
- Evaluate the efficacy of alternate methods of warnings and alerts, such as warning sirens and speakers. Research suggests that individuals trust and are more likely to respond to sirens than other warning systems like social media (National Academies of Sciences, Engineering, and Medicine, 2018).
- Make sure warnings and alerts can be understood by all residents, including those with English as a second language and with hearing impairments.

### 3.g. Outreach and Education

Engaging community members in wildfire preparedness and risk reduction activities, especially those living in the WUI, is essential. In addition to property owners having the authority to make changes on their lands, efforts that are coordinated and clustered in wildfire-hazard areas are more effective.

#### Firewise USA®

The National Fire Protection Association offers the Firewise USA® program and resources to guide residents in leading neighborhood-scale wildfire preparedness efforts. This is a great foundation to build off for planning community outreach and education events.

#### Neighborhood Ambassador Program

In order to support neighborhood volunteers and expand Firewise USA® recognition and the associated risk reduction benefits, communities can employ a system of volunteer support, referred to as the Neighborhood Ambassador approach. Expanding and providing resources through ambassadors could help residents better understand wildfire risks and spark coordinated action that affects positive change. The neighborhood ambassador approach requires engaged volunteer ambassadors and a dedicated lead coordinator. See the below table from the guide [\*Fire adapted communities neighborhood ambassador approach: Increasing preparedness through volunteers\*](#) for effective activities that neighborhood ambassadors can undertake (Wildfire Adapted Partnership, 2018).

Example activity	Ambassador responsibility	Coordinator responsibility
<b>Educational programs about Home Ignition Zone</b>	<p>Gauge interest of neighbors and select topics.</p> <p>Find a meeting location.</p> <p>Encourage neighbors to attend.</p>	<p>Arrange for specialists to make presentations.</p> <p>Advertise program through HOA newsletters, social media, etc.</p>
<b>Emergency planning</b>	<p>Organize an event for people to ask firefighters and law enforcement personnel about emergency planning and evacuation.</p> <p>Encourage residents to work with their neighbors to develop a plan for evacuation if a resident is not at home, school-aged children or pets might be home alone, or residents have mobility impairments and need special assistance.</p>	<p>Provide information to residents about emergency planning and go-bags.</p> <p>Arrange for specialists to make presentations.</p> <p>Advertise program through HOA newsletters, social media, etc.</p>
<b>Community chipping day</b>	<p>Secure HOA buy-in and request financial support.</p> <p>Select a date and organize event logistics.</p> <p>Encourage neighbors to attend.</p>	<p>Secure fuels module availability and grants or other financial support.</p> <p>Address liability and safety concerns.</p> <p>Advertise program through HOA newsletters, social media, etc.</p>
<b>Defensible space projects</b>	<p>Work with neighbors to identify high-priority project locations using insights from this CWPP.</p> <p>Secure HOA buy-in and request financial support.</p> <p>Select contractors and solicit bids.</p> <p>Oversee project completion.</p>	<p>Work with a certified forester for insights about effective treatment location and prescriptions, following guidelines in this CWPP.</p> <p>Identify potential contractors.</p> <p>Write scope of work for contract.</p> <p>Inspect project upon completion.</p> <p>Celebrate success through social media posts and newspaper articles.</p>

## 4 Objectives and Benefits of Fuel Treatments and Ecological Restoration.



### Fire and Healthy Forests



The forest ecosystems provide shade and wildlife habitat. Forests also purify water, absorb pollutants, recycle nutrients, and absorb carbon dioxide. Minnesota's forests provide opportunities for recreation, and, of course, there is the forest products industry, contributing billions of dollars to the state's economy annually.



Minnesota's forests provide critical habitat for wildlife, including bears, wolves, moose, grouse, bobcats, pine marten, and migratory songbirds. No less important than these more visible residents of the forest are the myriad forms of microscopic life. Forests provide habitat for insects that are the food for many forms of wildlife, as well as microbes that are responsible for decomposition and nutrient cycling.



Change is an integral component of forest health. A major force of change is the forest fire. Fire can be a destructive force, but it is also an important positive force. Fire removes low-growing underbrush, opening up the forest floor to sunlight and exposing mineral soils for new growth. Fire helps control disease and insects, and provides nutrients for the soil. Over thousands of years, trees and other plants of Minnesota's forests have adapted to fire. Low-level fires occurring with some frequency reduce the fuel on the forest floor, lessening the impact of larger fires. Some trees, like jack pine and black spruce, have cones that open after fire and thrive in the ash and soils exposed by fire. Other plants, like the aptly named fireweed, proliferate quickly following a fire and cover the forest floor with flowers.



"Fireweed"



"Fire is as essential to the long term health of wilderness forests as sunlight and adequate moisture."

~Jon Nelson



Clean Water · Healthy Forests · Diverse Recreation

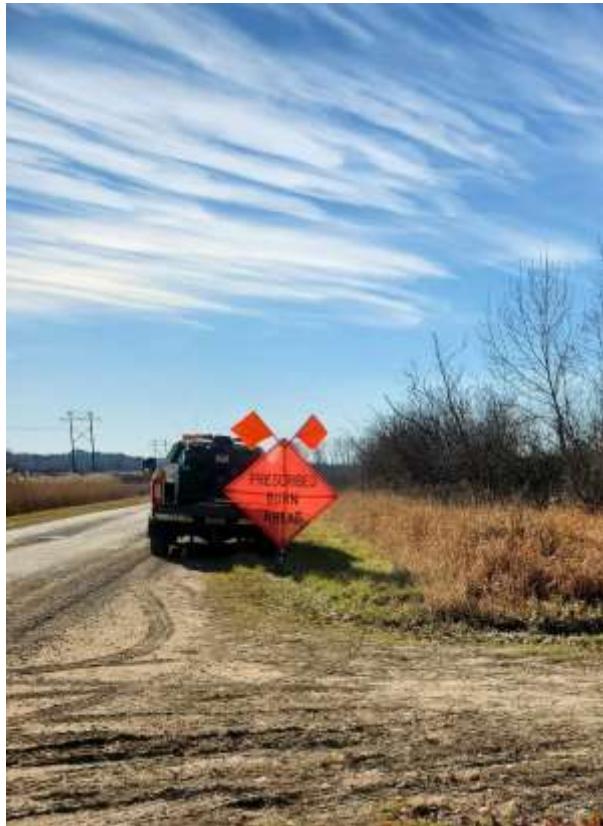
## Fuel Treatments

Fuel treatments are a land management tool for reducing wildfire hazard by decreasing the amount and altering the distribution of wildland fuels. Common goals of stand-scale fuel treatments are to reduce the risk of active or passive crown fires and to reduce fire intensity. This is achieved by removing trees, increasing the distance between tree crowns, removing small trees, shrubs, and low branches to increase the distance between surface fuels and tree crowns, and removing downed trees and other dead vegetation (Agee and Skinner, 2005). Fuel treatment methods include tree thinning, pruning, pile burning, chipping, broadcast prescribed burning, and fuel mastication.

"Given the right conditions, wildlands will inevitably burn. It is a misconception to think that treating fuels can 'fire-proof' important areas... Fuel treatments in wildlands should focus on creating conditions in which fire can occur without devastating consequences, rather than on creating conditions conducive to fire suppression" (Reinhardt et al. 2008).

Strategically located, high-quality fuel treatments can create tactical options for fire suppression (Jolley, 2018; Plucinski, 2019; Reinhardt et al., 2008). Fuel treatments along trails, topographic locations, roads, and other features can allow firefighters opportunities to use direct or indirect suppression techniques to contain fire spread.

Creating resilient landscapes is one of the three pillars of the National Cohesive Wildland Fire Management Strategy. Ecological restoration is the process of assisting the recovery of an ecosystem that has been damaged, degraded, or destroyed (SER, 2004). Many forests in the United States have been damaged, degraded, or destroyed because of changes to their historical fire regimes following Euro-American colonization.



## Treatment Types Covered in the CWPP

This CWPP covers fuel treatments in the home ignition zone 3, stand-level fuel treatments, and roadside fuel treatments, each with its own objectives and benefits:

Fuel Treatment Category	Primary Objectives and Benefits
<b>Defensible space in home ignition Zone 3 (30-100 feet away from the home)</b>	<p>Reduce surface fuels, reduce tree density, and increase the distance between surface and canopy fuels.</p> <p>Reduce fire behavior near structures and increase their chance of surviving a wildfire.</p> <p>Increase safety and access for emergency personnel.</p> <p>Increase the visibility of structures from roadways to assist wildland firefighters with locating and accessing your home.</p> <p>Coordinate with partners when Zone 3 overlaps neighboring properties to address shared wildfire risk. Defensible space projects that span ownership boundaries are better candidates for grant funding due to their strategic value.</p>
<b>Stand-level ecological restoration / fuel treatments</b>	<p>Reduce surface fuels, reduce tree density, and increase the distance between surface and canopy fuels.</p> <p>Restore ecological conditions to create more fire-resilient ecosystems.</p> <p>Reduce the likelihood of high-severity wildfires near communities.</p> <p>Create tactical opportunities for fire suppression.</p>
<b>Roadside fuel treatments</b>	<p>Dramatically reduce or eliminate surface and canopy fuels.</p> <p>Reduce the likelihood of non-survivable conditions along roadways during wildfires.</p> <p>Create tactical opportunities for fire suppression.</p> <p>Increase the visibility of structures from roadways to assist wildland firefighters.</p>

## 4.a. Priorities for Crow Wing County

Altering potential wildfire behavior and restoring ecological conditions requires a landscape-scale approach to treatments across ownership boundaries. We located and prioritized project areas for roadside fuel treatments, ecological restoration, and/or stand-level fuel treatments within and around Crow Wing County to be implemented in the next 3-5 years. These project areas cross ownership boundaries and require community-wide commitment, coordination, and collaboration among private landowners, public land managers, and forestry professionals to create successful outcomes.

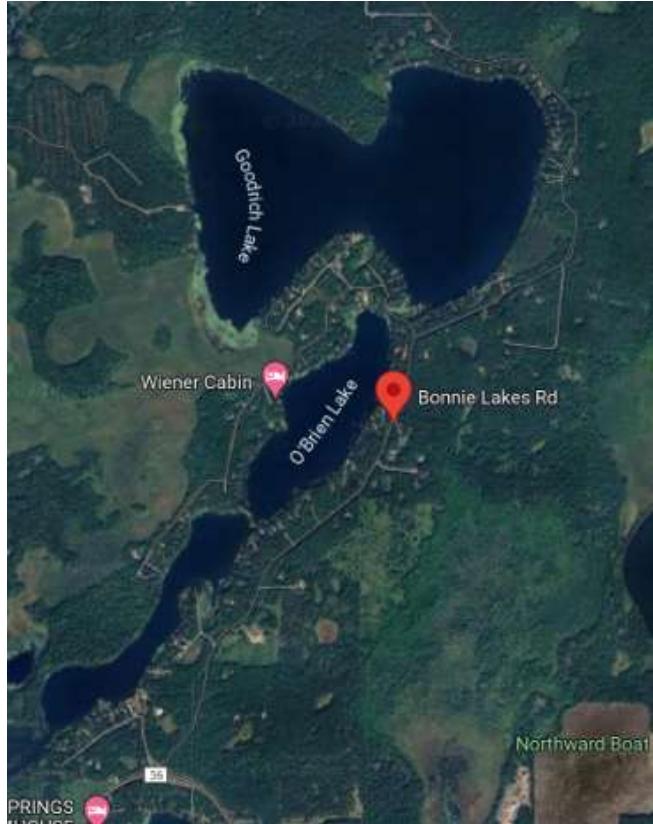
The section below describes the current conditions in each CWPP project area, treatment objectives and benefits, potential treatment types, project leads, and relative importance. The relative importance and feasibility of treatments is reflected in their timeline. Mid-term and long-term projects will require more coordination, funding, and other enabling conditions before implementation can begin.

The CWPP implementation plan for roadside treatments focuses on high-priority locations, but this does not discourage ecological restoration and fuel mitigation in other areas. If multiple neighbors work together to mitigate fire risk across ownership boundaries, it could attract funding and increase the priority and effectiveness of treating those areas. Communities, HOAs, residents, and land managers should reevaluate fire risks and reprioritize treatment units as conditions change over time.

## Priority Project #1 – Bonnie Lakes Road

### North Crow Wing County/City of Crosslake – Fairfield Township

Bonnie Lakes Road encompasses 3.4 miles of roadway along with secondary roads. This road is located in the City of Crosslake and Fairfield Township. This area was selected for a priority project because of the number of structures located on a dead-end road. Removing much of the right of way fuels will help with tactical fire suppression and assist in wildland firefighters' response. It will also help with evacuation situations.

4.a.1 Bonnie Lakes Road	
Treatment objectives:	Right of Way Mitigation
Treatment type:	Remove Limbs, Trees, Shrubs, and remove slash
Priority:	
Lead and support organizations:	City of Crosslake Public Works / Fairfield Township Public Works along with Homeowners.
	

## Priority Project #2 – County Road 134 (Camp Foley Road)

### North Crow Wing County/Ideal Township

County Road 134 encompasses 5.4 miles of roadway along with secondary roads. This road is located in Ideal Township. (**Figure 4.b.2**). This area was selected for a priority project because of the number of structures located on a dead-end road. Removing much of the right of way fuels will help with tactical fire suppression and assist in wildland firefighters' response. It will also help with evacuation situations.

County Road 134	
Treatment objectives:	Right of Way Mitigation
Treatment type:	Remove Limbs, Trees, Shrubs, and remove slash
Priority:	
Lead and support organizations:	Crow Wing County Highway Department / Ideal Township Public Works along with Homeowners.

## Priority Project #3 – Paradise Beach Road

### South Crow Wing County / Long Lake Township

Paradise Beach Road encompasses 2.0 miles of roadway along with secondary roads. This road is located in Long Lake Township. (**Figure 4.b.2**). This area was selected for a priority project because of the number of structures located on a dead-end road. Removing much of the right of way fuels will help with tactical fire suppression and assist in wildland firefighters' response. It will also help with evacuation situations.

County Road 134	
Treatment objectives:	Right of Way Mitigation
Treatment type:	Remove Limbs, Trees, Shrubs, and remove slash
Priority:	
Lead and support organizations:	Crow Wing County Highway Department / Long Lake Township Public Works along with Homeowners.

## 4.b. General Recommendations for Defensible Space Zone 3 and Stand-scale Treatments

Local knowledge and professional expertise are needed to design effective, site-specific fuel treatments based on the best available science. Specific fuel treatment recommendations are dependent on forest type, tree density, fuel loads, terrain, land use, and management objectives. The location and purpose of treatments also matter. Treatments in large, forested areas can include the retention of individual trees and groups of trees. Evenly and widely spaced trees might be reasonable in defensible space Zone 3, but this tree arrangement would not be appropriate for restoration-style fuel treatments.

Treatments in defensible space Zone 3 (30-100 feet away from the home) can restore historical forest structure, but it is most important to focus on reducing wildfire risk to the home, creating safe conditions for firefighters, and increasing the visibility of your home from the road for firefighters. Home ignition Zone 3 often overlaps neighboring properties and requires residents to work together to address shared wildfire risk.

For all fuel treatments, it is important to address surface fuels. Forest management operations often increase surface fuel loads and can fail to achieve fire mitigation objectives if fuels created by the harvest activities (also known as slash) are not addressed (Agee and Skinner, 2005). Slash can include small trees, limbs, bark, and treetops. See **Section 4.d. Approaches to Slash Management** for pros and cons of different slash management options.

Mitigating the impacts of tree removal on soil compaction and erosion is also important when treatments occur near streams and riparian ecosystems. MNDNR works with landowners on Forest Management Planning and treatments and can provide consultation on best practices. Treatments should be monitored for colonization of invasive, weedy plants that might require control through integrated weed management. It's always a good idea to take pictures of treatments before and after to help evaluate effectiveness and monitor changes over time.

## 4.c. General Recommendations for Roadside Fuel Treatments

Treatments along roadways require a dramatic reduction of fuels to create safe and survivable conditions. This includes removing most trees adjacent to the roadway, limbing remaining trees, and regularly mowing grass and shrubs. Treatments along roadways are often described as shaded fuel breaks (Dennis, 2005).

The width of an effective roadside fuel treatment (distance to the left and right of a road) is dependent on slope. It is recommended that treatments extend 150 to 240 feet off the downhill side of the road and 100 to 150 feet off the uphill side. Wider treatments are necessary on the downhill side on steeper slopes due to the exacerbating effect of slope on fire intensity when fires travel uphill (Dennis, 2005). Important aspects of all roadside fuel treatments include:

- Removing limbs overhanging the road to create **at least** 13.5-feet of vertical clearance.
- Removing trees alongside the road to create **at least** 20-feet of horizontal clearance.
- Removing trees to create **at least** 10-feet crown spacing between remaining trees within the roadside treatment zone,
- Removing shrubs and regeneration that can serve as ladder fuels.
- Mowing grasses adjacent to the road.
- Remove slash following fuel treatments.

Along important evacuation routes that could experience extreme congestion, roadside treatments should be more aggressive and consist of near removal of all trees **within at least 30 feet of roadways**. Clearcutting along roads when surrounding forests remain dense can cause problems with snow drifting, so shaded fuel breaks might be more appropriate in areas where drifting is more likely, or snow fences might need to be installed.



**Figure 4.d.1.** Effective roadside fuel treatments remove enough trees to result in widely spaced crowns, remove ladder fuels, and reduce surface fuels. More dramatic tree removal along roadways can create even safer roadway conditions where appropriate. Photo credits: Genesee Foundation (left) and USDA/FPAC/GEO/Google Earth (right).

Roadway example	Suggestions for improvement
	<ul style="list-style-type: none"> <li>• Clear trees and tall shrubs away from the roadways</li> <li>• Clear extra space on the downhill side</li> <li>• Create regular pullouts and turnaround locations</li> </ul>

	<ul style="list-style-type: none"> <li>• Mowing along the side of the road is recommended for the tall grasses.</li> <li>• The trees along this roadway are back and upslope from the road. Additional trees should be removed but this would be lower priority than other roadways.</li> </ul>
	<ul style="list-style-type: none"> <li>• Remove trees that are leaning over the roadway because they could fall and trap residents during an evacuation</li> <li>• Clear all trees on the sides of the roadways</li> </ul>

Photo: Minnesota Department of Natural Resources

*Table 4.d.2. Examples of conditions occurring along roadways and suggestions for treatment and improvement.*

## 4.d. Approaches to Slash Management

Forest management operations often increase surface fuel loads and can fail to achieve fire mitigation objectives if fuels created by the harvest activities (also known as slash) are not addressed (Agee and Skinner, 2005). Slash can include: small trees, limbs, bark, twigs, leaves and treetops. Slash management is a critical step in the forest management process. It is unwise, ineffective, and even dangerous to conduct poor-quality fuels treatments that fail to reduce canopy fuels, result in increased surface fuel loads, and do not receive maintenance treatments. Such treatments can lead to a false sense of security among residents and fire suppression personnel (Dennis, 2005), and they divert limited funds away from more effective, strategic projects.

Leaving untreated slash within roadside fuel treatments is particularly counterproductive. The risk of active crown fire might be lower after a thinning operation, but untreated slash in fuel treatments

can burn at high intensities and endanger the lives of residents stuck on roadways during a wildfire. Slash is easier and cheaper to manage along roadways due to access, and roads can serve as highly effective holding features for controlled burning of grass in the spring and fall and pile burning in the winter.

Methods for managing slash come with different benefits and challenges. For example, both lop-and-scatter and mastication do not remove surface fuels from the site, they only disperse the fuels. It can take a decade or more for slash to decompose to a point where it no longer poses a significant fire hazard. Broadcast-prescribed burning and pile burning are more effective at removing surface fuels, but they require extensive planning and expertise to conduct properly. Communities, HOAs and adjacent landowners should work together to develop a slash management strategy for their areas in consultation with MNDNR. This can and should include a combination of the following slash management techniques.

- **Pile and Burn**-This method removes the majority of the slash but should be done with caution to avoid unwanted escape fire. Consultation with the local fire department is encouraged, along with a burn permit which is issued by the MNDNR. A good practice to avoid escape fire is to cover the piles with paper or plastic to create a dry space and burn once the ground is covered with snow in early winter.
- **Broadcast burn/ Prescribed burn**- This technique is less labor intensive than the pile and burn technique, however, it is a very challenging way to dispose of slash and requires advanced knowledge of burning techniques to avoid escaped fires and lessen ecological damage to remaining vegetation. This should be done by a professional or in close consultation with the local fire department and/or MNDNR district office.
- **Mastication**- This technique is good for changing the character of slash on a given site into chips. This helps reduce the flammability of the debris but does not remove the available fuel from the site. This technique also requires specialized equipment that can chew up the fuels and change their character into chips along the ground. Many times, this will be accomplished with grants provided by local jurisdictions.
- **Chipping**- Chipping takes all the material on a site and runs it through a machine that pulverizes the material into a wood chip. Similar to the mastication technique mentioned above, however, the machine must be fed by individuals. This is very labor intensive; however, the benefit of chipping is that the chips can be concentrated in one area or blown into a truck or trailer and hauled off the property.
- **Lop and Scatter**- This technique involves leaving the slash material on site and lopping it down to a certain height so it can begin to decompose. This is the least desirable technique for wildfire mitigation but is still better than no mitigation. If a lop and scatter technique is utilized it is best to get the slash as close to the ground as possible to increase decomposition. Another technique combined with lop and scatter is to follow up with a broadcast burn as mentioned previously.



# Prescribed Fire

For thousands of years, fire was an important component of the health of natural areas including prairies, oak savannah, wetlands and forests. Fires were started by lightning and were also set by Native Americans as a planned landscape management effort.



Today, forest management professionals use what is called *Prescribed Fire* in an attempt to continue this important component of natural landscape management effort.

A prescribed fire is a carefully planned and controlled fire conducted to manage natural areas such as prairie, oak savannah, wetlands, and fire-dependent forest. A prescribed fire is conducted to mimic the fires that contributed to the health of Minnesota's landscapes over millennia. A prescription must be developed to assure that fire or smoke will not adversely affect surrounding homes, businesses, travel routes, recreation area and wildlife habitat.

Prescribed fire benefits prairies and oak savannah by removing brushy growth. Prairie plants grow better when brush is removed and built-up fuel is reduced. Fire also benefits forests in several important ways. Fire reduces fuel loads, lessening the chance for larger, catastrophic fires. Controlled fire helps rejuvenate forest soils by returning nutrients. Prescribed fire improves wildlife habitat by facilitating more open spaces, stimulating the growth of nutritious food on the forest floor, and encouraging new growth of fire-dependent plant species. Prescribed fire also helps retard the growth of non-native plant species that are not adapted to a fire-dependent ecosystem.

Shortly after a prescribed burn, you can notice a wonderful rejuvenation of the prairie or forest landscape where this management tool has been utilized.



A prescription is carefully followed to assure containment of the fire in the planned area. Temperature, wind and humidity must meet the prescription.



Fire is set with drip torches and contained with water pumps, if necessary.



Safety of the fire crew and of others in the area is of the utmost importance.



Clean Water · Healthy Forests · Diverse Recreation

## 5. The Future of the CWPP and Implementation Plan

Below are strategic actions for residents, other community groups, public land managers, county, state, and federal agencies, and non-profit conservation groups to accomplish in the short-, mid-, and long-term (see definitions below). Some activities have low financial cost but require a fundamental shift in attitudes and behavior to prioritize wildfire risk mitigation. Other actions are more substantial and require commitment and collaboration across the community to pool resources, apply for grants, and make incremental steps towards meaningful change.

### 5.a. Implementation Phases

Short-term actions	Mid-term actions	Long-term actions
<ul style="list-style-type: none"><li>• Can be implemented within the remainder of 2024.</li><li>• Can be accomplished within the current funding capacity for the fire department and residents.</li><li>• Can occur within the context of the current staff/volunteer base, with modest expansion.</li><li>• Can capitalize on current relationships with emergency response partners and land managers.</li><li>• Examples: increased community education, community days, updated Ready, Set, Go! Guides.</li></ul>	<ul style="list-style-type: none"><li>• Can be implemented within 18-24 months.</li><li>• Will require expansion of the current staff/volunteer base.</li><li>• Requires new cooperative relationships with emergency response partners, land managers, and non-profit organizations.</li><li>• Actions that are already in the planning stages and may have some portion of funding already identified.</li><li>• Examples: the project priorities listed within this CWPP.</li></ul>	<ul style="list-style-type: none"><li>• Require planning to start within 18-24 months so implementation can occur.</li><li>• Requires multi-year planning and funding.</li><li>• Requires extensive grant funding.</li><li>• Requires local staffing beyond volunteers.</li><li>• Examples: projects not yet identified within this CWPP, but perhaps already identified by the Core Planning Team.</li></ul>

## 5.b. Implementation Activities and Responsibilities

A Community Wildfire Protection Plan (CWPP) plays a critical role in enhancing the safety and resilience of communities against wildfires. One crucial aspect of CWPPs is the management of road rights-of-way, which are essential for emergency responders and evacuation routes. Improving these areas can significantly enhance both access for firefighting efforts and the safety of residents during evacuations.

Firstly, vegetation management along road rights-of-way is essential. Overgrown trees, shrubs, and other flammable materials can obstruct access for emergency vehicles and create significant fire hazards. Regularly clearing these areas of excess vegetation reduces the risk of fire spreading rapidly and ensures that emergency responders can reach affected areas quickly. This proactive approach not only aids in firefighting efforts but also facilitates safer and more efficient evacuations.

Additionally, maintaining clear and well-marked evacuation routes is paramount. Roads should be free from obstacles such as fallen branches or debris, which can hinder the swift movement of evacuees. Signage should be updated regularly to guide residents clearly and efficiently, especially in times of crisis when every second counts. These measures can prevent bottlenecks and confusion, ensuring a smooth, organized and quick evacuation process.

Moreover, ensuring adequate road width and structural integrity is vital. Narrow or poorly maintained roads can slow down or even prevent the passage of large firefighting apparatus and other emergency vehicles. Regular inspections and necessary upgrades to road infrastructure can mitigate these risks, providing reliable access for emergency services and safe passage for evacuees.

Lastly, community involvement and education are crucial. Residents should be informed about the importance of maintaining defensible space around their properties, including the road rights-of-way. Community programs and initiatives can foster a collaborative approach to vegetation management and road maintenance, enhancing overall preparedness and resilience.

In conclusion, focusing on the improvement of road rights-of-way within CWPPs is essential for the safety and effectiveness of emergency responders and the evacuation process. Regular vegetation management, clear and maintained evacuation routes, adequate road infrastructure, and community involvement are key strategies that can make a significant difference in mitigating wildfire risks and ensuring community safety.

Listed below are the strategic actions that will require commitment and collaboration across the community to pool resources, apply for grants, and make incremental steps towards a meaningful change in the community.

The three strategic actions have a common goal and are a priority in the county.

## **Roadway Mitigation for Dead-End roads in Wildfire Management**

### **Activity #1**

Activity: North Crow Wing County – Bonnie Lakes Road

Bonnie Lakes road is located within the City of Crosslake and Fairfield Township. The road is 3.4 miles long with additional secondary roads with 258 residential homes.

Responsible Party: City and Township Public Works

Timeline: One: Two years

Short-Term: Work with Lake Obrien association to educate the homeowners of the wildfire risk, mitigation options, and evacuation process for their area.

Mid-Term: Conduct budget discussions with the city of Crosslake and Fairfield Township Board regarding roadway mitigation. Create a roadway mitigation plan with the group to manage right of ways and evacuation signage.

Long-Term: Implement plan



## Activity #2

Activity: North Crow Wing County – County Road 134 (Camp Foley Road)

County Road 134 is 5.4 miles long with many secondary roads branching off around the lakes, with 178 residential homes and two youth camps located on this stretch of road.

Responsible Party: Crow Wing County Highway Department / Ideal Township Public Works

Timeline: One – Two years

Short-Term: Work with residents along County Road 134 and secondary roads to educate those affected by the wildfire risk, mitigation options, and evacuation process for their area.

Mid-Term: Conduct budget discussions with the Crow Wing County Highway Department and Ideal Township Board regarding roadway mitigation. Create a roadway mitigation plan with the group to manage right of ways and evacuation signage.

Long-Term: Implement plan



## Activity #3

Activity: Paradise Beach Road

Paradise Road is 2 miles long with many secondary roads with 169 residential homes.

Responsible Party: Long Lake Township and the South Long Lake Improvement Association.

Timeline: One – Two Years

Short-Term: Work with residents along Paradise Beach Road and secondary roads to educate those affected by the wildfire risk, mitigation options, and evacuation process for their area.

Mid-Term: Conduct budget discussions with the Long Lake Township Board regarding roadway mitigation. Create a roadway mitigation plan with the group to manage right of ways and evacuation signage.

Long-Term: Implement plan



## 5.c. CWPP as a Living Document

It is recommended to update them every *5 years, at minimum*. CWPPs greater than 10 years old are outdated and can exclude communities from successfully applying for competitive funding opportunities.

The update to this plan can either be a preface to this document or a new document that integrates with this one. The update to this plan should include:

- A description of progress made since the CWPP was created.
- A description of demographic changes in the community and other important infrastructure changes.
- Identification of new risks in the community.
- Updated risk analysis if major changes have happened between revisions.
- Updated and prioritized projects for the community with maps and descriptions

The suggested review process involves:

- Reviewing the existing CWPP
- Engaging partners that have a vested interest in the plan
- Hosting collaborative meetings
- Documenting completed projects and demographic and landscape changes
- Developing updated wildfire risk reduction priorities
- Updating maps
- Distributing updated drafts to key partners for review and input prior to final approval
- Finalizing with Planning Group signatures and submit to MNDNR

This CWPP is a **call to action!** Becoming a fire adapted community and decreasing wildfire risk takes concerted effort, time, and coordination. Use it to spark action on your property and across your neighborhood and entire community. The need to protect lives, safety, and property from wildfire is too great to wait.

## Glossary

**20-foot wind speed:** The rate of sustained wind over a 10-minute period at 20 feet above the dominant vegetation. The wind adjustment factor to convert surface winds to 20-foot wind speeds depends on the type and density of surface fuels slowing down windspeeds closer to the ground (NWCG, 2021).

**Active crown fire:** Fire in which a solid flame develops in the crowns of trees and advances from tree crown to tree crown independently of surface fire spread (NWCG, 2018b).

**Basal area:** Cross sectional area of a tree measured at breast height (4.5 feet above the ground). Used as a method of measuring the density of a forest stand in units such as ft<sup>2</sup>/acre (USFS, 2021b).

**Broadcast prescribed burning (aka, prescribed burn, controlled burn):** A wildland fire originating from a planned ignition in accordance with applicable laws, policies, and regulations to meet specific objectives (NWCG, 2018b).

**Canopy cover:** The ground area covered by the crowns of all trees in an area as delimited by the vertical projection of their outermost crown perimeters (NWCG, 2019).

**Canopy fuels:** The stratum of fuels containing the crowns of the tallest vegetation (living or dead), usually above 20 feet (NWCG, 2018b).

**Canopy height:** The average height of the top of the vegetated canopy (NWCG, 2019).

**Canopy:** The more or less continuous cover of branches and foliage formed collectively by adjacent tree crowns (USFS, 2021b).

**Canyon:** A long, deep, very steep-sided topographic feature primarily cut into bedrock and often with a perennial stream at the bottom (NRCS, 2017).

**Chain:** Chains are commonly used in forestry and fire management as a measure of distance. 1 chain is equivalent to 66 feet. Chains were used for measurements in the initial public land survey of the U.S. in the mid-1800s.

**Chute:** A steep V-shaped drainage that is not as deep as a canyon but is steeper than a draw. Normal upslope air flow is funneled through a chute and increases in speed, causing upslope preheating from convective heat, thereby exacerbating fire behavior (NWCG, 2008).

**Community Wildfire Protection Plan (CWPP):** A plan developed in the collaborative framework established by the Wildland Fire Leadership Council and agreed to by state, Tribal, and local governments, local fire departments, other partners, and federal land management agencies in the vicinity of the planning area. CWPPs identify and prioritize areas for hazardous fuel reduction treatments, recommend the types and methods of treatment on Federal and non-Federal land that will protect one or more at-risk communities and essential infrastructure, and recommend measures to reduce structural ignitability throughout the at-risk community. A CWPP may address issues such as wildfire response, hazard mitigation, community preparedness, and structure protection (NWCG, 2018b).

**Convection:** A type of heat transfer that occurs when a fluid, such as air or a liquid, is heated and travels away from the source, carrying heat along with it. Air around and above a wildfire expands as it is heated, causing it to become less dense and rise into a hot convection column. Cooler air flows in to replace the rising gases, and in some cases, this inflow of air creates local winds that further fan the flames. Hot convective gases move up slope and dry out fuels ahead of the flaming front, lowering their ignition temperature and increasing their susceptibility to ignition and fire spread. Homes

located at the top of a slope can become preheated by convective heat transfer. Convection columns from wildfires carry sparks and embers aloft.

**Crown (aka, tree crown):** Upper part of a tree, including the branches and foliage (USFS, 2021b).

**Defensible space:** The area around a building where vegetation, debris, and other types of combustible fuels have been treated, cleared, or reduced to slow the spread of fire and reduce exposure to radiant heat and direct flame. It is encouraged that residents develop defensible space so that during a wildfire their home can stand alone without relying upon limited firefighter resources due to the great reduction in hazards they have undertaken. The Colorado State Forest Service defines three zones of defensible space: zone 1 (HIZ 1) as 0 to 5 feet from the home, zone 2 (HIZ 2) as 5 to 30 feet from the home, and zone 3 (HIZ 3) as 30 to about 100 feet from the home (CSFS, 2021).

**Direct attack:** Any treatment applied directly to burning fuel such as wetting, smothering, or chemically quenching the fire or by physically separating the burning from unburned fuel (NWCG, 2018b).

**Draws:** Topographic features created by a small, natural watercourse cutting into unconsolidated materials. Draws generally have a broader floor and more gently sloping sides than a ravine or gulch (NRCS, 2017).

**Ecological restoration:** The process of assisting the recovery of an ecosystem that has been damaged, degraded, or destroyed (SER, 2004). In ponderosa pine and dry mixed-conifer forests of the Colorado Front Range, ecological restoration involves transforming dense forests into a mosaic of single trees, clumps of trees, and meadows similar to historic forests that were maintained by wildfires and very resilient to them (Addington et al., 2018).

**Ember:** Small, hot, and carbonaceous particles. The term “firebrand” is also used to connote a small, hot, and carbonaceous particle that is airborne and carried for some distance in an airstream (Babrauskas, 2018).

**Fire adapted community (FAC):** A human community consisting of informed and prepared citizens collaboratively planning and taking action to safely coexist with wildland fire (NWCG, 2018b). There is not a checklist or one silver bullet to become a FAC; there are many strategic actions and tools that should be used together to reduce shared risk. Risk mitigation is the responsibility of everyone who lives and works in the community—residents, community groups, fire protection districts, agency partners, non-governmental organizations, etc. Fire adaptation is an ongoing process of collaborative action to identify risk, mitigate it, and maintain the work overtime.

**Fire behavior:** The manner in which a fire reacts to the influences of fuel, weather, and topography. Characteristics of fire behavior include rate of spread, fire intensity, fire severity, and fire behavior category (NWCG, 2018b).

**Fire history:** A general term referring to the historic fire occurrence in a specific geographic area (NWCG, 2018b).

**Fire intensity (aka, Fireline intensity):** (1) The product of the available heat of combustion per unit of ground and the rate of spread of the fire, interpreted as the heat released per unit of time for each unit length of fire edge, or (2) the rate of heat release per unit time per unit length of fire front (NWCG, 2018b).

**Fire regime:** Description of the patterns of fire occurrences, frequency, size, and severity in a specific geographic area or ecosystem. A fire regime is a generalization based on fire histories at individual sites. Fire regimes can often be described as cycles because some parts of the histories usually get

repeated, and the repetitions can be counted and measured, such as fire return interval (NWCG, 2018b).

**Fire severity.** Degree to which a site has been altered or disrupted by fire; loosely, a product of fire intensity and residence time (NWCG, 2018b). Fire severity is determined by visually inspecting or measuring the effects that wildfire has on soil, plants, fuel, and watersheds. Fire severity is often classified as low-severity (less than 20% of overstory trees killed) and high severity (more than 70% of overstory trees killed). Moderate-severity or intermediate fire severity falls between these two extremes (Agee, 1996). Specific cutoffs for fire severity classifications differ among researchers. For example, Sherriff et al. (2014) define high-severity fires as those killing more than 80% of overstory trees.

**Fire weather conditions:** Weather conditions that influence fire ignition, behavior, and suppression, for example, wind speed, wind direction, temperature, relative humidity, and fuel moisture (NWCG, 2018b).

**Firebreak:** A natural or constructed barrier where all vegetation and organic matter have been removed down to bare mineral soil. Firebreaks are used to stop or slow wildfires or to provide a control line from which to work (Bennett et al., 2010; NWCG, 2018b).

**Fireline:** (1) The part of a containment or control line that is scraped or dug to mineral soil, or (2) the area within or adjacent to the perimeter of an uncontrolled wildfire of any size in which action is being taken to control fire (NWCG, 2018b).

**Flame length:** The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface). Flame length is measured on an angle when the flames are tilted due to effects of wind and slope. Flame length is an indicator of fire intensity (NWCG, 2018b).

**Fuel reduction:** Manipulation, combustion, or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage from wildfires and resistance to control (NWCG, 2018b).

**Fuel break:** A natural or manmade change in fuel characteristics which affects fire behavior so that fires burning into them can be more readily controlled. Fuel breaks differ from firebreaks due to the continued presence of vegetation and organic soil. Trees in shaded fuel breaks are thinned and pruned to reduce the fire potential but enough trees are retained to make a less favorable microclimate for surface fires (NWCG, 2018b).

**Fuels mitigation / management:** The act or practice of controlling flammability and reducing resistance to control of wildland fuels through mechanical, chemical, biological, or manual means, or by fire, in support of land management objectives (NWCG, 2018b).

**Fuels:** Any combustible material, most notably vegetation in the context of wildfires, but also including petroleum-based products, homes, and other man-made materials that might combust during a wildfire in the wildland-urban interface. Wildland fuels are described as 1-, 10-, 100-, and 1000-hour fuels. One-hour fuels are dead vegetation less than 0.25 inch in diameter (e.g., dead grass), ten-hour fuels are dead vegetation 0.25 inch to 1 inch in diameter (e.g., leaf litter and pine needles), one hundred-hour fuels are dead vegetation 1 inch to 3 inches in diameter (e.g., fine branches), and one thousand-hour fuels are dead vegetation 3 inches to 8 inches in diameter (e.g., large branches). Fuels with larger diameters have a smaller surface area to volume ratio and take more time to dry out or become wetter as relative humidity in the air changes (NWCG, 2018b).

**Handcrews:** A number of individuals that have been organized and trained and are supervised principally for operational assignments on an incident (NWCG, 2018b).

**Handline:** Fireline constructed with hand tools (NWCG, 2018b).

**Hazards:** Any real or potential condition that can cause injury, illness, or death of personnel, or damage to, or loss of equipment or property (NWCG, 2018b).

**Home hardening:** Steps taken to improve the chance of a home and other structures withstanding ignition by radiant and convective heat and direct contact with flames or embers. Home hardening involves reducing structure ignitability by changing building materials, installation techniques, and structural characteristics of a home (California Fire Safe Council, 2020). A home can never be made fireproof, but home hardening practices in conjunction with creating defensible space increases the chance that a home will survive a wildfire.

**Home ignition zone (HIZ):** The characteristics of a home and its immediate surroundings within 100 feet of structures. Conditions in the HIZ principally determine home ignition potential from radiant heat, convective heat, and ember cast (NWCG, 2018b).

**Ignition-resistant building materials:** Materials that resist ignition or sustained flaming combustion. Materials designated ignition-resistant have passed a standard test that evaluates flame spread on the material (Quarles, 2019; Quarles and Pohl, 2018).

**Incident Response Pocket Guide (IRPG):** Document that establishes standards for wildland fire incident response. The guide provides critical information on operational engagement, risk management, all hazard response, and aviation management. It provides a collection of best practices that have evolved over time within the wildland fire service (NWCG, 2018a).

**Indirect attack** A method of suppression in which the control line is located some considerable distance away from the fire's active edge. Generally done in the case of a fast-spreading or high-intensity fire and to utilize natural or constructed firebreaks or fuel breaks and favorable breaks in the topography. The intervening fuel is usually backfired; but occasionally the main fire is allowed to burn to the line, depending on conditions (NWCG, 2018b).

**Insurance Services Office (ISO) rating:** ISO ratings are provided to fire departments and insurance companies to reflect how prepared a community is for fires in terms of local fire department capacity, water supply, and other factors (see more information online at <https://www.isomitigation.com/ppc/fsrs/>).

**Ladder fuels:** Fuels that provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees with relative ease. Ladder fuels help initiate torching and crowning and assure the continuation of crowning. Ladder fuels can include small trees, brush, and lower limbs of large trees (NWCG, 2018b).

**Lop-and-scatter:** Cutting (lopping) branches, tops, and unwanted boles into shorter lengths and spreading that debris evenly over the ground such that resultant logging debris will lie close to the ground (NWCG, 2018b).

**Mastication:** A slash management technique that involves using a machine to grind, chop, or shred vegetation into small pieces that then become surface fuel (Jain et al., 2018).

**Mitigation actions:** Actions that are implemented to reduce or eliminate (mitigate) risks to persons, property, or natural resources. These actions can be undertaken before and during a wildfire. Actions before a fire include fuel treatments, vegetation modification in the home ignition zone, and structural changes to increase the chance a structure will survive a wildfire (aka, home hardening). Mitigation actions during a wildfire include mechanical and physical tasks, specific fire applications, and limited suppression actions, such as constructing fire lines and creating "black lines" through the use of controlled burnouts to limit fire spread and behavior (NWCG, 2018b).

**Mosaic landscape:** A heterogeneous area composed of different communities or a cluster of different ecosystems that are similar in function and origin in the landscape. It consists of 'patches' arranged

in a 'matrix', where the patches are the different ecosystems and the matrix is how they are arranged over the land (Hansson et al., 1995).

**National Wildfire Coordinating Group (NWCG):** An operational group established in 1976 through a Memorandum of Understanding between the U.S. Department of Agriculture and Department of the Interior to coordinate programs of the participating agencies to avoid wasteful duplication and to provide a means of constructively working together. NWCG provides a formalized system and agreed upon standards of training, equipment, aircraft, suppression priorities, and other operational areas. More information about NWCG is available online at <https://www.nwcg.gov/>.

**Noncombustible building materials:** Material of which no part will ignite or burn when subjected to fire or heat, even after exposure to moisture or the effects of age. Materials designated noncombustible have passed a standard test (Quarles, 2019; Quarles and Pohl, 2018).

**Non-survivable road:** Portions of roads adjacent to areas with predicted flame lengths greater than 8 feet under severe fire weather conditions. Potentially non-survivable flame lengths start at 8 feet according to the Haul Chart, which is a standard tool used by firefighters to relate flame lengths to tactical decisions (NWCG, 2019). Drivers stopped or trapped on these roadways would have a low chance of surviving radiant heat from fires of this intensity. Non-survivable conditions are more common along roads that are lined with thick forests, particularly with trees that have limbs all the way to the ground and/or abundant saplings and seedlings.

**Overstory:** Layer of foliage in a forest canopy, particularly tall mature trees that rise above the shorter immature understory trees (USFS, 2021b).

**Passive crown fire:** Fire that arises when surface fire ignites the crowns of trees or groups of trees (aka, torching). Torching trees reinforce the rate of spread, but passive crown fires travel along with surface fires (NWCG, 2018b).

**Pile burning:** Piling slash resulting from logging or fuel management activities into manageable piles that are subsequently burned during safe and approved burning conditions (NWCG, 2018b).

**Radiation:** A method of heat transfer by short-wavelength energy through air (aka, infrared radiation). Surfaces that absorb radiant heat warm up and radiate additional short-wavelength energy themselves. Radiant heat is what you feel when sitting in front of a fireplace. Radiant heat preheats and dries fuels adjacent to the fire, which initiates combustion by lowering the fuel's ignition temperature. The amount of radiant heat received by fuels increases as the fire front approaches. Radiant heat is a major concern for the safety of wildland firefighters and can ignite homes without direct flame contact.

**Rate of spread:** The relative activity of a fire in extending its horizontal dimensions. It is expressed as rate of increase of the total perimeter of the fire, as rate of forward spread of the fire front, or as rate of increase in area, depending on the intended use of the information. Rate of spread is usually expressed in chains or acres per hour for a specific period in the fire's history (NWCG, 2018b).

**Ravine:** Topographic features created by streams cutting into unconsolidated materials and that are narrow, steep-sided, and commonly V-shaped. Ravines are steeper than draws (NRCS, 2017).

**Risk:** (1) The chance of fires starting as determined by the presence and activity of causative agents (e.g., lightning), (2) a chance of suffering harm or loss, or (3) a causative agent (NWCG, 2018b).

**Roadside fuel treatment:** A natural or manmade change in fuel characteristics along a roadway which affects fire behavior so that fires burning into them can be more readily controlled, survivable conditions with shorter flame lengths are more likely during a wildfire, and firefighter access is enhanced (NWCG, 2018b).

**Saddle:** A low point on a ridge or interfluvium, generally a divide or pass between the heads of streams flowing in opposite directions. The presence of a saddle funnels airflow and increases windspeed, thereby exacerbating fire behavior (NRCS, 2017).

**Safety zones:** An area cleared of flammable materials used by firefighters for escape in the event the line is outflanked or spot fires outside the control line render the line unsafe. In firing operations, crews progress so as to maintain a safety zone close at hand, allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuel breaks; they are greatly enlarged areas which can be used with relative safety by firefighters without the use of a fire shelter (NWCG, 2018b).

**Shaded fuel break:** Fuel treatments in timbered areas where the trees on the break are thinned and pruned to reduce fire potential yet enough trees are retained to make a less favorable microclimate for surface fires (NWCG, 2018b).

**Slash:** Debris resulting from natural events such as wind, fire, or snow breakage or from human activities such as road construction, logging, pruning, thinning, or brush cutting. Slash includes logs, bark, branches, stumps, treetops, and broken understory trees or brush (NWCG, 2018b).

**Smoldering combustion:** The combined processes of dehydration, pyrolysis, solid oxidation, and scattered flaming combustion and glowing combustion, which occur after the flaming combustion phase of a fire; often characterized by large amounts of smoke consisting mainly of tars (NWCG, 2018b).

**Spot fire:** Fire ignited outside the perimeter of the main fire by an ember (NWCG, 2018b). Spot fires are particularly concerning because they can form a new flaming front, move in unanticipated directions, trap firefighters between two fires, and require additional firefighting resources to control.

**Spotting:** Behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire (NWCG, 2018b).

**Stand:** An area of forest that possesses sufficient uniformity in species composition, age, size, structural configuration, and spatial arrangement to be distinguishable from adjacent areas (USFS, 2021b).

**Structure protection:** The protection of homes or other structures from an active wildland fire (NWCG, 2018b).

**Structure triage:** The process of inspecting and classifying structures according to their defensibility or non-defensibility, based on fire behavior, location, construction, and adjacent fuels. Structure triage involves a rapid assessment of a dwelling and its immediate surroundings to determine its potential to escape damage by an approaching wildland fire. Triage factors include the fuels and vegetation in the yard and adjacent to the structure, roof environment, decking and siding materials, prevailing winds, topography, etc. (NWCG, 2018b). There are four categories used during structure triage: (1) defensible – prep and hold, (2) defensible – stand alone, (3) non-defensible – prep and leave, and (4) non-defensible – rescue drive-by. The most important feature differentiating defensible and non-defensible structures is the presence of an adequate safety zone for firefighters (NWCG 2018a). Firefighters conduct structure triage and identify defensible homes during wildfire incidents. Categorization of homes are not pre-determined; triage decisions depend on fire behavior and wind speed due to their influence on the size of safety zones needed to keep firefighters safe.

**Suppression:** The work and activity used to extinguish or limit wildland fire spread (NWCG, 2018b).

**Surface fire:** Fire that burns fuels on the ground, which include dead branches, leaves, and low vegetation (NWCG, 2018b).

**Surface fuels:** Fuels lying on or near the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and low stature living plants (NWCG, 2018b).

**Torching:** The burning of the foliage of a single tree or a small group of trees from the bottom up. Torchng is the type of fire behavior that occurs during passive crown fires and can initiate active crown fires if tree canopies are close to each other (NWCG, 2018b).

**Values at risk:** Aspects of a community or natural area considered valuable by an individual or community that could be negatively impacted by a wildfire or wildfire operations. These values can vary by community and include diverse characteristics such as homes, specific structures, water supply, power grids, natural and cultural resources, community infrastructure, and other economic, environmental, and social values (NWCG, 2018b).

**Watershed (aka, drainage basin or catchment):** An area of land where all precipitation falling in that area drains to the same location in a creek, stream, or river. Smaller watersheds come together to create basins that drain into bays and oceans (NOAA, 2021).

**Wildfire-resistant building materials:** A general term used to describe a material and design feature that can reduce the vulnerability of a building to ignition from wind-blown embers or other wildfire exposures (Quarles, 2019; Quarles and Pohl, 2018).

**Wildland-urban interface (WUI):** Any area where the built environment meets wildfire-prone areas—places where wildland fire can move between natural vegetation and the built environment and result in negative impacts on the community (Forge, 2018). For the purpose of this CWPP, the WUI boundary is defined in **Figure 2.c.2**. Strategic wildfire mitigation across the WUI can increase the safety of residents and wildland firefighters and reduce the chances of home loss.

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# Appendices

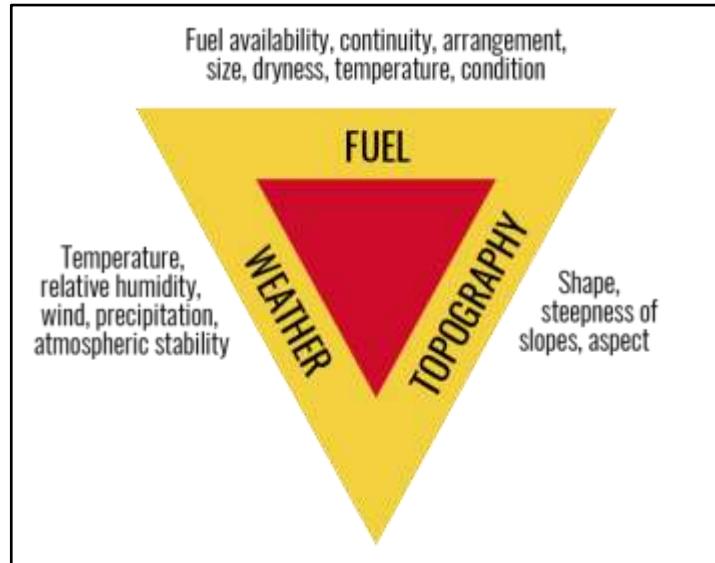
## Appendix A Introduction to Wildfire Behavior and Terminology

### Fire Behavior Triangle

Complex interactions among wildland fuels, weather, and topography determine how wildfires behave and spread. These three factors make up the sides of the fire behavior triangle, and they are the variables that wildland firefighters pay attention to when assessing potential wildfire behavior during an incident (NWCG, 2019).

### Fuels

Fuels include live vegetation such as trees, shrubs, and grasses, dead vegetation like pine needles, leaves and cured grass, and materials like houses, sheds, fences, trash piles, and combustible chemicals.



Grasses, leaves and pine needles are known as “flashy” fuels because they easily combust and burn the fastest of all fuel types. If you think of a campfire, flashy fuels are the kindling that you use to start the fire. Flashy fuels dry out faster than other fuel types when relative humidity drops or when exposed to radiant and convective heat<sup>1</sup>. Fires in flashy fuel types can spread quickly across large areas, and fire behavior can change rapidly with changes in weather conditions.

Dead branches on the surface dry out slower than flashy fuels, release more radiant heat when they burn, and take longer to completely combust. The rate of spread is fast to moderate through shrublands depending on their moisture content, and long flame lengths can preclude direct attack by firefighters. Shrubs and small trees can also act as ladder fuels that carry fire from the ground up into the tree canopy.

Dead trees (aka, snags) and large downed logs are called “heavy fuels”, and they take the longest to dry out when relative humidity drops and when exposed to radiant and convective heat. Heavy fuels release tremendous radiant heat when they burn, and they take longer to completely combust, just like a log on a campfire. Fire spread through a forest is slower than in a grassland or shrubland, but forest fires release more heat and can be extremely difficult and unsafe for firefighters to suppress.

<sup>1</sup> Radiant heat transfer occurs by short-wavelength energy traveling through air. Radiant heat is what you feel when sitting in front of a fire. Radiant heat preheats and dries fuels adjacent to a wildfire, which initiates combustion by lowering the fuel's ignition temperature. Convective heat transfer occurs when air is heated, travels away from the source, and carries heat along with it. Convective heat is what you would feel if you put your hand in the air above an open flame. Air around and above a wildfire expands as it is heated, causing it to become less dense and rise into a hot convection column. Cooler air flows in to replace the rising gases, and in some cases, this inflow of air creates local winds that further fan the flames. Hot convective gases move up slope and dry out fuels ahead of the flaming front, lowering their ignition temperature and increasing their susceptibility to ignition and fire spread.

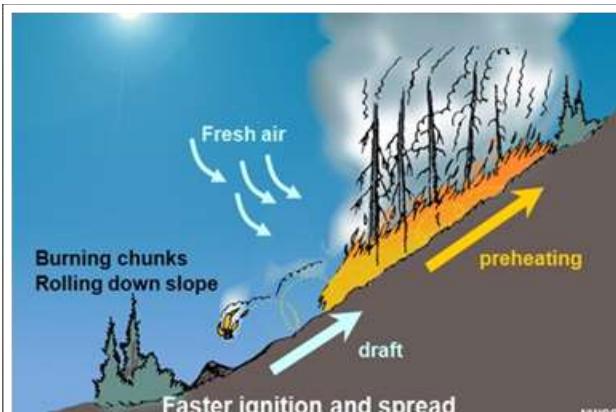
An abundance of dead trees killed by drought, insects, or disease can exacerbate fire behavior, particularly when dead trees still have dry, red needles (Moriarty et al., 2019; Parsons et al., 2014).

## Topography

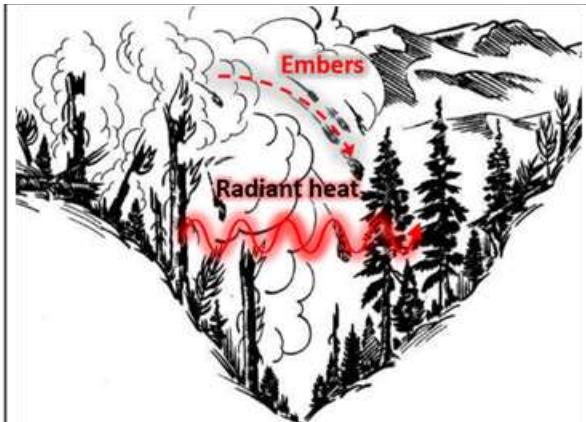
Topography (slope and aspect) influences fire intensity, speed, and spread. In the northern hemisphere, north-facing slopes experience less sun exposure during the day, resulting in higher fuel moistures. Tree density is often higher on north-facing slopes due to higher soil moisture. South-facing slopes experience more sun exposure and higher temperatures and are often covered in grasses and shrubs. The hotter and drier conditions on south-facing slopes mean fuels are drier and more susceptible to combustion, and the prevalence of flashy fuels results in fast rates of fire spread.

Fires burn more quickly up steep slopes due to radiant and convective heating. Fuels are brought into closer proximity with the progressing fire, causing them to dry out, preheat, and become more receptive to ignition, thereby increasing rates of spread. Steep slopes also increase the risk of burning material rolling and igniting unburnt fuels below.

Narrow canyons can experience increased combustion because radiant heat from fire burning on one side of the canyon can heat fuel on the other side of the canyon. Embers can easily travel from one side of a canyon to the other. Topography also influences wind behavior and can make fire spread unpredictable. Wildfires burning through steep and rugged topography are harder to control due to reduced access for firefighters and more unpredictable and extreme fire behavior.



Slope increases fire spread through radiant and convective heating (source: [NWCG](#)).



Fires can easily cross narrow canyons (source: [U.S. Forest Service](#)).

*Steep slopes and topographic features such as narrow canyons exacerbate fire behavior.*

## Weather

Weather conditions that impact fire behavior include temperature, relative humidity, precipitation, and wind speed and direction. The National Weather Service uses a system called a red flag warning to indicate local weather conditions that can combine to produce increased risk of fire danger and behavior. Red flag warning days indicate increased risk of extreme fire behavior due to a combination of hot temperatures, very low humidity, dry fuels, strong winds, and the presence of thunderstorms.

Direct sunlight and hot temperatures impact how ready fuels are to ignite. Warm air preheats fuels and brings them closer to their ignition point. When relative humidity is low, the dry air can absorb moisture from fuels, especially flashy fuels, making them more susceptible to ignition. Long periods of dry weather can dehydrate heavier fuels, including downed logs, increasing the risk of wildfires in areas with heavy fuel loads.

Wind influences fire behavior by drying out fuels (think how quickly your lips dry out in windy weather), increasing the amount of oxygen feeding the fuel, preheating vegetation through convective heat, and carrying embers more than a mile ahead of an active fire. Complex topography, such as chutes, saddles, and draws, can funnel winds in unpredictable directions, increasing wind speeds and resulting in erratic fire behavior.

National Weather Service –Duluth Forecast Office Red Flag Warning Criteria	
Factors	Other factors considered
Relative humidity less than or equal to 25%	Widely scattered dry thunderstorms
20-foot winds, sustained above 20 mph or frequent gusts over 25 mph	Potential for relative humidities of less than 15% and one-hour fuel moisture down around 2-3% w/ minimal wind
Dry fuels with winds but humidity threshold not met	Fire Danger Rating from MNDNR of High or Extreme

*Table A.1. Red flag days are warnings issued by the National Weather Service using criteria specific to a region.*

## Categories of Fire Behavior

Weather, topography, and fuels influence fire behavior, and fire behavior in turn influences the tactical options available for wildland firefighters and the risks posed to lives and property. There are three general categories of fire behavior described throughout this CWPP: surface fire, passive crown fire, and active crown fire.

- **Surface fire** – Fire that burns fuels on the ground, which include dead branches, leaves, and low vegetation. Surface fires can be addressed with direct attack using hand crews when flame lengths are less than four feet and with equipment when flame lengths are less than eight feet. Surface fires can emit significant radiant heat, which can ignite nearby vegetation and homes.
- **Passive crown fire** – Fire that arises when a surface fire ignites the crowns of trees or groups of trees (aka, torching). Torching trees reinforce the rate of spread, but passive crown fires travel along with surface fires. Firefighters can sometimes address passive crown fires with indirect attack, such as dropping water or retardant out of aircraft or digging fire lines at a safe distance from the flaming front. Radiant heat and ember production from passive crown fires can threaten homes during wildfires.
- **Active crown fire** – Fire in which a solid flame develops in the crowns of trees and advances from tree crown to tree crown independently of surface fire spread. Crown fires are very difficult to contain, even with the use of aircraft-dropping fire retardant, due to long flame lengths and tremendous release of radiant energy. The likelihood of active crown fires increases when trees have interlocking canopies. Radiant heat and ember production from active crown fires can threaten homes during wildfires.



Passive and active crown fires can result in short- and long-range ember production that can create spot fires and ignite homes. Spot fires are particularly concerning because they can form a new flaming front, move in unanticipated directions, trap firefighters between two fires, and require additional firefighting resources to control. Crown fires are generally undesirable in the wildland-urban interface (WUI) because of the risk to lives and property; however, passive and active crown fires are part of the natural fire regime for some forest types and result in habitat for plant and animal species that require recently disturbed conditions (Keane et al., 2008; Pausas and Parr, 2018).

## Wildfire Threats to Homes

Wildfires can ignite homes through several pathways: radiant heat, convective heat, and direct contact with flames or embers. The ability for radiant heat to ignite a home is based on the properties of the structure (i.e., wood, metal, or brick siding), the temperature of the flame, the ambient air temperature, and distance from the flame (Caton et al., 2016). Ignition from convective heat is more likely for homes built along steep slopes and in ravines and draws. For flames to ignite a structure, they must directly contact the building long enough to cause ignition. Flames from a stack of firewood near a home could cause ignition to the home, but flames that quickly burn through grassy fuels are less likely to ignite the home (although the potential still exists). Fires can also travel between structures along fuel pathways such as a fence or row of shrubs connecting a shed and a home (Maranghides et al., 2022). Some housing materials can burn hotter than the surrounding vegetation, thereby exacerbating wildfire intensity and initiating home-to-home ignition (Mell et al., 2010).

Homes can be destroyed during wildfires even if surrounding vegetation has not burned. During many wildland fires, 50 to 90% of homes ignite due to embers rather than radiant heat or direct flame (Babrauskas, 2018;



*Homes built mid-slope and at the top of steep slopes and within ravines and draws are at greater risk of convective heat from wildfires. A wildfire could rapidly spread up this steep slope and threaten the home above. Photo credit: The Ember*

Gropp, 2019). Embers can ignite structures when they land on roofs, enter homes through exposed eaves, or get under wooden decks. Embers can also ignite nearby vegetation and other combustible fuels, which can subsequently ignite a home via radiant heating or direct flame contact. Burning homes can release embers that land on and ignite nearby structures, causing destructive home-to-home ignitions, as evidenced by the destructive 2021 Marshall Fire in Boulder County, Colorado. Structural characteristics of a home can increase its exposure to embers and risk of combustion, such as wood shingle roofs and unenclosed eaves and vents (Hakes et al., 2017; Syphard and Keeley, 2019). Embers can also penetrate homes if windows are destroyed by radiant or convective heat. See your community's CWPP for specific recommendations to harden your home against wildfires.

## Resources for More Information on Fire Behavior

- [Introduction to Fire Behavior](#) from the National Wildfire Coordinating Group (9:57 minute video)
- [The Fire Triangle](#) from the National Wildfire Coordinating Group (7:26 minute video)
- [Understanding Fire Behavior in the Wildland/Urban Interface](#) from the National Fire Protection Association (20:51 minute video)
- [Understanding Fire](#) from California State University (website)
- [S-190 Introduction to Wildland Fire Behavior Course Materials](#) from the NWCG (PowerPoints, handouts, and videos)

## Appendix B Minnesota Firewise Handbook

[Firewise Handbook \(state.mn.us\)](#)

## Appendix C Ready, Set, Go! Action Guide

[rsg-eag.pdf \(iafc.org\)](#)