Cascade County Community Wildfire Protection Plan

Prepared By

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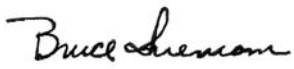
The Cascade County Community Wildfire Protection Plan has been prepared by, reviewed and/or approved by the following signatories:



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Cascade County Fire Warden

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BLM – Lewistown Field Office

Lewis & Clark National Forest

Central Land Office, MT Dept. of Natural Resources & Conservation

CASCADE COUNTY COMMUNITY WILDFIRE PROTECTION PLAN

1. Executive Summary

1.1. Problem Overview

Cascade County is located in North Central Montana east of the continental divide. Cascade County is a relatively large county covering an area of 2,698 square miles. Under the current conditions, Cascade County has a high degree of potential for extended wildland fire seasons ranging from March through October or November. Cascade County has 19 fire departments located throughout the county, including, the Malmstrom AF Fire Department and the Montana Air National Guard (MANG) Fire Department. Cascade County has the potential to interact with not only DNRC, but also the Bureau of Land Management, Lewistown Field Office and the Lewis and Clark NF and law enforcement, search and rescue, Disaster & Emergency Services , thus providing a high degree of interagency complexity. As with numerous counties in Montana, there is an increasing development of wildland-urban interface areas, with potential access problems and a general lack of understanding of the need for an asset protection zone to protect the improvements. As a general matter, Cascade County's Fire Departments have had to deal with multiple ignitions throughout the county from lightning storms.

1.2. Process Overview

The Cascade County Community Wildfire Protection Plan -- hereafter known as "CWPP," has been developed to assist Cascade County, Cascade County's Fire Departments and the federal, state, tribal wildland agencies in the identification of private and public lands at risk of severe wildland fires and to explore strategies for the prevention and suppression of such fires. The CWPP is intended to outline the Cascade County's plans and activities targeted at reducing the risk of a catastrophic wildland and/or a wildland-urban interface (WUI) or structural fire event in Cascade County. The intent of this planning document will ensure that the health, safety and welfare of Cascade County's citizens remain secure from the threats of structural and wildland fires in the county.

1.3. Overall Goals

The CWPP will improve planning and fire suppression tools for county and the county fire departments alike, which will result in Cascade County providing its citizens with tools to live more safely in a fire prone ecosystem. The CWPP fosters the preservation of the economy of Cascade County by maintaining and improving the efficiency of the overall fire protection system in the County.

1.4. Methodology

Fire Logistics, Inc. uses Geographic Information System (GIS) based analysis approach to development of the fire hazard assessment for Cascade County. This enables personnel from Fire Logistics to look at specific areas of high risk in the county such as wildland-urban interface or subdivision areas and focus on issues that should be included in the wildland fire mitigation plan as recommended projects.

Personnel from Fire Logistics, Inc. spent 3 days in Cascade County in October of 2005 gathering data and touring around the county gathering intelligence for the CWPP. Additional information was gathered from the County during visits in March, April, May, June and July of 2006.

Fire Logistics staff developed a draft of our approach to the Cascade County CWPP between October of 2005 and November of 2006. The rough draft was circulated to collaborators and comments where incorporated into the final version of the Cascade County CWPP.

1.5. Mitigation Strategy – The Action Plan

Summary of the specific action is provided, which were developed in the *mitigation plan* of Chapter 7 to include mitigation goals such as evaluate, upgrade and maintain emergency wildfire protection responsibilities, decrease fuels, etc. The assumptions for planning priorities of the community fire plan are: protect human health and life, protect critical community infrastructure, protect private property, and protect natural resources. The existing mitigation efforts are described, which include asset protection zones, neighborhood preparedness and fire protection response, and the coordination of prevention programs, protection projects and response plans. Several recommended projects and programs are included as part of the mitigation effort for Cascade County.

2. Introduction

2.1. Background and History

The Cascade County Community Wildfire Protection Plan (CWPP) has been developed to assist Cascade County, Cascade County's Fire Departments and the federal and state wildland agencies in the identification of private and public lands at risk of severe wildland fires and to explore strategies for the prevention and suppression of such fires. The CWPP is intended to outline the Cascade County Fire's plans and activities targeted at reducing the risk of a catastrophic wildland, wildland-urban interface (WUI) or structural fire event in Cascade County. The intent of this planning document will ensure that the health, safety and welfare of Cascade County citizens remains secure from the threats of structural and wildland fires in the county.

The CWPP will improve planning tools for county and the fire departments alike, which will result in better building and development codes and regulations, as they relate to the development of the WUI and urban development. The CWPP fosters the preservation of the economy of Cascade County by maintaining and improving the fire protection capability of the County.

The Chouteau County Conservation District retained the services of Fire Logistics, Inc. to:

1. Development of a countywide Community Wildfire Protection Plan (CWPP) that meets NFP, HFRA and FEMA standards for each of the three counties: Cascade, Chouteau, and Meagher. The CWPP must be a stand alone plan. The process must follow the guidance specified in *Preparing a Community Wildfire Protection Plan - A Handbook for Wildland-Urban Interface Communities.* This document is a collaboration of a number of organizations, and can be found at the website for the Society of American Foresters http://www.safnet.org/policyandpress/cwpphandbook.pdf **This guidebook is incorporated by reference into this RFP**. All the elements listed in the "Summary and Checklist" of this planning guide must be covered in the CWPP; the term "forest areas" should be understood to include all vegetation types that may be subject to wildfire. Mapped components must be provided in both hard copy and GIS layers.
2. Development of a county Pre-Disaster Mitigation Plan (PDM) that meets FEMA standards for each of the three counties: Cascade, Chouteau, and Meagher. Finished plans will conform to the Federal Disaster Mitigation Act of 2000, 44CFR Parts 201 and 206; Interim Final Rule. The CWPP will cover the wildland fire hazard for each county and as such should be incorporated into the PDM plan. Guidance for FEMA compliance should be taken from FEMA's *Multi-Hazard Mitigation Planning Guidance,* available at FEMA's website http://www.fema.gov/fima/resources.shtm **This guidance is incorporated by reference into this RFP**. Mapped components must be provided in both hard copy and GIS layers.

3. Prepare GIS layers including: Evacuation Routes, Fuels, Floodplain, Wildland-Urban-Rural Interface Boundary, Past Fire Occurrence, Fire Prone Landscapes (interpretation of fuels, topography, fire history etc.), Critical Infrastructure, etc. Fire occurrence data should include federal, state and county records. Working with local dispatch and rural fire districts will be necessary to insure completeness of the county fire records. See Attachment A for a list of currently existing GIS layers for each county. Additional existing GIS layers are available through state, BLM and USFS sources.

4. Coordinate meetings with local committees, fire district personnel, local governments, state and federal agencies and keep them informed of activities of the countywide fire and all-hazard planning processes.

5. Establish and maintain effective working relationships with federal, state, local governments, local fire districts and councils, corporate, and private landowners that will assist in the planning project.

6. Prepare materials and make presentations, both orally and in writing, to individuals or groups about the fire and all-hazard mitigation plans.

7. Prepare news releases, articles, and public service announcements for use by media to enhance public relations, inform the public of the fire mitigation plans.

8. Conduct assessments of individual communities and develop a prioritized list (high, medium, low) of recommended mitigation projects including both private and public lands.

9. Analyze and review the information collected and develop strategies to address fire and other hazards in each county. The hazards to be analyzed in detail (in addition to wildland fire) for each county are:
    - Cascade County: flood-dam failure; severe weather, hazardous materials spill
    - Chouteau County: flood-dam failure; severe weather, hazardous materials spill
    - Meagher County: flood-dam failure; severe weather, earthquake.

10. Provide separate budgets for the CWPP's (all counties combined) and the additional increment for the PDM plans (all counties combined). Quarterly reports detailing the planning, assessment, educational or outreach activities and accomplishments as well as dollars spent in the current period and to date for CWPP's and PDM plans separately.
11. Each county will appoint a local contact person to work with the contractor and facilitate setting up public meetings. Locations for public meetings will be determined in consultation with the counties. Public meetings are expected to be required in 3-4 locations for Cascade and Chouteau counties; one or two locations for Meagher may be adequate as long as joint meetings occur in some locations for Cascade and Meagher (e.g., Monarch, Neihart or King's Hill).

2.2. Mission

The mission of the Cascade County Community Wildfire Protection Plan is:

"The mission of the Cascade County Community Wildfire Protection Plan is to protect the county's natural and manmade resources by mobilizing our community to make their homes, neighborhoods and community's fire safe."

2.3. Current Relevant Fire Policies

A brief discussion of the relevant fire policies is provided to educate the community.

2.3.1 Federal Policies "Homeland Security is Fire Safety"

We have briefly described the relevant policies at the national level, which affect fire planning on the local level.

2.3.1.1 National Fire Plan

"The National Fire Plan (NFP) is a long-term investment that will help protect communities and natural resources, and most importantly, the lives of fire fighters and the public. It is a long term commitment based on cooperation and communication among federal agencies, states, local governments, tribes and interested publics." It mandates community participation in its implementation.[1] The NFP also mandates that local governments develop and adopt local land use plans and ordinances that provide for the maintenance of defensible space and fuel management on municipal and private property.[2]

[1] See www.fireplan.gov.
[2] See www.westgov.org/wga/initiatives/fire/implem_plan.pdf

2.3.1.2 Western Governor's Association, *10-Year Comprehensive Strategy for Reducing Wildland Fire Risks*[3] and *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment—Implementation Plan*

The goals of the 10-Year Comprehensive Strategy are to:

- Improve Prevention and Suppression
- Reduce Hazardous Fuels
- Restore Fire Adapted Ecosystems
- Promote Community Assistance.

This is done through a "Framework for Collaboration… Local Level—Successful implementation will include stakeholder groups with broad representation including Federal, State, and local agencies, tribes and the public, collaborating with local line officers on decision making to [4]establish priorities, cooperation on activities, and increase public awareness and participation to reduce the risks to communities and environments."[5]

2.3.1.3 Healthy Forests Restoration Act

The Healthy Forests Restoration Act (HFRA) represents the legislative component of the Healthy Forests Initiative, introduced by President Bush in January 2003. Title I of the HFRA authorizes the Secretaries of Agriculture and Interior to expedite the development and implementation of hazardous fuel reduction projects on federal land managed by the US Forest Service or Bureau of Land Management when certain conditions are met.

Priority areas for use of expedited authorities include the wildland-urban interface, municipal watersheds, areas impacted by wind throw or insect and disease epidemics, and critical wildlife habitat that would be negatively impacted by catastrophic wildfire.

The HFRA emphasizes the need for federal agencies to work collaboratively with communities in developing hazardous fuel reduction projects and places priority on treatment areas identified by the communities themselves in a CWPP.

2.3.1.4 Disaster Mitigation Act 2000

Disaster Mitigation Act 2000 (DMA 2000) sets policies for "disaster mitigation plans"—plans designed to avoid disasters such as fires and floods. DMA 2000 requires 4 elements in these plans:

1. A planning process.
2. An assessment of risks.
3. A mitigation strategy (action plan) and,
4. A plan maintenance and updating process.

Disaster Mitigation Plans must be approved by 11/04 to receive HMGP funds after that date.[6]

2.3.1.5 Local Implementation of Federal Fire Policies

Fire protection objectives on the state and private lands in Cascade County are addressed indirectly in the Cooperative Fire Management Agreement between USDI's Bureau of Land Management, National Park Service – Intermountain Region, Bureau of Indian Affairs – Portland and Billings Area, US Fish and

[3] www.westgov.org/wga/initiatives/fire/final_fire_rpt.pdf
[4] The full text of the Act is available at http://thomas.loc.gov/. Type HR 1904 in the Bill Number box and then select the enrolled bill from the list of options.
[5] www.westgov.org/wga/initiatives/fire/implem_plan.pdf
[6] www.fema.gov/pdf/fima/howto1.pdf

Wildlife Service – Rocky Mountain Region; USDA's Forest Service – Northern Region; and the State of Montana – Department of Natural Resources and Conservation. This agreement requires that Annual Operating Plans be developed and approved by May 1 of each year specifying how the terms of the agreement will be carried out between the cooperating agencies and the state. Cooperation with local county governments is encouraged and additional agreements are executed with Cascade County. These agreements are to validate the arrangements desired between the county and a federal agency or the state in respect to assistance with their fire management programs.

As a minimum, those procedures for obtaining state and federal assistance for large wildland fire needs to be included in any agreements prepared at the local level. They should include an articulation of the suppression standards that need to be employed by federal or state agencies working on a fire on state and private land. The reverse is also true for county resources working on federal or state lands. In the former case the objective will most likely be to suppress the fire at the smallest size possible utilizing the full range of suppression resources available. In the latter case, however, certain land management objectives may preclude this approach, i.e., mechanical equipment in an Area of Critical Environmental Concern.

There may be circumstances where a fire is human caused and assistance in an investigation is needed. The skill to be a fire investigator can either be developed within the county or it can be brought in from another agency on an as needed basis. Whichever route is chosen, there should be no delay in utilizing a fire investigator when the situation is warranted.

2.3.2 State Policies

The Montana Legislature adopted the following state fire policy during the 2007 legislature. The legislature finds and declares that:

(1) the safety of the public and of firefighters is paramount in all wildfire suppression activities;
(2) it is a priority to minimize property and resource loss resulting from wildfire and to minimize expense to Montana taxpayers, which is generally accomplished through an aggressive and rapid initial attack effort;
(3) interagency cooperation and coordination among local, state, and federal agencies are intended and encouraged, including cooperation when restricting activity or closing areas to access becomes necessary;
(4) fire prevention, hazard reduction, and loss mitigation are fundamental components of this policy;
(5) all property in Montana has wildfire protection from a recognized fire protection entity;
(6) all private property owners and federal and state public land management agencies have a responsibility to manage resources, mitigate fire hazards, and otherwise prevent fires on their property;
(7) sound forest management activities to reduce fire risk, such as thinning, prescribed burning, and insect and disease treatments, improve the overall diversity and vigor of forested landscapes and improve the condition of related water, wildlife, recreation, and aesthetic resources; and
(8) development of fire protection guidelines for the wildland-urban interface is critical to improving public safety and for reducing risk and loss.

Currently there are no State policies that require a rural fire district or county fire organization to develop a community wildfire protection plan, however, it certainly is encouraged by the State Fire Policy.

It is the policy of the State to complete pre-disaster mitigation plans in compliance with the Federal direction noted above.

2.3.3 Local Policies

Cascade County adopted Cascade County Growth Policy in August of 2006 that includes the unincorporated areas of the County. In 1999, the Montana Legislature revised this community development and planning tool and renamed it the Growth Management Policy. The requirements of a

Growth Management Policy are detailed in 76-1-601, Montana Code Annotated. The Cascade County Growth Policy provides guidance as the community grows and develops. Special attention is given to specific land uses and the need for infrastructure to support those identified uses. Preparing a growth policy includes describing the historical base, establishing key indicators and monitoring the growth trends, and developing policies to accommodate the potential growth and changes in the community.

In the Cascade County Growth Policy, the Wildfire and Fire Protection Goal is:

> "Minimize risk of fire by management and planning, and to permit the effective and efficient suppression of fires in order to protect persons, property and forested areas."

Objectives which support the goal are:

1. Encourage fire protection measures throughout the county, giving special emphasis to the extreme fire hazards at the wildland-urban interface.
2. Subdivisions should be planned, designed, constructed and maintained so as to minimize the risk of fire. Developers should submit a defensible space plan for each subdivision to the appropriate fire district for its review.
3. Encourage fire resistant construction.
4. Promote cooperation with local fire districts and state and federal agencies to develop and provide a wildfire educational program.
5. Promote fire services for all subdivisions.
6. Promote adequate water supply systems.
7. Support adequate ingresses and egresses in all subdivision planning.
8. Promote vegetation policies that reduce fire hazards.

In Chapter VI – Public Facilities – Local Services, under the fire protection section recommended actions include:

1. All major subdivisions should be reviewed by the Rural Fire District prior to approval by the Planning Board.
2. The subdivider should be made aware and should provide information concerning fire protection prior to preliminary plat approval.

Subdivision regulations are normally developed after completion and adoption of the Growth Policy. The County is also in the process of up-dating their Subdivision Regulations. In ***Planning for Wildfires***, three strategies are offered for dealing with development in the wildland-urban interface, they include:

1. Conduct Wildfire Planning in a comprehensive planning context. This CWPP accomplishes this strategy.
2. Conduct a program of regulation and enforcement that stresses continuous individual responsibility by homeowners and property owners including:
    a. Subdivision regulations.
    b. Zoning regulations, such as a wildland-urban interface overlay.
    c. Building and fire codes
3. Conduct an effective ongoing program of education and outreach to affected residents and property owners.[7]

The City of Great Falls Growth Policy has direction which impacts this CWPP:

Goal – To provide and enhance crime prevention and law enforcement, fire prevention and protection, and emergency services for residents, businesses, and visitors.

Policy Statements in the Great Falls Growth Policy for Law Enforcement/Fire Rescue/Emergency Services:

[7] Planning for Wildfires; American Planning Association; 2005

1. The City shall maintain mutual aid agreements with surrounding jurisdictions for law enforcement, fire/rescue, and emergency response.
2. The City shall continue to ensure that public safety is a primary concern and that high quality services and equipment are provided and maintained.
3. The City should implement the Cascade County Emergency Preparedness Plan, which is adopted and incorporated into this Growth Policy by reference.

A Pre-Disaster Mitigation Plan (PDM), developed by Fire Logistics, Inc., is another tool developed to provide Cascade County with insight into the potential events, which might impact the County. Wildland fire was ranked as the top natural hazard in probability of occurrence in Cascade County. As a result, Cascade County's PDM has the following goals which apply to this CWPP:

- Conduct a SWOT (strength, weakness, opportunity, threats) and Gap analysis of community infrastructure to determine vulnerability, risk and community impact.
- Develop comprehensive strategic plans that:
    - Institutionalize disaster preparedness, mitigation measures, and the PDM Program
    - Improve response and recovery from natural and manmade disasters to include, wildland fires, floods, weather events, earthquakes, hazardous materials, terrorist attacks, agricultural threats, and disease outbreaks.
    - Promote public awareness and training to help the public prepare and mitigate the effects of a natural or manmade disaster.
    - Preventing personal injury, loss of life, damage to property, and damage to the environment from natural or manmade hazards.
    - Enhance the ability and capability of emergency services to respond to the effects of hazards on people, property, and the environment.
- Form partnerships with private and public sector agencies, businesses and organizations and develop comprehensive plans to maintain essential public services during the disaster and to speed the recovery of these essential services should failure occur.
- Creates additional benefits such as improving the City's and the County's ability to respond and recover, improves public safety, and improve the capabilities of emergency services
- Improve interoperable communications capabilities.

2.4. Planning Area Boundaries

The Cascade County CWPP covers Cascade County in its entirety. The county was further subdivided into sub-planning areas by the 5th Code Watershed. The purpose of the 5th Code Watershed is to provide a uniquely identified and uniformed method of subdividing large drainage areas. These smaller 5th Code Watershed units are approximately 40,000 acres to 250,000 acres and are useful for fire planning purposes as well as other programs by the Natural Resources and Conservation Service and other agencies (See Figure 1 and Planning Area Map in Map Section 10.5).

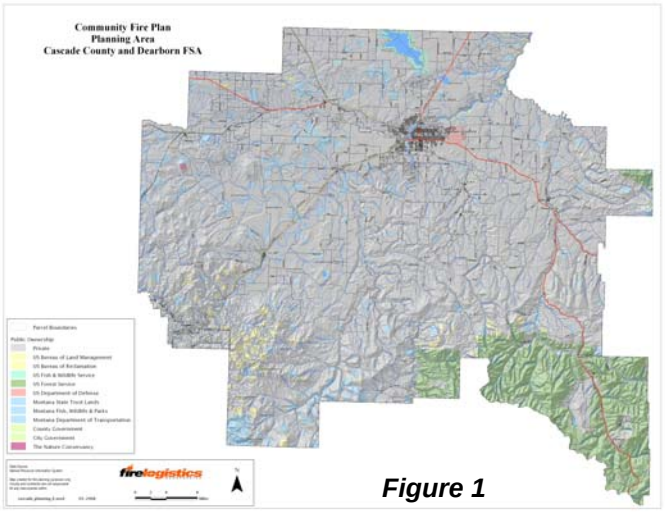


Figure 1

2.5. Community Legal Structure, Jurisdictional Boundaries

There is a mixture of fire protection organizations providing fire services to Cascade County. These include Great Falls Fire/Rescue, Belt City FD, and Neihart FD (MCA 7-33-4101-4133); Belt Rural Fire District

(RFD) (MCA 7-33-2101-2129); Fort Shaw FSA, Vaughn FSA, Black Eagle FSA, Cascade FSA, Gore Hill FSA, Monarch FSA, Sand Coulee FSA, Stockett FSA, Sun River FSA, Ulm FSA, Simms FSA, Dearborn FSA, Cascade Farmer/Rancher FSA, (MCA 7-33-2401-2405); Cascade County Fire Department (MCA 7-33-2201-2211); MT Department of Natural Resources and Conservation Direct Protection and County Cooperative Program; Lewis and Clark National Forest and Bureau of Land Management. The Montana Air National Guard has a fire department located at the Great Falls International Airport and the Malmstrom Air Force Base has a fire department located at the Air Force Base in Great Falls (See Figure 2 and Fire Resources Map in Map Section 10.5).

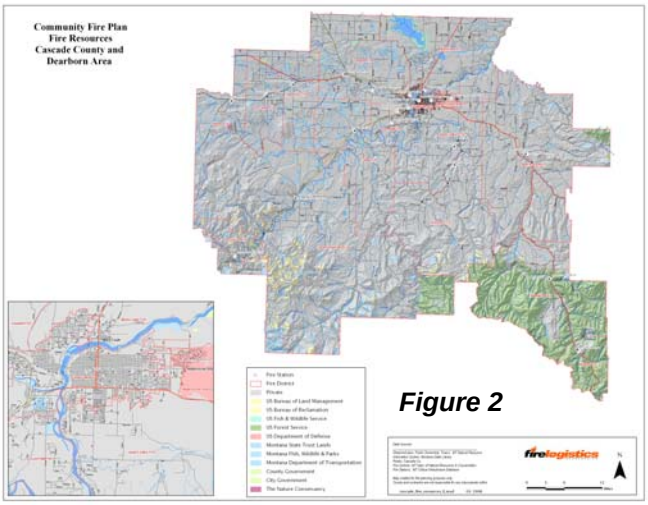


Figure 2

There is no county-wide automatic or mutual aid agreement under which resources can be requested to provide assistance to another fire entity. The Cascade County Rural Fire Dispatch Matrix calls for automatic and mutual aid, however there are no written agreements which provide the basis for the dispatch matrix. There is a written mutual aid agreement between Monarch FSA and Neihart FD and a separate mutual aid agreement between the Great Falls Fire/Rescue Department and the Montana Air National Guard and Malmstrom AFB Fire Departments. In addition, there is a mutual aid agreement between Simms, Fort Shaw, Sun River and Vaughn FSA and the Teton County Volunteer Fire Departments. There is also a mutual aid agreement between Dearborn FSA and Cascade Fire Department and Wolf Creek/Craig FSA.

The Bureau of Land Management is the responsible land management agency for BLM lands and assists the local agencies as needed. The Lewis and Clark NF is the land management agency responsible for the National Forest Lands in Cascade County and assists the County as needed.

The Department of Natural Resources and Conservation has scattered parcels of Direct Protection lands in southwest Cascade County and the DNRC County Cooperative Program provides fire support to counties when the county's capability has been exceeded and assistance is requested.

2.6. Acknowledgements

Fire Logistics, Inc. would like to thank the Cascade County Fire Warden; Cascade County DES, especially Vince Kolar; the Fire Chiefs of the Cascade County Fire Departments; Bureau of Land Management, especially Shannon Downey and Gary Kirpach; Lewis and Clark National Forest, especially Lee Clark Forest FMO, Jim Homison, Stanford District FMO and Jess Secrest, White Sulphur District FMO; Cascade County Planning Board; the Cascade County Local Emergency Planning Committee; the Cascade County Rural Fire Council and Cascade County Board of County Commissioners for their contributions to this plan.

3. Planning Process

3.1. Stakeholders

The following stakeholders are affected by wildland fire and have a stake in a successfully implemented CWPP:

Fort Shaw VFD
Belt City VFD
Belt Rural VFD
Black Eagle VFD
Cascade VFD
Gore Hill VFD
Monarch VFD
Neihart VFD
Sand Coulee VFD
Stockett VFD
Sun River VFD
Ulm VFD
Vaughn VFD
Manchester VFD
Sun Prairie VFD
Newman Bench VFD
Simms VFD
Dearborn VFD
Cascade Farmer/Rancher VFD
Great Falls Fire-Rescue
Cascade County Fire Warden
MT Dept. of Natural Resources and Conservation
Bureau of Land Management
Lewis & Clark NF
City of Great Falls
City of Belt
City of Neihart
Burlington Northern Santa Fe Railroad
Cascade County Local Emergency Planning Committee
Cascade County Road Department
Cascade County DES
Board of County Commissioners – Cascade County
Residents of Cascade County

3.2. Current Process and Plan Development

In the summer of 2005, the Chouteau County Conservation District awarded a contract to Fire Logistics, Inc. to complete a comprehensive risk assessment of Cascade County and to develop a mitigation plan which provides recommendations for improvements to the county's fire protection system, mitigation measures for treating the fuels and providing protection to structures. The Cascade County Community Wildfire Protection Plan (CWPP) is the result of that effort.

3.2.1 Avenues of Community and Public Input – Collaboration

Public meetings of the Cascade County LEPC and the Cascade County Rural Fire Council were held on September, October, & December of 2005, February, March, April, September and November of 2006 to discuss the CWPP. The following were discussed in these public meetings:

- Mission of the CWPP

- Goals of the CWPP
- Project identification
- Designation of wildland-urban interface areas
- Review draft of the CWPP

In addition, a draft of the CWPP was placed on Cascade County's web site and a press release was placed in the Great Falls Tribune to notify county residents of the ability to review the document and provide comments on the draft CWPP.

Comments were incorporated into the final version of the Cascade County CWPP.

3.3. Review of Existing Plans, Studies, Reports, Technical Documents

The following documents have been reviewed for data, which may need to be referenced and incorporated in the Cascade County CWPP:

- Cascade County Cooperative Fire Management Agreement
- Cascade County Growth Policy Plan; 2006.
- Draft Cascade County Subdivision Regulations, 2006.
- Cascade County Subdivision Regulations, 2004.
- Development Plan – Cascade County, 1979.
- Cascade County – Zoning Regulations, 2005.
- Cascade County – Emergency Operations Plan, 2004.
- Public Protection Classification Results – Neihart FD, 2004.
- Mutual Aid Agreement between Cascade County, Pondera County, Teton County, Toole County, Liberty County, Glacier County, Judith Basin County and Fergus County.
- Mutual Aid Agreement between Simms VFD, Fort Shaw VFD, Sun River VFD, Vaughn VFD and the Teton County Volunteer Fire Companies, 2000.
- Mutual Aid Agreement between Neihart FD and the Secretary of the Air Force, 2001.
- FY 2005 Annual Operating Plan between the USFS Lewis & Clark NF – Judith Ranger District and Cascade County Fire Districts; 2005.
- Advancing Wildland Fire Training for Fire Departments – Implementation Plan; 2006.

3.4. Local Jurisdictional Involvement, Approval, Adoption

Once the Cascade County CWPP is reviewed and approved by the Board of County Commissioners, it should be adopted as the fire component of Cascade County's Pre-Disaster Mitigation Plan.

4. Community Description

4.1. General Environmental Conditions

Cascade County is located in north central Montana, see Figure 3. It covers just over 2,712 square miles and has a population of about 79,569 (2005 estimate)[8] people. The county has five distinct watersheds, the Missouri River, the Smith River, the Sun River, the Dearborn River, and Belt Creek. Most lands in the county are used for some type of agriculture and as a result, agriculture is the county's number one industry. The majority of the terrain is relatively flat when compared with the western part of the state and the elevations in the County range from 8,621 feet in the Highwood Mountains to 2,700 where the Missouri River exits the County. The county receives approximately 15 inches of rainfall a year in Great Falls to a high of 29 inches a year in the Highwood Mountains, the Showdown Ski Resort receives approximately 200 inches of snow a year and the adapted ecosystems contain vegetative types and quantities commensurate with soil productivity and available moisture.

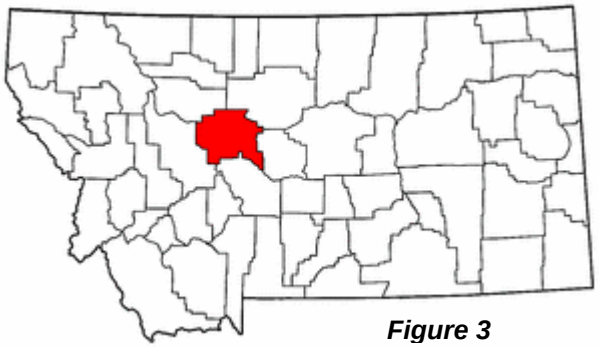


Figure 3

4.1.1. Topography, Slope, Aspect, Elevation

The main drainages are Missouri flows from the southwest to the northeast and Smith Rivers flowing generally south to north, Dearborn and Sun Rivers flowing from the west to the east, and Belt Creek flows from the southeast to the northwest. The northern portion of the county drains south into the Sun and Missouri Rivers, and the western portion of the county drains into the Sun and Dearborn Rivers, while the southern half of the county drains to the north into the Missouri and Smith Rivers and Belt Creek.

The majority of the County's terrain is made up of rolling upland plateaus and benches, with moderate deep canyons. The eastern portion of the county has elevation changes are more pronounced and approach 4,000 feet toward the eastern boundary of the county in the Highwood Mountains. Along the conifer covered ridges, the slopes fluctuate widely, with some steep pitches approaching 60% plus. The southern portion of the county ranges from rolling upland benches to hilly and mountainous terrain with elevations reaching 8,621 feet at Long Mountain near Neihart. Steep timbered slopes and deep canyons are the norm in the southern portion of the county.

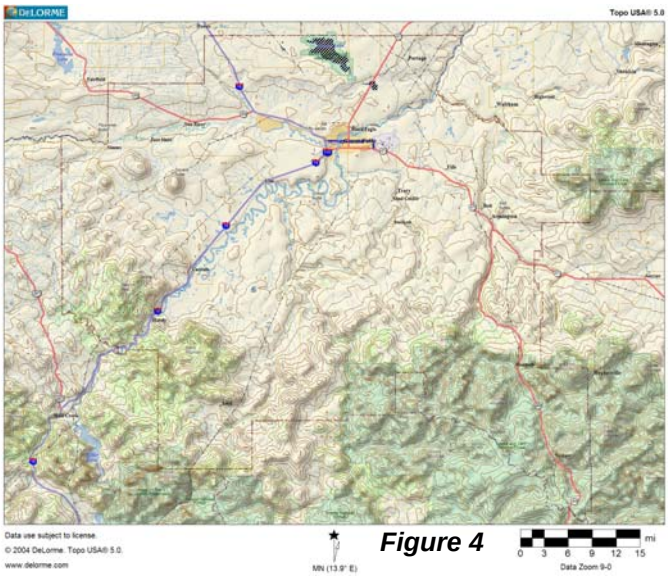


Figure 4

Aspect is the direction toward which a slope faces. Because of the topographic nature of Cascade County, the southern area of the county has more southern and western aspects that are more prone to exacerbate wildland fire behavior.

Figure 4 shows the topography of Cascade County and it is evident that there is some correlation between slope, elevation and vegetative cover types,

[8] http://quickfacts.census.gov

especially in the southern portion of the county. The pine forest is generally located on higher ground in distinct bands where soil and moisture conditions are conducive to its survival. The ponderosa pine type is usually denser on north and east aspects where the soils can retain moisture somewhat longer then they can on south and west aspects.

The tillable lands that can be irrigated are used for hay; grain and root crops while the remaining lands are left in a natural state or are in the Conservation Reserve Program (CRP). These CRP lands are source of great concern to government officials in Cascade County due to their extremely flammable nature and potential for large fire growth.

4.1.2. Meteorology, Climate, Precipitation and Fire Weather

Weather directly affects fire behavior, with wind and low humidity values being the major influencing factors due to their ability to rapidly dry fuels and allow fires to grow rapidly. Generally, steering winds at the surface and aloft over central Montana in the spring and summer prevail out of the south to west and are moderate to strong across open areas with lighter winds over hilly or mountain areas. Surface winds vary depending on the method used for developing the winds, elevation, aspect and openness of the local terrain. Southwest and west facing slopes are more exposed to the prevailing winds and have drier fuels, which relates to increased fire behavior activity. Fires generally spread from southwest to northeast.

Wind speeds are of great concern for fire fighters and strongly influence all fire activity. Winds are generally caused by one of four methods. The first method is pressure gradient winds. These winds are caused by winds trying to equalize pressure between high and low pressure systems. An example of this is a cold frontal passage accompanied by gusty winds. These winds are typical of open grassy areas found across large portions of northern Cascade County. A second method for generating winds is by diurnal heating and cooling of the land. These winds are typically found in mountain or hilly areas where daytime upslope and nighttime down slope winds occur. These winds are usually lighter than pressure gradient winds but can be over-ridden by strong pressure gradient winds. The third method of producing wind is by outflow from thunderstorm activity. These winds can be very erratic as well as very gusty and can challenge all wildland fire suppression efforts and lead to fire fighter safety concerns as well as the potential for large wildland fire growth. The fourth method is primarily a winter phenomena with strong to very strong lee slope winds.

The normal summer weather pattern for central Montana can best be understood by looking at the larger weather pattern for the entire western United States. The Bermuda High located in the Caribbean and Gulf of Mexico makes its way across Texas and New Mexico by July and cuts off a supply of low-level moisture from the Gulf of Mexico to the plains of North America. This cause's general thunderstorm activity to decrease across central Montana as the low level moisture diminishes. This allows the lower atmosphere to dry with a corresponding lowering of humidity values. This is timed with the development of a high-pressure system that sets up across Montana with subsidence within the high-pressure system that dries the atmosphere. This subsidence does two things; it brings very warm temperatures (95-110) to the area and it significantly lowers the relative humidity values. During this time overnight humidity recovery becomes poor allowing the drying of fuels of all size classes (1 hour, 10 hour, 100 hour, and 1000 hour plus time lag fuels). The 1-100 hours time lag fuels will show evidence of drying within 3-5 days. The 1000 hours fuels will take significantly longer to dry, usually in the 3-5 weeks range.

The typical fire season in central Montana is from early spring into the fall or early winter or from March through November. Spring, before green-up, can be a time of large fire growth as dry residual winter cured fuels combined with gusty winds pose a threat of large fires. Moisture in the spring provides for fuel growth and is a time for prescribed fire activity. As the season turns to summer, the amount of moisture from thunderstorms taper off while grasses and shrubs begin to lose their live fuel moisture, down fuels begin to dry, and fire conditions normally peak by late August. As autumn approaches, conditions generally begin to cool and killing frost begins to affect fuels. Dry cold frontal passages become common and can promote conditions of extreme fire behavior especially when accompanied by very strong winds. Late fall conditions in late October and November mark the transition into winter, but again, dry cold

frontal passages at this time of year and the lack of snow pack can lead to conditions of rapid fire growth and high intensity fire behavior during wind events.

Climatic seasonal changes can influence fire behavior as well. Winter months of December through February are generally non-fire months, but snow pack accumulations can be a key factor in potential fire activity for any given fire season. In the last half of the 20th century, spring seasons (April through June) were generally moist months with low fire frequencies. The ignitions that did occur resulted in mostly low intensity fires. Since 1988, the weather patterns have been changing to a warmer and dryer cycle resulting in extended fire seasons; spring months no longer can be counted on as a low fire period of the year. Long-term drought conditions have increased the fire complexity in central Montana and Cascade County and it is not unusual for significant pre green-up fires to occur in the early spring.

Moisture regimes in the spring and summer can be defined in terms of storm tracks, which typically move across the county from southwest to east. The storm track affecting the analysis area starts along the western or southern edges of Cascade County and tracks northeastward across the county before moving out onto the eastern plains of Montana. Significant moisture associated with these storm tracks will be higher in April and May and will trend downward in June with mainly dry thunderstorms expected in July and August. Thunderstorm activity is possible in September and early October but at a much-reduced rate compared to early spring.

Winters have been mild for the past few years with a pronounced drought that affected large portions of the Northern Rockies. Winter and spring snow events have been fewer with less snow accumulating over the mountains with streams and rivers flowing at or near record low levels. In addition, subsurface moisture continued to be short helping to stress vegetation of all types. Bug kill has spread across large portions of the Northern Rockies and forested areas of Cascade County over the past few drought years providing standing dead fuels for potential large fires. The winter of 2005-2006 continued this trend with warmer than normal conditions along with drier than normal moisture however several spring storm systems in March and April 2006 have provided much needed widespread moisture across large portions of Montana. While this moisture has helped the agriculture community and helped replenish surface and subsurface moisture with near normal streams and reservoirs, the long-term drought continues to pose potential large fire problems in the larger fuel types.

The higher elevations in the Little Belt Mountains of southern Cascade County provide the orographic lifting that results in more moisture to this forested area with a corresponding increase in thunderstorm activity. Heavy lightning activity associated with these storms contributes to a significant number of fire starts along the storm's path especially in late July and August. Dry lightning events increase during this period with these thunderstorms often producing strong down draft winds with little if any rain. These storms can be several miles wide at their bases with lightning expected anywhere within a 40-50 mile radius of the storms.

A review of the fire history for Cascade County for the years 1980-2005 showed the following:

1. Average maximum temperature warmest in July and August.
2. Average wind speed was strongest in winter, early spring and late fall. During the summer winds are moderate with the higher winds over open ground and from a westerly direction. Wind gusts during the summer were strongest from thunderstorm outflow winds.
3. August is consistently the driest month with weather records showing poor nighttime relative humidity recovery. During the day light hours the relative humidity begins to drop substantially beginning at 0900 and remains low until 2100. These lows bottom at the lower teens around 1700-1800. In reviewing the weather history, there are also days in August where relative humidity values remained low for multiple twenty-four hour periods.
4. Moisture events did occur in August, but were limited in location, content and duration. The remnants of these events kept the maximum relative humidity high in that particular area for a period of seven days after initiation.
5. Continued drought conditions have begun to modify but have stressed large fuels.
6. Drought stressed conifer stands contributed to large fire spread, where high fire intensities did not allow for aggressive initial attack or fire suppression with ground forces due to safety concerns.

7. Lightning occurrence usually begins in April with the heaviest occurrence in May and June. Dry Lightning is most prevalent July and August.

Tabular conditions of temperature, humidity, precipitation and winds are listed below. Caution should be used with the November data as the sample period is limited. These conditions are more typical of mountain locations while warmer temperatures, lower humidity valued and stronger winds can be expected over open areas.

Cascade County		Years	1980-2005						
Temp	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**
Max	38.2	38.7	73	75	74.8	72	75.5	61	36.2
Avg	24.1	35.3	46	54.8	66.9	66.9	59.1	40.9	33.6
Min	21.3	32.1	42.8	50.5	42	58.1	50.7	35.6	28.3
RH	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**
Max	79.5	63.4	56.8	57	91	49.3	68.1	61.5	84.8
Avg	72.9	62.9	52.6	49.5	34.6	33.2	37.5	54.4	60.1
Min	38.8	62.5	18	21.7	23.6	21.2	21.6	24	45
Pcpn	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**
Max	2.72	3.15	5.15	6.55	9.07	5.66	2.07	2.7	0.87
Avg	2.72	2.61	3.24	4.49	2.54	2.38	1.21	1.63	0.87
Min	2.72	2.08	2.01	3.03	0.23	0.3	0.35	0.91	0.87
Wind	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**
Max	17.2	13.6	12.2	15.8	13.6	11.9	15.9	15.7	15.5
Avg	14.8	11.9	10.9	11.1	9.8	9.9	11.1	13.3	13.6
Min	14.3	10.2	5	6.4	5.3	6.6	7.1	8	12.5

4.2. Population, Demographics

Population and demographics information was derived from the 2000 Census. The population for Cascade County was 80,357. The population of Great Falls is 56,690. In the county the population was spread out with 26.00% under the age of 18, 9.10% from 18 to 24, 28.10% from 25 to 44, 22.80% from 45 to 64, and 14.00% who were 65 years of age or older. The median age was 37 years. While these demographics don't indicate the population is aging, the demographics of Neihart indicate that the population over the age of 65 is a significant concern. Because of the aging population in the county's smaller communities and the fact that the majority of the county's younger residents must commute to Great Falls to find work, there is a significant problem in recruiting and retaining volunteer fire fighters for the county fire departments.

4.3. Infrastructure: Roads, Driveways, Utilities, Communication, and Water Supply

Interstate 15 bisects Cascade County from the southwest to Great Falls, and then exits the county to the northwest. Montana Highways 87, 89, and 200 are other primary highways that provide access throughout the county. Cascade County maintains an extensive network of paved and graveled roads that can be utilized to provide access for fire suppression activities.

There are significant access problems for fire departments in the Monarch FSA and Dearborn FSA response areas.

Burlington Northern Santa Fe Railroad tracks generally follow Highway 87 through the county and have a significant amount of rail traffic which has the potential to start wildland fires.

Large propane tanks are located throughout Cascade County at ranch and home sites. In the Great Falls area, Energy West provides natural gas services.

Electric transmission lines and distribution power lines along with telephone lines and railroad signal lines are concentrated along Highway 87 and local distribution lines to some populated areas. Northwestern Energy and the Sun River Electric Cooperative provide electrical power to the county.

Qwest, Chinook Wireless, 3 Rivers Communications provide telephone service to Cascade County.

Cellular phone service is generally available; however, there are areas within the county that do not have cellular phone service. Cellular phone service is provided Verizon, Altel, and Chinook Wireless.

There are municipal water systems serving the City of Great Falls, Belt, Neihart, Cascade and Ulm. In the County, there is limited developed water supply and water tenders must transport fire protection water to the fire scene. Stock ponds and creeks are available at times for a water supply point, but during periods of extended drought, water is a premium to ranchers.

Radio communication for Cascade County Fire Departments is generally very good except for some areas of Sand Coulee, Stockett, Monarch, Neihart and Vaughn.

4.4. Emergency Services

Emergency services within Cascade County include fire protection, emergency medical services including ambulance transportation, law enforcement, and emergency preparedness.

4.4.1. Fire Protection

There is a mixture of fire protection organizations providing fire services to Cascade County. These include Great Falls Fire/Rescue, Belt City FD, and Neihart FD (MCA 7-33-4101-4133); Belt Rural Fire District (RFD) (MCA 7-33-2101-2129); Fort Shaw FSA, Vaugh FSA, Black Eagle FSA, Cascade FSA, Gore Hill FSA, Monarch FSA, Sand Coulee FSA, Stockett FSA, Sun River FSA, Ulm FSA, Simms FSA, Dearborn FSA, Cascade Farmer/Rancher FSA, (MCA 7-33-2401-2405); Cascade County Fire Department (MCA 7-33-2201-2211); MT Department of Natural Resources and Conservation Direct Protection and County Cooperative Program; Lewis and Clark National Forest and Bureau of Land Management. The Montana Air National Guard has a fire department located at the Great Falls International Airport and the Malmstrom Air Force Base has a fire department located at the Air Force Base in Great Falls.

Wildland fire protection is provided by all of the above fire entities under the direction of the county fire warden with various fire suppression resources throughout the County under the Cascade County Co-Op plan. The wildland fire apparatus is located strategically throughout the county (See Figure 5 and Fire Resources Map in Map Section 10.5).

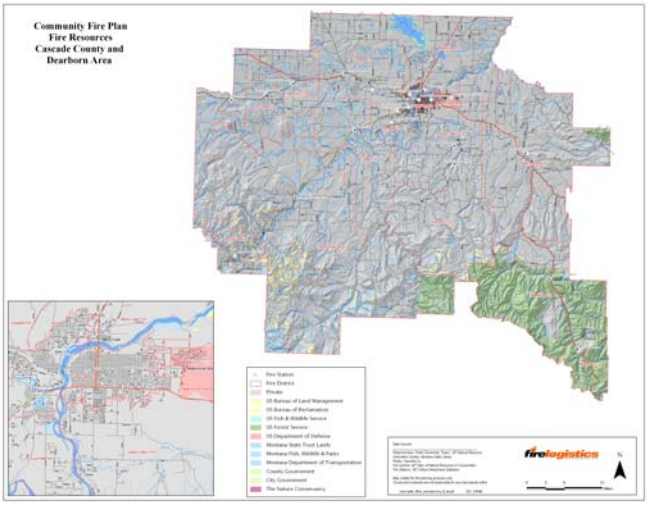


Figure 5

As a “Coop County,” if a wildland fire exceeds or threatens to exceed Cascade County’s capability and the county is fully committed to a wildland fire, the county can request assistance from Montana DNRC at no cost to the county. As part of the county equipment, Cascade County furnishes water tenders, dozers and

motor graders from the County Road & Bridge Department for wildland fire suppression efforts in the county.

Cascade County is within the Central Land Office (CLO) of Montana DNRC's geographic area. When State assistance is requested the CLO provides additional resources such as air tankers, helicopters, single engine air tankers and crews and overhead. During the fire season these resources may be committed to other incidents and may not be available.

The following photographs are representative examples of the fire protection facilities in Cascade County's fire protection system (See Figures 6-8).

Figure 6 Neihart FS

Figure 7 Vaughn FS

Figure 8 Great Falls Fire/Rescue FS # 4

4.4.1.1. Fire Engine Pump/Draft Source Sites

Water supply sources for wildland fire protection and structural fire protection throughout Cascade County are relatively scarce. They include rivers, creeks, stock ponds and the occasional water supply point, etc. Due to the long-term drought in Cascade County, most ranchers would not authorize fire protection entities to utilize their scarce water resources for fire protection. As a result during this extended drought period, water supply sources need to be delivered to the fire, through fire apparatus such as water tenders. There is no map of the water sources in the county.

4.4.1.2. Training, Certification, and Qualification

All incidents require different skill levels of incident management personnel. To assist in assigning appropriate incident commanders to wildland fire incidents, an incident analysis can be used as a guide to identify and mitigate certain complexity and safety issues by selecting a different strategy, tactic, or higher qualifications of incident command personnel. Certain assumptions are made in this analysis:

- As an incident becomes more complex, the need for more competent incident management personnel, an incident management team or organization increases.
- To facilitate assembling an efficient and effective organization, key managers should be involved during the early stages of the complexity analysis; this should include federal, state, and local partners.
- The incident analysis is not a cure-all for the decision process; local fire history, current fire conditions, and management experience must be considered.

All wildland fires, regardless of size, must have an assigned Incident Commander (IC). The training, certification and qualifications of the Incident Commander (IC) vary by the type, size and complexity of fire. General guidance is:

Type 5 Incident

- Resources required typically vary from two to six fire fighters
- The incident is generally contained within the first burning period and often within a few hours after resources arrive on scene.

Type 4 Incident

- Command staff and general staff functions are not activated.
- Resources vary from a single resource to several resources.
- The incident is usually limited to one operational period in the control phase.
- No written incident action plan (IAP) is required. However a documented operational briefing will be completed for all incoming resources (See Briefing Checklist – Incident Response Pocket Guide).

Type 3 Incident

- In-briefings and out-briefings are more formal.
- Some or all of the command and general staff positions may be activated, usually at the division/group supervisor and/or unit leader level.
- Type 3 organizations manage initial attack fires with a significant number of resources, an extended attack fire until containment/control is achieved, or an escaped fire until a Type 1 or Type 2 team assumes command.
- Resources vary from several resources to several task forces or strike teams.
- The incident may be divided into divisions.
- The incident may involve multiple operational periods prior to control, which may require a written IAP.
- A documented operational briefing will be completed for all incoming resources and before each operational period. See Briefing Checklist in Resources Section.
- Staging areas or an incident base may be used.

By completing an Incident Complexity Analysis, a fire county fire warden can assess the hazards and complexities of an incident and determine the specific incident management positions needed (See Northern Rockies Incident Organizer in Resources Section 10.4).

Required training, experience and prerequisites for various wildland fire management positions are contained in PMS 310-1 (Wildland and Prescribed Fire Qualification System Guide). PMS 310-1 has been adopted by the Northern Rockies Coordinating Group (NRCG) and, consequently, applies to all wildland fire fighting personnel in the state of Montana and Cascade County for mobilization outside of the county. Within the County, local standards would apply.

The United States Fire Administration and the National Fire Protection Association conducted a needs assessment of the fire service in the United States; one of the findings was that only 26% of the fire departments in the US can handle a wildland-urban interface fire affecting 500 acres with local trained personnel.[9] The Cascade County fire departments are in those very few fire departments in Montana that can manage such an incident.

4.4.2. Law Enforcement

The Cascade County Sheriff's Department, Great Falls Police Department, and the Belt Police Department provide law enforcement and evacuation services to the city and county. Due to limited resources in the Sheriff's Department, a significant evacuation during a wildland-urban interface fire will be a challenge.

4.4.3. Emergency Management

County emergency preparedness comes under the office of the Cascade County Disaster and Emergency Services.

Cascade County Disaster Emergency Services has mutual aid agreements with surrounding counties and these have recently been updated.

4.5. Insurance Ratings

The insurance premiums that residential and commercial customers pay are based on a rating system established by the Insurance Services Office (ISO). In its evaluation of a community, ISO considers the water system and the fire protection provided by the fire department. The relative weight of the components is:

Water Supply	-	50
Fire Department	-	40
Fire Dispatch	-	10

The ISO rating system produces ten different Public Protection Classifications, with Class 1 receiving the most insurance rate recognition and Class 10 receiving no recognition.[10] **A split rating such as Class 6/9 & 10 means that a department is rated as a Class 6 within 1,000 feet of a fire hydrant or certified water point, a Class 9 when over a 1,000 feet from a hydrant and within 5 miles of a fire station, and a Class 10 rating applies when the insured is more than 5 road miles from a fire station.**

The majority of Cascade County currently has an ISO rating of Class 10. However, the county's fire departments have worked to lower their ISO ratings. Individual fire departments ratings are listed in the following table:

[9] A Needs Assessment of the U.S. Fire Service, USFS & NFPA, 2002

[8] *Fire Protection Handbook,* NFPA 1997

Insurance Services Office Ratings of Fire Departments	
Department	**Rating**
Great Falls Fire/Rescue	Class 3
Belt City FD	Class 7
Belt Rural FD	Class 8/9/10
Black Eagle FSA	Class 7/8/9
Cascade FSA	Class 7/9
Fort Shaw FSA	Class 8
Gore Hill FSA	Class 6/8
Monarch FSA	Class 9
Neihart FD	Class 7/9
Sand Coulee FSA	Class 9
Stockett FSA	Class 10
Sun River FSA	Class 8/9
Ulm FSA	Class 8
Vaughn FSA	Class 6/9
Simms FSA	Class 8/9
Dearborn FSA	Class 9
Farmer-Rancher FSA	Class 10
Malmstrom AFB FD	Class 5

Improvements to the water delivery system, dispatch and the fire departments could improve the ISO rating for the individual fire protection agencies. This would result in potential annual insurance premium savings to the fire department's customers, e.g., home and business owners. It is important to note that some insurance companies will not insure structures that are outside of 5 road miles from a fire station.

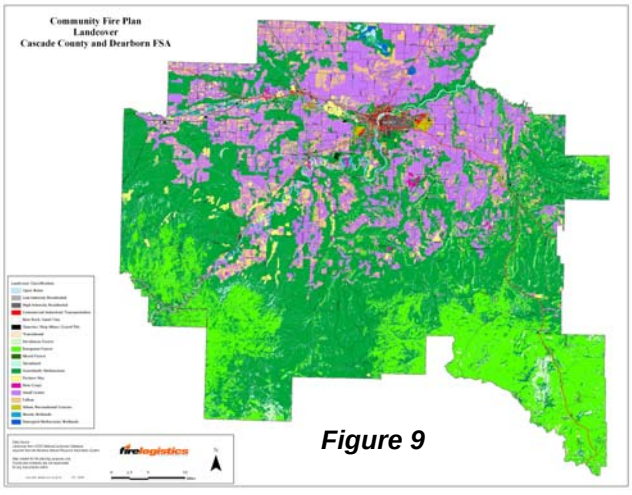


Figure 9

4.6. Land Use/Development Trends

The majority of land use in Cascade County is agricultural based (See Figure 9 and Land Cover Map in Map Section 10.5).

Currently new land development is at a slower pace than in the late 1990's, however, the Cascade County Planning Department processed 32 subdivisions in 2005. These subdivisions resulted in the development of 94 additional tracts of land in the County. It seems likely that development will continue to occur and may increase as the prices of real estate continue to escalate in the major markets of Southwest and Western Montana.

4.7. Air Quality

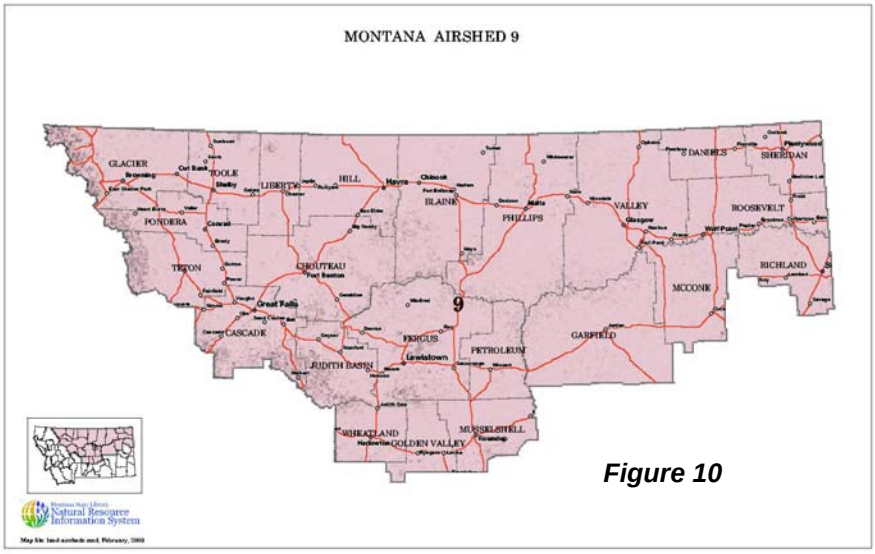


Figure 10

The State of Montana's air quality is managed by the Montana State Airshed Group through the Department of Environmental Quality. Cascade County is located in Airshed 9, see Figure 10. Generally, open burning is permitted year around in the eastern Montana opening burning zone (Airsheds 9 and 10), during December, January, and February the DEQ needs to be notified by telephone of agricultural open burning or a prescribed fire. In most cases this approval can be obtained for any proposed open burning in the eastern Montana zone because of good smoke dispersal and the lack of significant air quality issues such as the valley inversions experienced in western Montana.

4.8 Summary

The impacts of the elements of the community have on the wildland fire program and the delivery of wildland fire fighting services in Cascade County is summarized in Table 4.8.1.

Table 4.8.1

Element	Summary of Impact on Cascade County's Wildland Fire Program
Topography, Slope, Aspect, Elevation	Accessibility
	Increased rates of spread
Meteorology, Climate, Precipitation and Fire Weather	Accessibility of water supplies
	Increased number of high fire danger days
	Increased flammability of fuels
Population, Demographics	Reduced availability of volunteers
	Reduced availability of skills and experience
	Need for increased recruitment and training
	Need for fire protection planning
Infrastructure	Reduced accessibility
Fire Protection	High cost wildland-urban interface fires
Fire Engine Pump/Draft Source Sites	Accessibility of water supplies
	Increased damage
Training, Certification, and Qualification	Availability of personnel
	Financial Constraints
	Mitigate potential liability
Law Enforcement	Capacity to deliver evacuation services, security
Insurance Ratings	Predictor of service capability
	Increase or decrease in insurance premiums paid by customers
Land Use/Development Trends	Change of fire protection risk profiles
Air Quality	Ability to conduct prescribed burns

5. Current Fire Environment

The following narratives describe the current fire environment in Cascade County. These perspectives are a result of an on the ground tour conducted by Cascade County Fire Warden and Fire Logistics, Inc. personnel in October of 2005.

5.1. Wildfire Problem Definition

The Conservation Reserve Program (CRP) land and with the change of agricultural practices, i.e. no-till farming, have created a significant wildland fire problem in parts of the county. As stated in Chapter 4, Cascade County does have areas of forested land. Ponderosa pine and scattered juniper is the dominant conifer through the largest portion of the forested land in the county. However, the areas within the Highwood and Little Belt Mountains contain continuous stands of multi-storied Douglas fir, Lodgepole pine and sub-alpine fir. As will be discussed in the next section, these conifer species is a fire prone ecosystem is subject to repeated wildland fires. The impacts of those frequent fires can be quite variable depending on the values at risk (See Figure 11).

Figure 11

Currently, Cascade County fire departments are responsible for wildland protection on the state and private lands within Cascade County. The Bureau of Land Management and the United States Forest Service are responsible for providing wildland fire protection on federal lands within Cascade County.

An analysis of the placement of wildland engines through out Cascade County indicates that there are wildland engines generally located throughout the areas of the county where fire occurrence is the highest and where there is a willing host (typically a rancher or resident) who will make a commitment to attending required training and respond to wildland fires in the areas and throughout the county.

Figure 12

5.2. Wildland-Urban Interface

During the past several fire seasons of 2000 through 2003 it has become evident that wildland-urban interface fire losses have increased throughout the Western United States (See Figure 12). The expectation under the Federal Fire Policy is "that losses will increase in the future."[11]

The wildland-urban interface is defined as the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.[12] Similar terms are wildland/residential interface

[11] *Federal Fire Policy, 2001*
[12] *Ibid.*

and wildland-urban intermix. For the purposes of this CWPP, "the wildland-urban interface is defined as a group of homes and other structures with basic infrastructure and services within or adjacent to Federal land; in which conditions are conducive to a large scale wildfire event; and for which a significant threat to human life or property exists as a result of a wildland fire disturbance event."[13]

From a fire fighter's perspective there are nine Wildland-Urban Interface "Watchout" Situations that are significant to the safety of wildland fire fighters:

- Wooden construction and wood shake roofs
- Poor access and narrow congested one-way roads
- Inadequate water supply
- Natural fuels closer than 30 feet to structures
- Extreme fire behavior
- Strong winds
- Need to evacuate the public
- Structures located in chimneys, box or narrow canyons, or on steep slopes in flashy fuels
- Inadequate bridge load limits

Cascade County communities that are listed in the Federal Register as "Communities at Risk" from wildland fire include:

Monarch
Neihart

There are several additional areas of wildland-urban interface within the county, which have been identified during this planning process (See Figure 13 and Wildland-Urban Interface Area Map in Map Section 10.5).

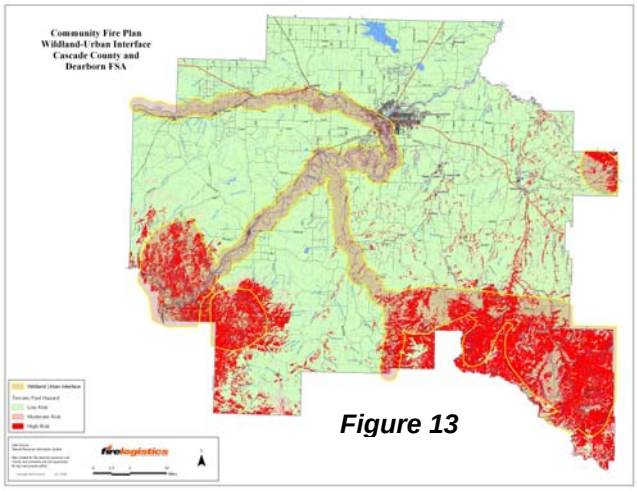


Figure 13

Additional areas of wildland-urban interface in Cascade County include:

Dearborn Area, including Cooper Ranch & Stickney Creek
Hardy - Missouri River Corridor
Logging Creek Area
Southwest side of the Highwood Mountains, adjacent to National Forest
Missouri, Sun, & Smith River Corridors

The current and potential development of portions of Cascade County into residential lots of varying sizes will contribute to the wildland-urban interface fire problem for the fire protection agencies in the county. This leads to several complex problems, which need to be addressed in the CWPP:

- Access
- Asset Protection Zones
- Water Supply
- Building Construction Requirements
- Fuel Reduction On All Ownerships
- Long term affects to fuels as a result of long term drought
- Insect and disease mortality in the mature conifer stands
- High costs of wildland fires when the structure protection resources need to be acquired from other areas of the state.
- Kinds And Types Of Fire Apparatus Required For Fire Protection

[13] Healthy Forest Restoration Act

5.3. Structure Fire Problem Definition

Currently, Great Falls Fire/Rescue, Belt City FD, and Neihart FD have fire protection responsibilities for all structure protection within the incorporated city limits. Great Falls Fire/Rescue contracts for fire protection with 16 rural fire districts, surrounding the City of Great Falls and provides fire protection to these fire districts. These departments plus the Belt Rural Fire District, Black Eagle FSA, Cascade FSA, Fort Shaw FSA, Gore Hill FSA, Monarch FSA, Sand Coulee FSA, Stockett FSA, Sun River FSA, Ulm FSA, Vaughn FSA, Simms FSA, Dearborn FSA, Farmer & Rancher FSA, Montana Air National Guard FD, and Malmstrom AFB FD provide structure protection for structures within the county.

The best way to quantify the structure fire problem in the Cascade County outside of the city limits of Great Falls is to conduct an occupancy risk assessment, which evaluates the severity of a specific structure in relation to the fire districts ability to handle the types and severity of emergencies with that structure.[14] Risk categories used in the Self-Assessment Manual developed by the International Commission on Fire Accreditation are: [15]

Category	Description
Maximum/Worst Risk	Occupancies classified as maximum risk will be of substantial size and contain a concentration of properties, which present a very high risk of life loss, loss of economic value to the community or large loss damage to property in the event of a fire. These risks impact the need for the fire department to have multiple alarm capability and have an adequate assessment of their ability to concentrate resources.
High Hazard/Key Risk	Built-up areas of substantial size with a concentration of property presenting a substantial risk of life loss, severe financial impact on the community or unusual potential damage to property in the event of fire.
Moderate/Typical Risk	Built up areas of average size, where the risk of life loss or damage to the property in the event of a fire in a single occupancy is usually limited to the occupants. In certain areas, such as small apartment complexes, the risk of death or injury may be relatively high. The moderate/typical risks are often the greatest factor in determining fire station locations and staffing due to the frequency of emergencies in this category. To assure an equitable response and to provide adequate initial attack/rescue capability to the majority of incidents, the typical risk is often used in determining needed resources.

Figure 14
Maximum/Worst Risk

Cascade County fire agencies have similar risks located throughout the county (See Figures 14-16). A heavy commitment of mutual aid resources and long duration incidents are required for incidents in these maximum/worst risks.

Figure 15 High Hazard/Key

[14] *Fire and Emergency Service Self-Assessment Manual, Commission on Fire Accreditation International, 6th ed.*
[15] *Ibid*

Figure 16
Moderate/Typical Risk

The Commission on Fire Accreditation International, *Fire and Emergency Service Self-Assessment Manual* outlines the needed staffing levels for incidents occurring in the different types of risk occupancies, which are detailed in the following table.[16]

Task	Maximum/ Worst Risk	High Risk	Moderate Risk	Low Risk
Attack Line	4 (16-18*)	4	2	2
Search and Rescue	4	2	2	
Ventilation	4	2	2	
Back-up-Line	2	3	3	
Pump Operator	1	1	1	1
Water Supply	1	1	1	
Utilities Support	1	1	1	
Command/Safety	2	2	1	1#
Forcible Entry	*			
Accountability	1			
Salvage	*			
Overhaul	*			
Communication	1*			
Chief's Aid	1	1		
Operations Officer	1			
Administration	1			
Logistics	*			
Planning		1*		
Staging		1*		
Rehabilitation	1			
Sector Officers	1-4*			
High-Rise Evacuation	10-30*			
Stairwell Support	10*			
Relief	*			
Investigation	*			
TOTALS	25-65*	17	13	3-4

Can often be handled by the first due officer.
* At maximum and high-risk fires, additional fire fighting personnel are needed

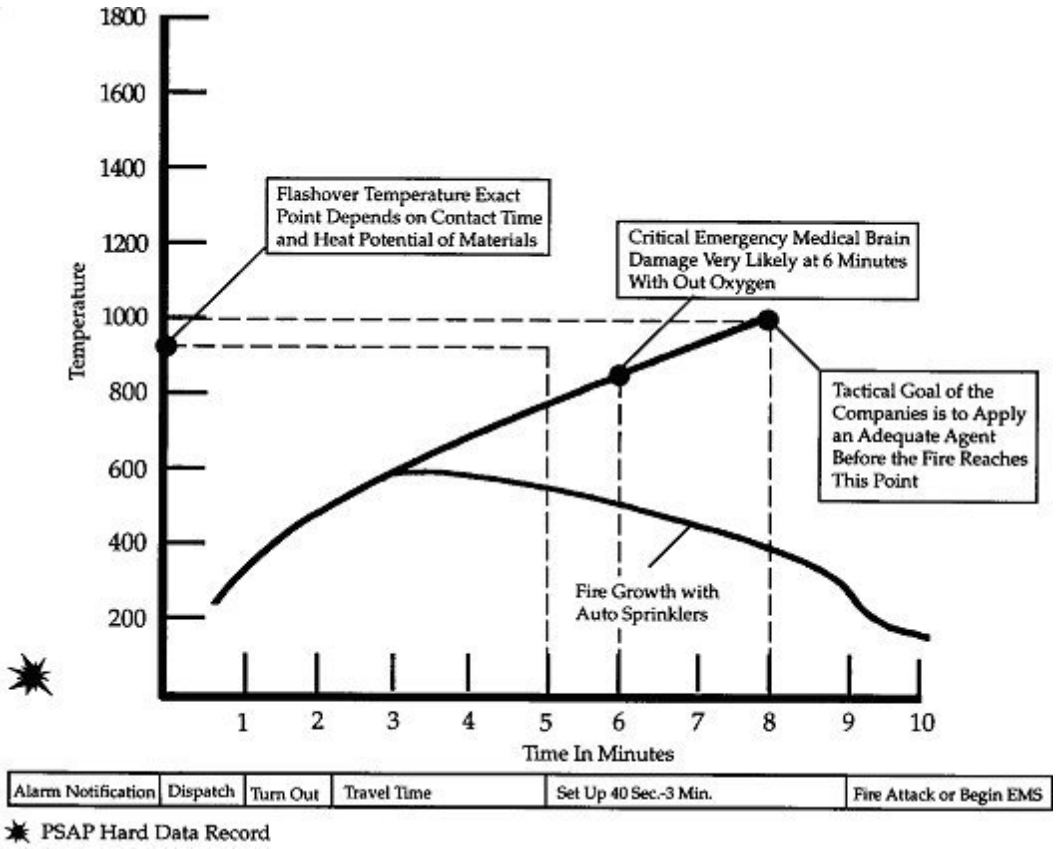
Structural fire suppression whether in a rural environment or in one of our cities requires the accomplishment of the above listed tasks, many of which must occur almost simultaneously to ensure effective and safe operations at the incident scene. To ensure an effective fire fighting force on the scene of significant fires in these kinds of risks, current staffing levels need to be augmented with paid-call fire fighters, volunteers and mutual aid from other fire departments.

A principal difference between rural fire departments and their municipal counterparts is that the rural departments must typically solve water supply issues, in addition to fighting the fire. Typical rural

[16] *Fire and Emergency Service Self-Assessment Manual, Commission on Fire Accreditation International, 6th ed.*

departments incorporate water tenders, portable tanks, draft points, etc. into their fire protection strategies for rural areas of Cascade County.

To be minimally effective in controlling a structure fire, the initial responding apparatus should reach the scene of the structural fire before "flashover" occurs.[17] The time from ignition to flashover varies based on the materials involved in the fire, but generally occurs somewhere between 4 and 10 minutes. The following chart illustrates the relationship between the response time or reflex time and flashover and/or critical brain damage in an EMS incident.



The Significance of Flashover

Pre-Flashover	*Post-Flashover*
Limited to one room	May spread beyond the room of origin
Requires smaller attack streams	Requires more larger attack lines
Search & Rescue is easier	Search and Rescue is difficult
Initial assignment can handle	Requires additional fire companies

For municipal departments in small and medium sized cities, all of the first alarm apparatus will not arrive at the fire scene simultaneously. For the departments in Cascade County, the typical scenario requires the volunteer fire fighters to be paged, the fire fighters either respond to the station or directly to the incident, if they respond to the station, then they don their personal protective equipment, board the apparatus and respond to the scene of the incident.

[17] Evaluation & Planning of Public Fire Protection, John Granito

There is currently a written mutual aid agreement between all of the fire agencies in Cascade County. In Cascade County, as in many areas of the country, fire services agencies are now transcending the traditional fire service hierarchy and geopolitical boundaries to meet increased service demands and reduce expenditures.[18]

5.4. Local Fire Ecology

The fire ecology of the forest and grassland habitat types is an integral part of the changing dynamics of the fuel conditions. By understanding fire's role within these plant communities coupled with the knowledge of the extent of the conservation reserve program (CRP) and potential subdivision development, one can further understand the present day risks.

A method of placing various forest and grassland habitats type into fire groups is commonly used to determine response of vegetation to fire and the path certain species take during succession. Fire groups describe the natural role of fire following a sequence from low to high elevation vegetative categories (Fisher, et. al. 1983). They paint an average picture of fire intensities and frequencies, and describe the natural role of fire prior to active fire suppression efforts. Fire groups correlate directly to Pfister's Habitat Types of Montana (1977), in how they respond to fire disturbance, and are grouped in this analysis based on vegetation similarities.

FORESTED ECOLOGY

There are a number of conifer species that have adapted to the ecology of Cascade County, with the most prevalent timber type being ponderosa pine. In Cascade County, the ponderosa pine is generally found at the lower elevations within the county near the Missouri River. Douglas fir and lodge pole pine are present in the county, but located predominately found at higher elevations in the Highwood Mountains and Little Belt Mountain. Some scattered stand can be found predominantly in sheltered, northern aspects, where moisture regimes support these conifer species.

The ponderosa pine type is a fire adapted tree species that has developed natural mechanisms to cope with frequent fire. It has a thick corky bark that insulates the tree's cambium from heat generated by wildland fires. The cambium is the living layer of cells between the bark and the woody portion of the tree stem and is responsible for the growth of both new wood and new bark. Ponderosa pine can be found on isolated dry sites such as those found in Cascade County. Because of the frequency of lightning storms in the county, it is estimated that fire burned in and under most of the natural pine stands at a 10-20 year interval and less than that in some areas. Because of this frequency fuel loadings were traditionally low in the stands as dead branch wood and needle litter were consumed during these fire events. The fires also tended to thin out patches of heavy regeneration that resulted from good cone crop years and favorable moisture conditions. The fires kept the density of trees lower by selectively killing some of the thinly barked seedlings and smaller individual trees. The trees that did survive had a greater supply of nutrients and water to nourish them and were stronger and healthier. In the absence of the heavy fuel loadings, periodic low intensity fires would have had no significant impacts on the older trees that remained.

Since the advent of fire protection, however, the situation has changed considerably. The natural litter occurring from the trees in these stands has accumulated for decades. In most areas there are many more trees per acre, resulting in multi storied stands of conifers then there would have been historically. These multi storied stands result, in situations where continuous fuel exists from the ground to the crowns of mature trees (ladder fuels). This results when too many seedlings survive and, because of intense competition for water and nutrients, form overcrowded pockets of spindly trees. These trees will survive to intermediate heights with many of them bent or broken by snow loads.

Today, when a wildland fire occurs it is much more likely to have greater negative consequence. The

[18] Klamath County Fire District No. 1 Deployment Process, 2000

higher fire intensity caused by a greater amount of fuel, results in an increased amount of heat. This increased heat can have adverse effects on the soil and, subsequently, the productivity of the site. Higher intensity fires are also more difficult to keep away from improvements landowners and fire fighters wish to protect. Most importantly, they increase the risk to fire fighters.

Four timber fire groups are represented in Cascade County: Dry ponderosa pine, Cool Dry Douglas fir, Moist Douglas fir and cool habitats dominated by lodgepole pine. The following will describe the fire ecology of each type and how fire plays a role.

Warm, Dry Ponderosa Pine

Figure 17

This Group consists of ponderosa pine stands with predominantly grass undergrowth. Dense ponderosa pine understories often develop beneath scattered overstory trees on some Group Two sites. Fires that start in such stands often burn vigorously in the crowns of the under story trees. Consequently, fast spreading, severe fires result despite relatively light down and dead fuel loadings (See Figure 17).

Numerous fire history studies conducted in the ponderosa pine forest types throughout the western states have shown fire to have been a frequent event, occurring at intervals from 5 to 25 years in most locations. These low intensity surface fires maintained a more open stand of trees and removed much of the under story helping to prevent the development of a stand destroying crown fire. Successful fire control during the 20th century has undoubtedly affected some Group Two stands. A primary effect is the increased presence of two-storied stands on some sites where the under story is a dense stand of pole-sized or larger trees. When fire control eventually fails in such stands, large, severe fires often result. An example or representation of this group is timber stands that are present lower elevations along the southern exposes of the Missouri River corridor.

Warm, Moist Ponderosa Pine

Fire Group Three ponderosa pine stands are moister and slightly cooler than those of Group Two. Group Three stands are usually found in ravines or on north slopes. Live fuels in the form of dense dog hair thickets of ponderosa pine saplings create a definite fire hazard in Group Three stands. The tendency toward multistoried stands results in a high probability of crown fires. An example or representation of this group, are those stands within the ravines and north aspect within the area adjacent to the fire group two, but are located in area where moisture from snow or rain tends to collect.

Warm, Dry Douglas-Fir

Group Four consists of Douglas-fir habitat types where ponderosa pine usually occurs as a major seral or climax associate especially at lower elevations. Dense thickets of Douglas-fir regeneration may become established during fire free periods. Overstories become susceptible to stand-destroying crown fire when such situations are allowed to develop in the under story. Historic fire frequency in Group Four habitat types probably was not very different from that of Group Two- that is, 5 to 20 or more years between fires. Successful suppression of surface fires in open, fire-maintained stands over the last few decades has altered the sites toward a more flammable condition that has increased the fire potential. This group is located in the more sheltered ravines and draws in the Coopers Ranch and surrounding area.

Cool Dry Douglas fir


Figure 18

This group exists on dry sites that are generally too dry for lodgepole pine and too cold for ponderosa pine. Rocky Mountain Juniper, limber pine, and sub-alpine fir can be found as minor species within these stands. This fire group includes big sagebrush, common juniper, wax currant, russet buffaloberry, white spirea, and mountain snowberry (See Figure 18).

Downed dead fuel loads for this group average 10 tons/acre. While downed, dead woody fuel loading can, at times, be significant, live fuels are less of a problem, due to the harsh site conditions. This factor plus the usual open nature of these stands results in a low probability of a crown fire. Individual trees will often have branches close to the ground and if sufficient ground fuels are available, torching can occur.

The role of fire in this fire group is not well defined. Fire probably occurred less frequently than in the warmer Douglas fir habitat types. The relatively light fuel load, sparse undergrowth, and generally open nature of the stands would appear to favor a long fire-free interval. However, fire history studies have estimated a fire interval of 35 to 40 years (Arno and Gruell, 1983).

Fire plays an important role in favoring ponderosa pine within this group. Without fire, Douglas fir would slowly replace ponderosa pine. Fire's role in seedbed preparation on most of these fire group sites is confounded by the difficulty of regeneration beyond the seedling stage on these droughty sites because of undergrowth and overstory competition. Where dense regeneration does occur, fire probably played a role as a thinning agent in sapling and pole-sized stands. Ground fire probably maintains many mature stands in an open, park like condition. Many pre-settlement stands were actually scattered groves. Modern fire suppression has allowed these groves to become more dense forest stands.

Opportunities for wildland fire use may be limited in some stands in this group, due to the normally sparse fuels. Where sufficient surface fuels exist, prescribed fire can be used to accomplish timber, range and wildlife management objectives.

Fire can be used following timber harvest activities to prepare the seedbed and to reduce wildland fire hazards from the harvest related slash. Care needs to be taken in managing the fire intensity when prescribed burning in partial-cut stands. The hazard reduction objective in these situations should be only to remove the fine fuels. Burning under moist conditions is recommended.


Figure 19

Moist Douglas fir

This group exists at elevations ranging from 4,800 ft. to 7,200 ft. Douglas fir is both the indicated climax species and a vigorous member of seral communities. It is not uncommon for Douglas fir to dominate all stages of succession on these sites. Lodgepole pine is a major seral component in many stands. Whitebark pine is usually well represented at higher elevations (See Figure 19).

Shrubs and moist forbs dominate the

undergrowth along with pine grass, bear grass, and elk sedge. Common shrubs include ninebark, snowberry, white spirea, oceanspray, blue huckleberry, grouse whortleberry, kinnikinnick, twinflower, and common juniper.

Downed dead fuel loads average 13 tons/acre, but can often be much heavier. Fuel conditions will vary according to stand density and species composition. The most hazardous fuel conditions occur in well-stocked stands with dense Douglas fir understories. These stands are usually characterized by relatively large amounts of downed twigs and small branch wood less than 3 inches in diameter beneath partially fallen and standing dead sapling and small pole-sized stems.

The absence of a dense under story results in a reduced fire hazard. However, the density of overstory trees and the presence of dead branches near ground level, create ladder fuels leading to crown fire potential under severe burning conditions.

Fuel conditions in stands dominated by lodge pole pine tend to be less hazardous than in stands dominated by Douglas fir. Ladder fuels are much less prevalent, so the probability of fire going from the forest floor to the crown is not as great.

The tendency toward overstocking and the subsequent development of dense understories is the main reason for high-hazard fuel conditions in many of these stands. Fuel accumulation due to fire suppression, natural mortality, snow breakage, blow down and insect and disease mortality are at a high level in many stands. Relatively deep duff develops and contains a lot of rotten logs. Fires may often sit and smolder undetected in the duff until burning conditions become favorable for fire spread, resulting in a large acreage being burned.

Historically, fire was important as a thinning agent and as a stand replacement agent. Low to moderate severity fires converted dense pole-sized or larger stands to a fairly open condition. Subsequent light burning maintained stands in park like conditions. Severe fires probably occurred in dense, fuel-heavy stands and resulted in stand replacement. Fire's role as a seedbed-preparing agent is less important in this group than in dry Douglas fir.

Fire has a demonstrable effect on wildlife habitat through its effect on food plants. The combination of opening up stands by killing overstory trees, reducing competition by removing understories, and rejuvenation of sprouting plants through top kill, can significantly increase the availability of palatable browse and forage.

Fire's role as a stand replacement agent becomes more pronounced when the natural fire-free interval is increased through fire suppression, unless corresponding fuel reduction occurs. Stands within this group are quite variable depending on site conditions, stand history, and successional stages. Fire management considerations must, therefore, be attuned to this variation. Protection from unwanted fire may be a major fire management consideration in those stands where combinations of live and dead fuels result in severe fire behavior potential. It may be difficult and impractical to abate the fire hazard in such stands except in conjunction with a timber harvest operation. Pre-attack planning coupled with rapid detection and initial attack may be the only reasonable means to deal with this situation until such time as harvest operations can be scheduled. Examples of this group are located in the Highwood and Little Belt Mountain.

Cool Habitat Types/Lodgepole Pine

Fire group 7 contains two groups of habitat types. The first consists of lodgepole pine climax series habitat types that support essentially pure stands of lodgepole pine (See Figure 20). The second group consists of those Douglas fir, spruce, and subalpine fir habitat types that, regardless of potential climax species, are usually found in nature supporting lodgepole pine dominated stands. These stands seldom reach a near climax condition. Periodic wildfires seem to recycle the stand before a substantial amount of mature lodgepole pine dies out. Subalpine fir, spruce, Douglas fir and Whitebark pine occur in varying amounts with lodgepole pine in most of these habitat types.

Figure 20

Undergrowth in this group often consists of dense mats or layers of grasses or shrubs. The most common graminoid species are pinegrass, bluejoint, and elk sedge. Common shrubs include grouse whortleberry, blue huckleberry, dwarf huckleberry, myrtle whortleberry, twinflower, kinnikinnick, white spirea, bunchberry dogwood, snowberry, common juniper, bitterbrush, buffaloberry, and Oregon grape.

The average downed dead woody fuel load in this group is 15 tons/acre, but maximum loads may greatly exceed this value. This group's fuel load is characterized by relatively large amounts of material 3 inches and larger.

Live fuels in this group can be a problem. The primary live fuel consideration is related to the occurrence of dense patches or entire stands of young lodgepole pine with intermingled crowns and lower branches extending down to the surface fuels. When ignited under favorable burning conditions, such stands are can be destroyed in a few minutes.

Densely stocked, clean-boled trees characterize many mature stands with large amounts of deadfall on the forest floor. An immediate source of deadfall in a young lodgepole pine stand is the snags created by a previous fire.

The role of fire in the seral lodgepole pine forest is almost exclusively as the agent that perpetuates or renews lodgepole pine. Without periodic disturbance, the shade-tolerant species replaces the lodgepole pine because it does not regenerate well on duff or under shaded conditions. Fire interrupts the course of succession and increases the proportion of lodgepole with each burn. Within 50 to 100 years following a severe fire, a lodgepole pine forest will exist even though shrubs and herbaceous cover may become dominant immediately following the burn.

Large stand replacement fires play a definite role in the ecology of lodgepole pine forests. The natural range of fire in seral lodgepole pine stands runs from less than 100 years to about 500 years. The interval between any two fires in one area might be only a few years. Recurring cool fires may thin a stand or otherwise rejuvenate it without doing serious damage. Stands greater than 60 to 80 years old, however, become increasingly flammable due to overcrowding. Eventually an ignition sets off a major conflagration. In certain areas such a stand replacement fire can cover thousands of acres. Vast tracts of lodgepole can develop in this way as the serotinous cones open and shower the burn with seeds.

The exclusive dominance of lodgepole pine in the lodgepole community types is attributed in a large part to fire for the following reasons:

1. Historic repeated wildfires over large areas may eliminate seed sources of potential shade-tolerant competitors.
2. Light ground fires may remove invading shade-tolerant competitors from the under story.
3. Dense stands may prevent regeneration of all conifers for up to 200 years in the absence of disturbance or stand deterioration.
4. Sites may be unfavorable for the establishment of other conifers.

The primary fire management consideration in this group's habitat types is protection from unwanted fire during extended periods of drought and during severe fire weather conditions. Stand replacement fires at such times often crown and become catastrophic, resulting in complete stand mortality.

Opportunities for use of prescribed fire are limited in natural stands because of the low heat resistance of lodgepole pine, spruce and subalpine fir. The other problem is that burning during conditions that would allow for low fire intensities, make it difficult to sustain a prescribed fire in these stands.

Removal of the under story trees and brush and prudent thinning and limbing of the overstory with some prescribed underburning can reduce the fire hazard in all of these Fire Groups in the wildland/urban interface. Fire Ecology of Montana Forest Habitat Types East of the Continental Divide by Fisher and Clayton (1983) suggests management strategies to reduce the wildfire hazard in forested ecosystems. This fuel treatment method could help reduce or modify the expected fire behavior that will result from a wild land fire.

RANGELAND ECOLOGY

Rangeland and the ecology of the plant species that occupy these sites have their own relationship to wildland fire. The grass species can be a contributor to fire behavior, but can easily be modified through agricultural practices, such as grazing (Bunting, Kilgore, Bushey, 1987).

The sagebrush grass range is fairly extensive within the county. Silver Sagebrush is the predominate species and can dominate areas within the county. It is a noted sprouter but apparently can be controlled by fire in some areas of its range. Other authors refer to Silvertip Sagebrush as an occasional re-sprouter following fire. In some instances it re-sprouts vigorously following spring burns, but fall burns result in greater mortality and low vigor of sprouts.

Many species of nature grasses abound within the county. With proper range management practice these grasses provide outstanding grazing opportunities for range animals and wildlife. Areas of grasses that are absent from grazing find that over time they become rank and provide little for forage and present a significant danger from wildfire.

5.5. Hazardous Fuels

As displayed in fire regime condition class map the continuity of heavy fuels, i.e. Douglas fir, ponderosa pine, subalpine, and lodge pole pine is concentrated in the mountains surrounding the Missouri River Corridor, around the Dearborn River, the Highwood and Little Belt Mountains. Scattered stands of ponderosa pine and juniper dominate the wooded coulees interspersed between the agricultural tracts in Cascade County. There are areas of continuous coniferous fuels covering several thousand acres in size and these are the areas that have the greatest potential for supporting large intense fires. Fires may be terrain driven, plume dominated, or wind driven in this fuel type.

Areas of sage and brush species also have potential for large intense fires but they are less likely except under wind driven conditions. There are many thousands of acres of this fuel type in the county.

The most common fuel type in Cascade County is grassland which includes a significant amount of CRP. Some of the CRP land has been enrolled in the program for approximately 20 years. Fires in the grassland type will exhibit significant fire behavior which includes high intensity fire behavior that are not easily controlled. Furthermore, the non grazed heavy concentrations of grass are readily able to burn during any given time of the year. During periods of green up, the fire behavior is reduced, but the heavy dead component will carry a wild land fire.

5.5.1. Fire Regime Condition Class

To best understand hazardous fuels ranking, a definition system called "vegetative condition class" is one approach to define and interpret the importance of fire frequency in the ecosystem. Current "Condition Class" is defined in realms of departure from the historic fire regime, as determined by the number of missed fire return intervals. Fire has always been a part of the wildland, changing and shaping the structure and composition of vegetation in the area. The five natural (historical) fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation.[19] These five regimes are:

I – 0-35 year frequency and low (surface fires most common) to mixed severity (less than 75% of the dominant overstory vegetation replaced);

II – 0-35 year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);

III – 35-100+ year frequency and mixed severity (less than 75% of the dominant overstory vegetation replaced);

IV – 35-100+ year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);

V – 200+ year frequency and high (stand replacement) severity.

All of the wildland-urban interface areas in the Cascade County were historically maintained by fire. Because of the predominance of fire dependent tree species on these sites, fire helped maintain them. Low intensity surface fires burned, keeping ground vegetation from becoming ladder fuels. As fire became less of a factor (fire suppression) in maintaining the vegetation in these areas, the vegetation changed. As a result, there are more vegetation and ladder and ground fuels (litter mat and down woody material) that contribute to higher intensity fires than occurred historically. This has increased the risk, hazards and threats to people and human resource values within the wildland-urban interface.

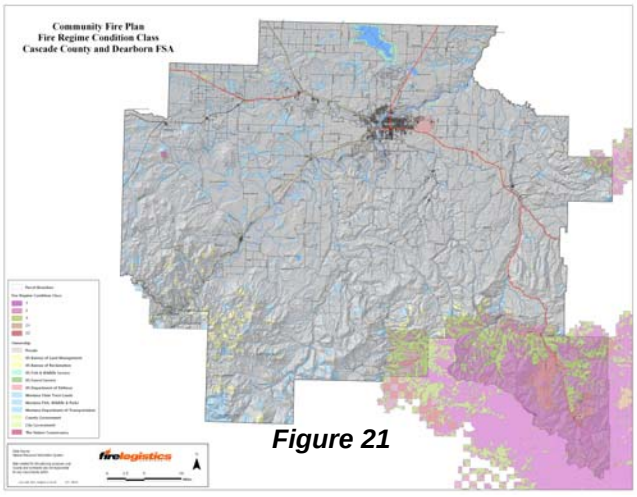


Figure 21

Current "Condition Class" is defined in realms of departure from the historic fire regime, as determined by the number of missed fire return intervals. There are three "Condition Classes" that have been developed to categorize the current condition with respect to each of the historic fire regime groups (See Figure 21).

The following table describes each Condition Class:

[19] Hann, Wendel, Havlina, Doug, Shlisky, Ayn, et al. 2003. Interagency and The Nature Conservancy fire regime condition class website .USDA Forest Service, US Department of the Interior, The Nature Conservancy, and Systems for Environmental Management [frcc.gov].

Fire Regime Condition Class	Description	Potential Risks
FRCC 1	Within the natural (historical) range of variability of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	Fire behavior, effects, and other associated disturbances are similar to those that occurred prior to fire exclusion (suppression) and other types of management that do not mimic the natural fire regime and associated vegetation and fuel characteristics. Composition and structure of vegetation and fuels are similar to the natural (historical) regime. Risk of loss of key ecosystem components (e.g. native species, large trees, and soil) are low
FRCC 2	Moderate departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	Fire behavior, effects, and other associated disturbances are moderately departed (more or less severe). Composition and structure of vegetation and fuel are moderately altered. Uncharacteristic conditions range from low to moderate; Risk of loss of key ecosystem components are moderate
FRCC 3	High departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	Fire behavior, effects, and other associated disturbances are highly departed (more or less severe). Composition and structure of vegetation and fuel are highly altered. Uncharacteristic conditions range from moderate to high. Risk of loss of key ecosystem components are high

The timbered portions of the Cascade County can be considered to fall into Condition Classes 2 and 3. In some instances, the severe nature of the fire has the potential to do severe damage to the burn site.

The areas of grass and brush that are managed for agricultural purposes can be considered class 1. Those areas that are not managed or are held within the CRP programs fall well outside the natural regime for the natural fire cycle and could be considered to fall into Condition Class 2.

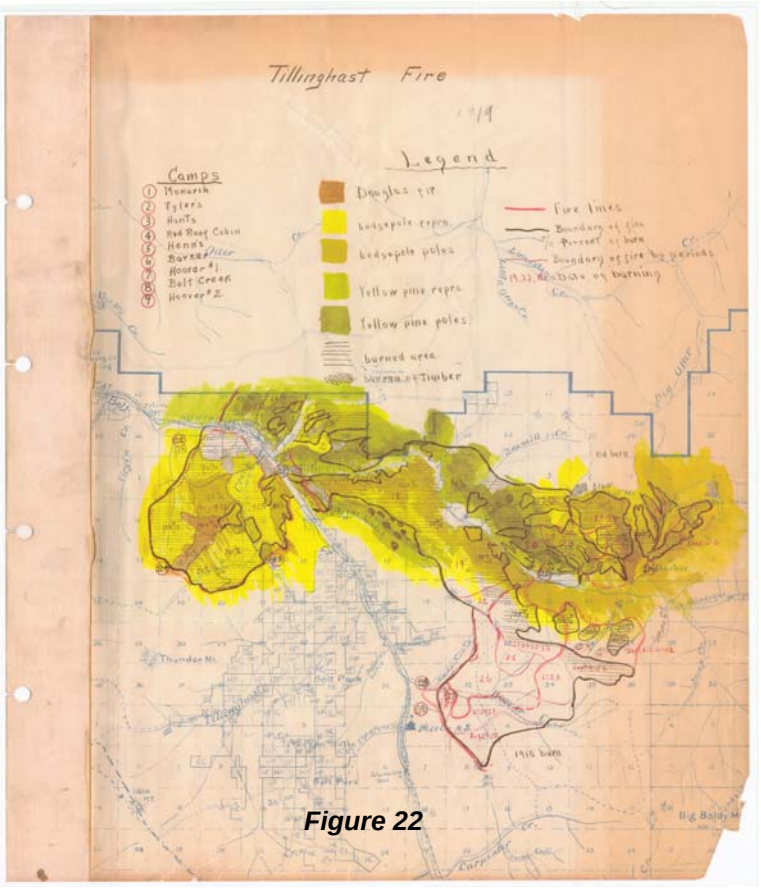


Figure 22

5.5.2. Natural Fire Breaks

Other than the county's transportation system, irrigated agricultural uses, and the Missouri River, the Sun River and the Dearborn River, there are few breaks in the fuels in Cascade County. Grazing is probably one of the best fuel management tools available for rancher and in many cases provides an anchor point to initiate wildland fire suppression activities.

5.6. Fire History

The fire history for Cascade County began long before European settlement advanced into Montana (See Figure 22). Data from the Tenderfoot D area, as well as some from the greater Yellowstone ecosystem indicate that large fires

occurred during severe droughts in the early to mid-1600's.

The Tenderfoot Fire History Study provides some indication of how wildland fire has played its natural role in the lodgepole pine mountainous areas within Cascade County.

Previously, little fire history information existed for lodgepole pine forests in mountainous areas of central Montana, such as in the Little Belt Mountains. In 1992, the Tenderfoot Fire History Study was initiated in cooperation with the USDA Forest Service Intermountain Research Station to determine the fire history of the Tenderfoot Creek Experimental Forest (TCEF), Lewis and Clark National Forest. Primary objectives of the study were to: 1) determine pre-1900 fire frequencies, severities, and burning patterns in the area's lodgepole pine dominated stands, and 2) document and map the forest age class mosaic, reflecting stand replacing fire history at the landscape level of analysis. Secondary objectives were to interpret the possible effects of long-term fire suppression on area forests, and to determine their relative position along the fire regimes continuum for northern Rockies lodgepole pine.

STUDY AREA

The Tenderfoot Creek Experimental Forest (TCEF) encompasses approximately 8,600 acres of the upper Tenderfoot Creek drainage, ranging in elevation from 6,035 to 7,941 feet. The area is primarily a headwaters zone dissected by a primary drainage (Tenderfoot Creek) and 7 sub drainages. Perhaps significant to the fire history, a relatively abrupt change in terrain occurs at about 7000 feet, where the steep narrow canyon drained by Tenderfoot Creek moderates to gentle-or moderately steep slopes approaching main divides. The study area is occupied by single-layer, even-age stands that are dominated by lodgepole pine and occasionally Whitebark pine (P. albicaulis Engelm.), and most stands have very sparse tree understories of shade tolerant subalpine fir (Abies lasiocarpa (Hook.) Nutt.) and Engelmann spruce (Picea engelmannii Parry). Throughout the Little Belt Mountains extensive even age classes of lodgepole pine have regenerated shortly after stand replacing fires that exposed mineral soil seedbeds and promoted seedling establishment (Lieberg 1904, Fischer and Clayton 1983).

RESULTS AND DISCUSSION

Landscape Fire Patterns.

The master fire chronology extends back 412 years, to about 1580, and is composed of primarily stand replacing fires that initiated the current age class mosaic. The increment core-and fire scar data suggested 12 fires between 1580 and 1992, resulting in an mean fire interval (MFI) of 38 years—that is, stand replacing fires of varying size occurred in the 8600 acre study area on an average of every 4 decades. The last fire of any significance occurred in 1947 (~20 acres), and the last major fire occurred 104 years ago, in 1902 (~650 acres).

The master fire chronology contains 5 major fires (600+ ac.), yielding an area MFI of 103 years for large fires. Together, these 5 fires initiated most of today's age class mosaic: 1726, 1765, 1845, 1873, and 1902. Additionally, relatively widespread sample locations indicating the oldest fire suggested a possible major event in about 1580, but subsequent fires destroyed most stands that regenerated shortly after that fire. A insufficiency of fire scar- and age class data between 1580 and 1726 suggested that either a relatively fire-free interval occurred for approximately 150 years after 1580, or that a large amount of fire history evidence was destroyed by post-1700 fires (few snags or ridge top Whitebark pines were found dating to the 1600s). After 2 major fires in the 1700s, nearly a century lapsed before major burning recurred in the mid- to late 1800s. Similarly, 9 decades have now passed since TCEF's last major fire. Thus, the average interval between major fires has been relatively long over the past 400 years but the data suggest a repeating cycle of large burns occurring close in time, followed by comparatively long fire-fee intervals. The chronology also reveals that about 1 out of every 2 fires burned substantial acreage in TCEF. From a landscape perspective, the overall interpretation is that while few ignitions developed into spreading fires. Many fires became important ecological events, often in pulses of activity spanning just a few decades.

Because some major fires after 1726 occurred relatively close in time, age class margins often were indistinct on the aerial photographs. The grouped nature of major fires in the chronology and on the landscape also suggests that portions of fires might have been reburns (e.g., see juxtaposition of 1726-1765 age classes; and 1845-1873-1902 classes. Specifically, severe fires can recur in post-fire fuels, primarily dead trees and dense post-fire regeneration, several decades after an initial event (Brown 1975). Lieberg (1904) first alluded to this fire-fuel interaction in his survey of the early-day Little Belt Mountains Forest Reserve, bordering today's
TCEF:

> "…In this region fires almost invariably destroy the forest, except in thin subalpine stands. The timber is rarely consumed by the first fire. Usually it is killed and left standing, and is later overthrown by wind and destroyed by future fires….." (Lieberg 1904: 24)

The age class mosaic for TCEF is moderately complex, composed of polygons ranging in size from a few tens of acres to an estimated maximum of 700 acres. A few relatively small polygons are 2=aged, a result of mixed severity underburns, but most stands are 1-aged and cover substantial acreage. For example, the 1873 fire apparently initiated the largest number of seral stands, which occupy an estimated 3000-4000 acres in the central to eastern portion of TCEF. However, these 1873-initiated stands often abut stands that regenerated after a substantial fie in 1845, making it impossible to accurately estimate fire sizes. Similarly, some of the area's oldest stands, generally north of Tenderfoot Creek, regenerated after fires in 1726 and 1765 and today comprise an indistinct mosaic that totals an estimated approximately 1500-2000 acres.

In summary of the TCEF forest age class mosaic, most stands regenerated after just 4 fires between 1726 and 1873. Between 75% and 90% of the area is occupied by overmature stands, ranging in age from 120 to 260 years. The oldest stands, dominated by high elevation Whitebark pines or by moist-site spruce and subalpine fir approaching climax, are between 310 and 410 years old and comprise less than 2 percent of the mosaic. Conversely, the area's youngest stands today are between 45 and 90 years old and occupy about 8 percent of the age class mosaic.

Stand Fire Patterns.

Since most mixed severity fires occurred within 50 years of a previous fire, the secondary burns undoubtedly were fueled by dense post-fire regeneration and fire-killed trees. In 2-age stands today, the younger age class usually comprises less than 20% of overstory canopy coverage, suggesting a patchy pattern of underburns that had achieved only light-to moderate severity. One exception would be an intense reburn during severe fire weather; such a fire might totally destroy the immature stand and thus consume all evidence of reburning. Conversely, underburns during later successional stages often were highly patchy because live and dead fuels are very sparse in many overmature stands. Such fires usually scarred few trees and failed to trigger a new seral age class. Overall, however, the predominance of stand replacing fires in TCEF is clearly evident by the age class mosaic, in which less than 5 percent of stands are multi-aged and these areas generally are less than 100 acres each. Absent a reburn, 2 or 3 centuries can pass before drought, ignition, and stand decadence coincide to fuel another stand replacing fire.

In addition to lightning fires, some early-day fires in the Little Belt Mountains are known to have been caused by humans (Lieberg 1904). Before about 1860, Indians frequently ignited fires to improve game forage and for other purposes (Lieberg 1904. Barrett and Arno 1982, Gruell 1985). Lieberg (1904) felt that such fires also helped perpetuate the area's numerous grassland parks. Subsequently, mining and other settlement activities produced heavy timber cutting in the major drainages, and Lieberg (1904) stated that a number of large fires had originated in the residual slash. Regardless of ignition source, however, most fires in TCEF probably burned in natural fuels because early-day logging was negligible in remote drainages.

The fire history data suggest that TCEF stands have experienced nearly the full range of fire patterns previously documented in Northern Rockies lodgepole pine forests. Evidence of non-lethal or mixed severity fires at less than 50 year intervals also has been found on relatively dry, gently sloped terrain on

the Bitterroot National Forest (Arno 1976), in the Bob Marshall Wilderness (Gabriel 1976), in Jasper National Park (Tande 1979), and in Glacier National Park's (USA) North Fork Valley (Barrett et al. 1991). Additionally, the fire patterns that occurred on relatively moist, steep slopes in TCEF were similar to those on comparable terrain elsewhere in the Northern Rockies. For example, underburns were uncommon and intervals between stand replacing fires averaged 150 to 200 years in other lodgepole pine stands in and adjacent to Glacier National Park (USA) (Sneck 1977, Barrett et al. 1991), Kananaski Provincial Park (Hawkes 1979), and in the Absaroka Mountains within Yellowstone National Park (Barrett [in prep]). In contrast, some of the region's longest fire intervals have been found on Yellowstone's subalpine plateau, where highly unproductive sites and very slow fuel accretion has delayed fires for 400 years or more (Romme 1982, Romme and Despain 1989).

Fire Suppression History.

To derive interpretations about the relative effectiveness of modern fire suppression and its possible influence on forest succession, atlas records (on file, Kings Hill Ranger District) were examined for an approximately 16,000 acre area surrounding the 8,600 acre TCEF. Comprehensive records from 1920 to 1992 indicated that 19 fires (14 lightning, 5 person-caused) burned a total of less than 100 acres in the analysis area. There was no record of spreading fires in TCEF, but 2 fires in adjacent drainages had achieved appreciable size before they were suppressed (1966: 40 ac., 1984: 11 ac.). Before about 1950, early detection and travel to backcountry fires apparently was relatively inefficient, because the fire history sampling revealed 2 spreading fires that were not recorded in the atlas. In 1947, an intense stand replacing fire burned about 20 acres in the upper Stringer Creek drainage before expiring (there was no evidence of suppression measures such as fire lines or felled trees). In 1921 a mixed severity underburn, totaling less than 100 acres, occurred in 2 separate locations in TCEF, north and east of Onion Park. King's Hill Ranger District also has archival records dating from 1870 that document the general locations of major fires, but these records fail to list the 1873 and 1902 fires that occurred in TCEF (4000+ acres, 650 acres, respectively).

From this evidence, it is difficult to interpret whether fire suppression has had any substantial effect on forest succession in TCEF. At the stand level, several factors suggest that succession has not yet been influenced to any appreciable degree. First, fire suppression apparently has been effective for, at most, only 40 years. In most stands, unnatural succession would not occur over such a short time span, even if a fire interval had been artificially lengthened in a relatively old stand (Romme and Despain 1989, Barrett et al. 1991, Barrett). However, succession still would have been altered to some degree if fires had been suppressed, for example, in immature stands that were prone to reburns (e.g., 1902 regenerated stands). Since the majority of fire intervals were relatively long, and were comparable to those found in other studies (Arno 1976, Romme and Despain 1989, Barrett et al. 1991, Barrett [in prep]), fire suppression's effect on succession in individual stands presumably has been minimal to date.

At the landscape level, long-term fire suppression might artificially induce mosaic homogeneity in forests that previously contained a heterogeneous mix of fire-initiated age classes (Romme and Despain 1989, Barrett et al. 1991). A potentially serious implication is that mosaics that age uniformly in the absence of fire could be prone to larger insect or disease epidemics, and unnaturally large firs in the future (Barrett et al. 1991). While no large wildfires have occurred in TCEF in this century, other free-ranging wildfires might well have spread into the Tenderfoot Creek drainage and markedly altered the forest mosaic. Nearly 120 years have passed since the last major fire, and the master fire chronology contains other evidence of 1 or 2 relatively long fire-free intervals over the last 4 centuries. Currently, as much as 90% of TCEF is occupied by stands that are now well within the past range of stand replacing fire intervals for this forest type (nearly 30% of these stands clearly are approaching the upper threshold of the interval range). Stand decadence was commonly observed during sampling, and stands in adjacent drainages recently experienced a large amount of mortality form a "red belt" effect (20,000 acres) and blow downs (3000 acres). Consequently, it is reasonable to conclude that the stage is being set for renewed fire activity in the coming decades.

5.7. Expected Fire Behavior

Fire behavior describes the way fires ignite and spread. Topography, fuel conditions, and weather all influence fire behavior and how wildland fires burn in Cascade County. Fuel is the only factor influencing fire behavior that we have the ability to manage. The following fire behavior assessment shows fire intensities and fire spread rates in different fuel types/models that are found in Cascade County. It is important to understand this information to determine what areas contribute to the fire problem in the county.

The following fuel types/models were used for analyzing potential fire behavior:

Fuel Model 1: Grass that dominated by short grass where very little shrubs or timber is present over less than ⅓rd of the area. The fine, porous, and continuous fuels that have cured or are nearly cured govern fire spread.

Fuel Model 2: Grass with open timber overstory that cover ⅓rd to ⅔rd of the area. This model represents the open grass and ponderosa pine and harvested areas where an overstory of timber remains. Fire spread is primarily by a surface fire through the curing or dead grasses with the litter and dead down wood from the open shrub or timber overstory contributing to fire intensity. This fuel model also includes scattered sagebrush within grasslands without ponderosa pine overstory.

Fuel Model #4: (This fuel model has more nearly represented the dense, continuous stands of ponderosa pine and Douglas-fir regeneration in this area). Fire intensity and fast-spreading fires involve the foliage and live and dead fine woody material in the crowns of a nearly continuous under story of ponderosa pine and/or Douglas-fir regeneration. Besides flammable foliage, dead woody material in the stands significantly contributes to the fire intensity. A deep litter layer may also hamper suppression efforts.

Fuel Model #6: This model represents the area around the Bears Paw Mountains. Fires are carried through the shrub layer where foliage is more flammable than fuel model 5, but requires a wind greater than 8 mph. Fire will fall to the ground without a wind and the shrubs are not as tall as described in fuel model #4.

Fuel Model #9: (This fuel model can represent some stands of dense ponderosa pine overstory in our area). Fires run through the surface litter faster than model 8 and have longer flame heights (due to the sometimes dense layer of ponderosa pine needles). Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting, and crowning.

Fire behavior calculations for these fuel models were made using the fuels, weather, and topographic conditions prevalent for Cascade County. One is for normal August fire season conditions, called Average, and one for extreme August fire season conditions, called Extreme. The extreme case also takes into consideration severe drought conditions. These conditions would be present in August and September when all the vegetation has cured and dried.

WEATHER

The weather that led to the extreme burning conditions in 1988 and 2000 started with drought conditions the previous fall. A low snow pack combined with warm, dry springs and hot, dry summers, led to very low fuel moistures and severe fire seasons during these years. The 1990 fire season was characterized by an extended dry fall. High winds associated with the passage of dry frontal systems added to the spread of the large catastrophic fires of 1988, 1990, and 2000. A repeat of these conditions can and will be experienced when similar weather conditions exist.

The following weather parameters were used representing severe August burning conditions in this area.

	Time of Day		
	1400 – 1700 hours	1700 – 2200 hours	2200 – 0200 hours
Air Temperature	80-89	70-79	50-59
Humidity	10 – 14%	15 – 19%	20 – 24%
20 foot wind speed	30 mph*	20 mph*	20 mph*
Mid-flame wind speed	9 mph	6 mph	6 mph

*Wind reduction factor of .3 for partially sheltered stands is used.

Critical level fuel moisture inputs for surface fuel models are:

One hour time lag dead fuel <1/4 inch diameter
Ten hour time lag dead fuel 1/4 to 1 inch dia.
One hundred hour dead fuel 1 in. to 3 in. dia.

Typical Fuel Moisture Inputs for Critical Fire Weather			
	1400 – 1700 hours	1700 – 2200 hours	2200 – 0200 hours
One Hour Fuels	4%	6%	8%
Ten Hour Fuels	6%	6%	7%
Hundred Hour Fuels	8%	8%	8%
Live Woody Fuel Moisture	70%	70%	70%

Other inputs are

Fuel Model 1 = 0-15 % slope
Fuel Model 2 & 4 = 15-30% slope
Fuel Model 9 = 30% slope

Fuel Shading = 0%
Fuel Shading = 45%
Fuel Shading = 85%

Fire behavior calculations were made using the BEHAVE Fire Modeling System, Andrews and Chase, USFS, General Technical Report INT-194, for surface fires, and Predicting Behavior and size of Crown Fires in the Northern Rocky Mountains, Rothermel, USFS, General Technical Report INT-438.

For Crown Fire Calculations, Rothermel's models for Drought Summer and Severe Drought-Late Summer were used. These conditions would be present normally after early August during periods of drought when all the vegetation had cured and dried and was available to be consumed by fire.

FIRE BEHAVIOR PROJECTIONS FOR CRITICAL AUGUST FIRE WEATHER				
	Fuel Model 1	Fuel Model 2	Fuel Model 4	Fuel Model 9
	Rate of Spread			
1400 – 1700	345 chains/hr	149 chains/hr	245 chains/hr	29 chains/hr
	4.3 mph	1.9 mph	3.1 mph	.4 mph
Flame Length	8.6 feet	12.8 feet	35.4 feet	5.4 feet
Fire line Intensity	607	1,444	13,241	219
1700 – 2200	136 chains/hr	66 chains/hr	131 chains/hr	13 chains/hr
	1.7 mph	0.8 mph	1.6 mph	0.2 mph
Flame Length	5.4 feet	8.5 feet	25.7 feet	3.5 feet
Fireline Intensity	225	600	6,660	87
2200 – 0200	117 chains/hr	60 chains/hr	122 chains/hr	11 chains/hr
	1.5 mph	0.75 mph	1.5 mph	0.1 mph
Flame Length	4.9 feet	8.1 feet	24.4 feet	3.2 feet
Fireline Intensity	179	536	5,877	70

* Critical fireline intensity and minimum flame length has been estimated for initiation of crown combustion dependent upon height to live crown. Typical height to the live crown base in the area of concern is approximately 5 to 20 feet. Conditions favorable for initiation of a crown fire are estimated at 59 BTU/ft/s fireline intensity and 2.9 foot flame lengths for a height to live crown of 5 feet. For a 20 foot height to live crown, 174 BTU/ft/s fireline intensity and 7.7 foot flame lengths would be required. This would indicate that crown fires could be initiated in all the timbered Fuel Models under the weather conditions described. Once a crown fire is initiated potential fire behavior can be estimated utilizing Rothermel's crown fire models. When spotting is possible, the Probability of Ignition where the firebrand lands must also be considered. Using the air temperature of 80 - 89 F. and a fine fuel moisture of 4%, the Probability of Ignition in Fuel Model 2 is 75%. This means that there is a 75% chance that a firebrand will start a spot fire if it lands in a receptive fuel bed.

In most case wildland fires ignite and burn under conditions that are not critical in natural and can be suppressed by wildland fire suppression forces. The following charts provide information that relates to fires burning under “normal” circumstances. Normal means the average or typical August climatic and fuel moistures.

These charts are just one of a number of scenarios that can be developed thru the BEHAVE fire behavior modeling process and should only be used as a reference.

The following weather parameters were used representing typical August burning conditions in this area.

	Time of Day		
	1400 – 1700 hours	1700 – 2200 hours	2200 – 0200 hours
Air Temperature	70 – 79	70-79	50 -69
Humidity	25 – 29%	25 – 29%	30 – 34%
20 foot wind speed	5 mph*	5 mph*	Calm
Mid-flame wind speed	1.5 mph	1.5 mph	Calm

*Wind reduction factor of .3 for partially sheltered stands is used.

Live Fuel Moisture Inputs for Typical Fire Weather			
	1400 – 1700 hours	1700 – 2200 hours	2200 – 0200 hours
One Hour Fuels	6%	8%	10%
Ten Hour Fuels	8%	8%	9%
Hundred Hour Fuels	10%	10%	10%
Live Woody Fuel Moisture	100%	100%	100%

The same slope and fuel shading is used as in the critical fire weather simulation.

FIRE BEHAVIOR PROJECTIONS FOR TYPICAL AUGUST FIRE WEATHER				
	Fuel Model 1	Fuel Model 2	Fuel Model 4	Fuel Model 9
	Rate of Spread			
1400 – 1700	12 chains/hr	11 chains/hr	22 chains/hr	3 chains/hr
	0.15 mph	0.14 mph	0.28 mph	0.04 mph
Flame Length	1.8 feet	3.7 feet	11 feet	1.8 feet
Fire line Intensity	19	96	1,035	21
1700 – 2200	10 chains/hr	10 chains/hr	20 chains/hr	3 chains/hr
	0.12 mph	0.12 mph	0.25 mph	0.04 mph
Flame Length	1.6 feet	3.5 feet	10.5 feet	1.6 feet
Fireline Intensity	16	86	944	17
2200 – 0200	3 chains/hr	5 chains/hr	8 chains/hr	2 chains/hr
	0.04 mph	0.06 mph	0.10 mph	0.02 mph
Flame Length	0.7 feet	2.5 feet	6.7 feet	1.3 feet
Fireline Intensity	3	40	358	10

Normal fire behavior under typical conditions for this area will usually result in wildland fires of low to moderate intensities that can be successfully suppressed. Some of these fires may exhibit torching, short crown fire runs, and spotting during the afternoon burning period. However, large, high-intensity fires exhibit some common characteristics. They normally occur during drought conditions when fuels are cured and very dry and there is continuous source of forest fuels. The prevailing wind usually pushes these fires in a northeasterly direction. These winds are associated with frontal passages. They can be quite strong and are from the south, southwest, and west. This direction of primary spread is very evident with all major fires in the Northwest. High intensity crown fires typically cause long range spotting, burn rapidly both up and down slopes, at times both day and night, and are essentially "uncontrollable". **It is this kind of fire that is of most concern to residents and fire fighters in the wildland-urban interface.**

Fire behavior descriptors and interpretations of wildland fires have been compiled for fire suppression strategy, prescribed fire and long range planning. Key fire behavior descriptors are rate-of-spread, flame length, and fireline intensity. Rate-of-spread in chains/hour with one chain equal to 66 feet, 80 chains equal to one mile, is the forward rate of spread at the head of a surface fire. Flame length in feet, is the length of the flame at the head of the fire. Fireline intensity in BTU/ft/sec, is the amount of heat released per second by a foot-wide slice of the flaming front and is indicative of the heat experienced by a person working near the fire. The following table is the fire behavior interpretations that should be used for the fire behavior outputs.

Fire Suppression Interpretations from Flame Length

Flame Length	Fireline Intensity	Interpretations
< 4 feet	< 100 BTU/ft/sec	Fires can generally be attacked at the head or flanks by fire fighters using hand tools. Hand line should hold fire.
4 – 8 feet	100 – 500 BTU/ft/sec	Fires are too intense for direct attack on the head with hand tools. Hand line cannot be relied upon to hold the fire. Bulldozers, engines, and retardant drops can be effective. Indirect line and burn out may be effective in light fuels.[20]
8 – 11 feet	500 – 1000 BTU/ft/sec	Fires may present serious control problems: torching crowning, and spotting. Control efforts at the head will probably be ineffective.
> 11 feet	> 1000 BTU/ft/sec	Crowning, spotting and major fire runs are probable. Control efforts at the head of the fire are ineffective.
> 50 feet	> 4,000 BTU/ft/sec	Major conflagrations are possible. Long range spotting occurs; Tree blow down may occur; flaming zone depths of up to ¼ mile may be possible.[21]

Fires are classified according to the fuels they are burning in; ground fires, surface fires, and crown fires. Each burns with different intensities and spread rates depending on fuel, wind, and topography. The transition from a fire burning in the surface fuels on the forest floor to a fire that burns in the crowns of the trees is determined by the amount of available fuel, the fire intensity or flame length, the presence of ladder fuels to carry the fire into the standing trees, and the wind. A fire may start out torching a single

[20] Personal conversation – Sonny Stiger; April, 2006
[21] ibid.

tree or small group of trees. When a fire becomes established in the tree crowns, the wind will usually carry the fire in the crowns creating fire intensities that cannot be dealt with by fire suppression forces.

Crown fires are normally driven by the wind but the dryness of the fuels and tree crowns can cause what is known as a plume dominated crown fire. Crown fires of this type occur because of dry, explosive, and cumulative drought conditions present in the forest. A plume dominated crown fire does not necessarily need wind to keep it sustained. Because of successful fire suppression efforts for the last 100 years, the increased fuel complex in many areas increases the potential for a plume dominated wildland fire.

Spot fires are caused by burning embers carried aloft by the wind and smoke column and dropped ahead of the main fire front. Spot fires need a dry fuel bed to ignite and it is not uncommon for these fires to start ¼ to ¾ of a mile ahead of the main fire front. These spot fires create serious problems for fire suppression forces trying to protect lives and property well ahead of an advancing fire front. As spot fires start and gain intensity, they can become as active as the main fire front. This was experienced during the Blaine County Fire in 1991. Some fires travel so quickly through a combination of crowning and spotting that there is absolutely no way for fire suppression forces to gain control.

Some of the timber stands in the Highwood's and on the Rocky Boy Indian Reservation would support a crown fire because of the presence of ladder fuels and heavy, down woody debris on the forest floor of the timber stands. This type of stand replacement fire behavior would need to be associated with an extended drought and an ignition moved by extremely high winds.

5.8 FIRE BEHAVIOR MODELING

Two locations were selected for fire behavior modeling. One in located in the southwestern side of the county within the Dearborn Fire Service Area and in the Highwood Mountains.

Fires were simulated using the topography on site, typical fuel models present, and the most probable weather under these severe burning conditions. Slopes immediately downwind range from 0% to 30%.
The values predicted are only approximations, but never the less provide a valuable estimate of fire behavior under comparable conditions. The calculated fire size at 1 hour assumes a continuous fuel bed with constant conditions.

Cascade County has three distinct fire behavior models (a grass model, a brush model and a timber model, each of which can burn at different time of any calendar year. The factors that are similar between the three are a potential to threaten structures and jeopardize the lives of the resident of the county.

Dearborn Fire

Vegetation within the Dearborn Fire Service Area varies from dry grasslands with some sagebrush to scattered ponderosa pine and dry-site Douglas-fir. Dense ponderosa pine stands occur on some wetter north facing slopes. Because of fire exclusion from past suppression efforts and a lack of timber harvesting and prescribed burning, there are many areas of unhealthy forest that have a concentrated build-up of tree regeneration, sick and dying trees as a result of over crowding, insects, and disease. The regeneration can adversely influence fire behavior and suppression efforts in two ways. Primarily the regeneration can act as a "ladder fuel" and carry a fire burning on the surface into the tree canopy. Fires spreading through the tree canopy, crown fires, have historically burned at the rate of 1-3 miles (80-240 chains) per hour. Crown fires typically cause long range spotting (>1/4 mile), burn rapidly both up and down slopes, at times both day and night, and are essentially "uncontrollable". Sick and dying trees present more available fuel to burn, further worsening potential fire behavior.

Secondly, the regeneration itself can cause extreme fire behavior in the form of high rates of spread and flame lengths that prohibit any direct suppression action. Recent examples of such fires in this area are the Canyon Creek and Warm Springs fires of 1988, the Beartooth Fire of 1990 near Craig, and the Cave Gulch, Bucksnort, and Wolf Creek Fires of 2000. This kind of fire is occurring over the entire nation as

evidenced by many other such fires in Montana in 2000, near Bozeman in 2001, and in Colorado, Arizona, New Mexico, and Oregon in 2002.

A site near the Dearborn River was selected to illustrate fire behavior under these conditions. This site is near a well-used road and residences simulating a person caused fire. Person caused fires are of the most concern because they usually occur during dry conditions without the rain and humidity that usually comes with lightning storms and they usually occur at the bottom of drainages near homes, roads, or other locations where people concentrate (See Figure 23 and West Behave Fire Model Map in 10.5).

Fires were simulated using the topography on site, typical fuel models present, and the most probable weather under these severe burning conditions. Slopes immediately downwind range from 0% to 30%. The values predicted are only approximations, but never the less provide a valuable estimate of fire behavior under comparable conditions. The calculated fire size at 1 hour assumes a continuous fuel bed with constant conditions.

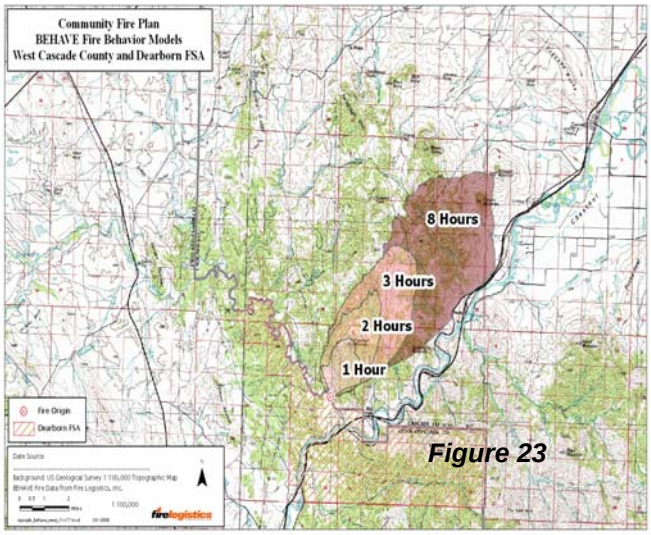


Figure 23

The resulting fire behavior from the calculations is comparable to what actually occurred on the Beartooth Fire near Craig in November of 1990. The Beartooth Fire near Craig in 1990 can be analyzed to portray a similar fire in the Dearborn FSA. Fuels and topography are similar and the weather experienced on the Beartooth Fire occurs frequently in the Dearborn area. The Beartooth Fire started at about 1730 on November 13, 1990. It burned aggressively throughout the first night and next day crowning through areas of dense ponderosa pine (Fuel Model 9). The fire started in grass (Fuel Model 1) and quickly moved into scattered ponderosa pine (Fuel Model 2). According to observers at the scene the fire moved through the scattered pine for 2 &1/2 miles in one hour and fifteen minutes with 40 foot flame lengths. The wind was estimated in excess of 40 miles per hour for most of the night. Fire activity began to diminish at about 0430 the next morning but again burned aggressively with daytime heating on the second day. However, it had made its primary run that first night and only slowed its forward progress when it reached the heavily grazed areas of the Sterling and Sieben ranches. The final size of the Beartooth Fire was 32,968 acres. Its forward spread was nearly eight miles burning in a north east direction pushed by 40 mph winds. If these ranches had not been grazed, the fire would have easily burned onto the Dearborn FSA in the vicinity of Stickney Creek and on to the Interstate Highway and the Missouri River.

The Dearborn FSA and the Beartooth Game Range are quite similar in fuels and topography and experience the same weather patterns.

Once a crown fire is initiated potential fire behavior can be estimated utilizing Rothermel's crown fire models.

When spotting is possible, the Probability of Ignition where the firebrand lands must also be considered. Using the air temperature of 80 - 89 F. and a fine fuel moisture of 4%, the Probability of Ignition in Fuel Model 2 is 75%. This means that there is a 75% chance that a firebrand will start a spot fire if it lands in a receptive fuel bed.

These fire behavior predictions are plotted on maps. All fires assume no effective fire suppression action can be taken and they are burning freely. All winds were projected to be out of the southwest up to 30 mph. This is a conservative projection as winds up to 70 mph have occurred frequently in this area with

the passage of dry cold fronts. All projections were made assuming a fire start at 2pm (1400 hours). This would normally be the warmest and driest part of the day. The first hour assumes a surface fire that escapes initial attack due to the windy, dry conditions.

This fire would differ from the Beartooth Fire in that the Beartooth Fire burned totally up drainage, whereas this fire would burn across several drainages. Under critical fire weather BEHAVE indicates the downhill spread only slightly less than uphill for the modeled fire.

For mapping purposes a ROS of 2 mph for uphill and up drainage is used and 1.8 mph for downhill spread with the wind for the time period 1400 to 1700 hours. For the period 1700 to 2200 hours an average rate of spread of 1 mph is used. An average of two miles per hour was the estimate for the Beartooth Fire starting in Fuel Model 1 at about 1730-1800 hours burning primarily through Fuel Model 1 and 2. By 1915 hours it had run approximately 2.5 miles. Therefore our projection for the Dearborn area is very conservative.

BEHAVE would move the fire in Fuel Model 1 at over 4 mph under these conditions. This appears to overestimate the ROS even though we are simulating a fire start at 1400 hours, i.e., the hottest, driest time of day. For our purposes 2 mph ROS is realistic and conservative and in line with what actually happened on the Beartooth Fire.

Fire Line Intensity and Flame Lengths as calculated with BEHAVE are adequate to initiate a crown fire. Using Rothermel's crown fire spread model under these critical conditions generates a crown fire ROS of 1.8 to 1.9 mph with flame lengths of over 100 feet. This is also in line with the spread observed on the Beartooth Fire as well as flame lengths observed during the crown fire runs in the denser stands of ponderosa pine.

Following this fire spread for 12 hours, similar to the Beartooth Fire, through the evening and nighttime hours, the spread would slow very little by 0200 hours and the fire would continue to be active until around 0500 hours. The fire size would be so enormous, just as on the Beartooth Fire that by the next day successful suppression action would not be very effective.

The Beartooth Fire slowed and allowed suppression forces to get the upper hand when it reached the heavily grazed areas of the Sterling and Sieben ranches. The Dearborn FSA does not appear to have substantial grazing. This fire would continue unchecked for at least eight miles until 0500 hours the next morning. This would carry it beyond Hardy Creek and the Missouri Inn exactly the distance covered by the Beartooth Fire in November with similar wind, temperature and humidity.

For comparative purposes, a fire is simulated starting in the same location on the Dearborn River but under typical weather conditions for August.

Those structures in front of this fire would certainly be in jeopardy without an adequate asset protection zone (defensible space) and most likely could not be protected due to the size and scope of this event. An evacuation would be started by the Cascade County Sheriff's Department.

Highwood Fire

The Highwood Mountain Range is located in the southeastern side of the county. This mountain range juts up from the prairie surrounding it and is predominantly Douglas fir and lodgepole pine habitat types.

In the late 19th century this mountain range burned completely and regenerated to the mixed conifer stands that exist today. The natural fuel loading within the range is quite slight except where some limited burning has been completed by the Forest Service. The prescribed fires conducted by the Forest Service killed a variety of age class and size class trees. Some and eventually all of these trees will come down and contribute to the natural fuel loading within these project areas. Since these prescribed burn projects areas do not encompass large tracts of ground, their influence on sustained fire behavior will be limited.

From forest health perspective, the timber stands are in good shape and these stands will remain healthy until they reach an older age class.

The fire that will be modeled will be one that will burn only during periods of sustained drought. During period of sustained drought, a fire beginning along the southwestern side of the Highwood Mountains at a lower elevation and pushed by winds of 30 to 40 mph can move a fire off the ground and into a crown fire.

The conditions that need to exist that can cause a fire of this nature are:

- Long term drought that will reduce live fuel moisture to the extent that was displayed during the 1988, 2000 and 2003 fire season.
- High sustained winds speeds
- Critical fire weather (single digit relative humidity's and high temperatures)
- An ignition located downwind and on a steep slope.
- A day of very high probability of ignitions
- Very low humidity recovery

A fire starting under these conditions would easily transition from a ground fire to a crown fire. A crown fire initiating along the southwestern side of the Highwood's would move upslope to the northeast. Long distance spotting would cause the fire to move across the entire mountain range. If the critical fire weather continued for a number of days and free burning condition exist, the entire range could be threatened. This could be very similar to the fire the burned most of the range in the late 19th century. If this occurred, this fire would transition from a wind dominated fire to a plume dominated fire that could burn until those conditions cease to exist or the fire runs out of available fuel.

Using a 30 mph wind, the rate of spread will be 29 chains/hour (1,914 feet/hour), at 40 mph wind the rate of spread will be 46 chains/hour (3,036 feet/hour), and at 50 mph the rate of spread will be 67 chains/hour (4,422 feet/hour). A fire, starting under critical fuel moisture condition and driven by a 30-50 miles per hour wind, could move across the Highwood Mountains and onto the prairie. A fire burning under these conditions potentially can reach a size of 11,856 acres in a six hour burning window, with sustained winds (See Figure 24 and Behave Fire Modeling Map in Section 10.5).

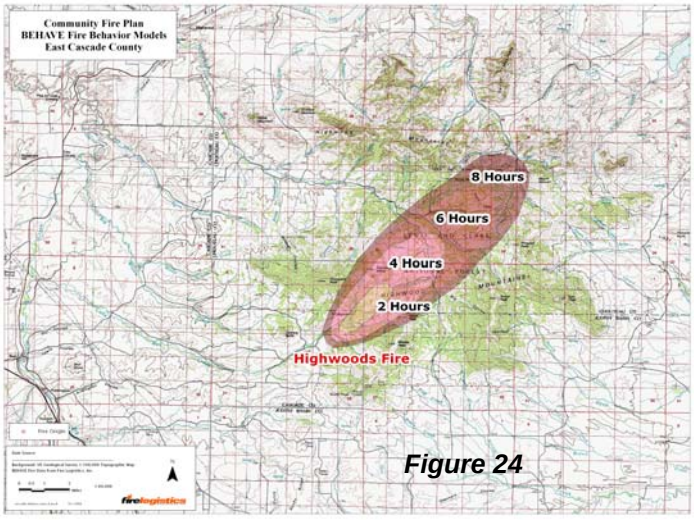


Figure 24

This will not be an easy fire to suppress and one that potentially will threaten lives and structures within its path. The Highwood Mountains do have some natural fuel breaks that will modify this fire's spread, but as occurred in the late 19th century, they were of little value. The opportunity for fuel and climatic conditions to exist that have the potential for this type of event, are limited, but have occurred three times in the past fifteen years. As time passes and the stands age and reach maturity, the risk of this fire event occurring is greater.

The fire events described above are not atypical and should be expected and should be used for planning purposes.

The overall complexity of any ignition that escapes initial attack or a set of weather and fuel conditions, which indicate the potential for large fire growth, could adversely affect public health and safety, property and resources values requires a coordinated public safety effort in Cascade County.

Cascade County has the potential to experience and has experienced large wildland-urban fires similar to that as illustrated by the BEHAVE run. As a result, the County needs to ensure that a coordinated planning, warning, communication and evacuation system is in place. In addition, the Cascade County's Fire Departments staff needs the knowledge, skill and ability to manage a large and complex wildland fire management workload.

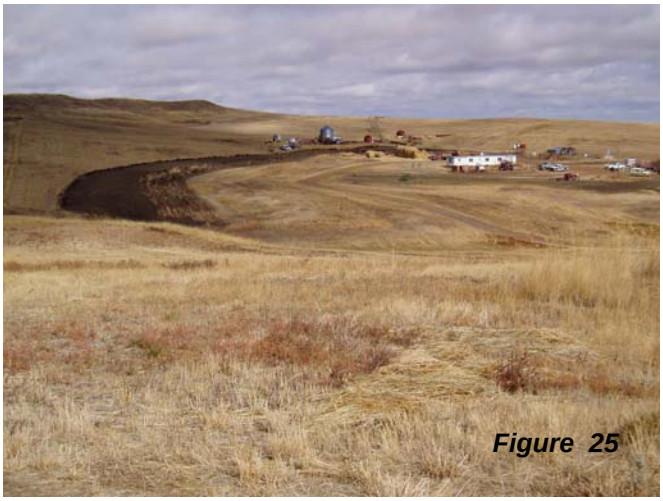


Figure 25

5.9. Fire Effects Assessment

Wildland fires generally have three possible outcomes on forested areas. They can be lethal, non-lethal or mixed. These outcomes are alluded to in 5.1 Fire Regime Condition Class. A broad definition of each follows:

- Lethal – Fire is of high enough intensity and long enough duration to cause mortality in all or most of the trees and shrubs in the burned area. This result is likely in a hardwood ecosystem but the exception in a healthy ponderosa pine ecosystem. It can result, however, from severe burning conditions and/or unnaturally high fuel accumulations in the forest. When a lethal fire occurs it will be evident for decades that the area has been burned.

- Non-lethal – Fire is not of high enough intensity or long enough duration to kill the trees in the burned area. This is a more normal result in a healthy ponderosa pine ecosystem since the trees have adapted to fire by producing a thick bark. This bark protects the tree's cambium from heat. Within two years of a non-lethal burn almost all evidence of the fire has disappeared.

- Mixed – Fire will create significant areas of both lethal and non-lethal effects within the burned area.

Unless a lethal or mixed fire is experienced, any wildland fire burning in Cascade County has a much higher probability of negatively impacting human improvements, livestock and forage then it does creating any long term damage to natural resources. While a wind driven, high intensity fire can certainly occur in the county, most fires are expected to be non-lethal or mixed. They may kill pockets of trees in places like draws and steep slopes but many trees will survive. A ponderosa pine can have over 60% of its crown scorched and it can still produce new needles the following year. The most significant natural resource loss from a non-lethal fire may be the short-term loss of forage for livestock.

Landowners can reduce the exposure of their buildings, structures and themselves to a spreading fire. Asset protection and fuel modification zones, which may include grazed areas, should be in place around sites needing protection (See Figure 25 and the Wildland-Urban Interface Areas Map in Section 10.5). This is particularly effective on the south and west sides or down slope from such areas since most fires will progress to the north and east or upslope. Exceptions to this general rule can occur when a thunderstorm is in the vicinity of the fire and downdrafts from it cause the fire to spread erratically.

It is imperative that any new start be controlled as soon as possible. If a fire goes unattended it will continue to spread making eventual control more labor intensive and probably more difficult as it gets into new fuel sources. It also increases the chances of the fire being exposed to some type of severe weather event that can create a dangerous situation for life and property including those of the fire fighters.

5.10. County Fire Complexities

Cascade County has several distinct issues that not only make the wildland fire program complex, but requires very highly skilled fire managers to provide fire leadership and maintain success.

The fire issues revolve around the semi-arid landscape and poor moisture regime that due to the lack of moisture during any of the four seasons can place the county into a fire season throughout a large share of the year Figure 26. Many counties in Montana go through periods of long term drought, but few have the extremely arid landscape that even on a good year goes for long periods without significant precipitation.

Figure 26

The second issue is the significance of wind that is generated from the Rocky Mountain Front Range, which is a part of living in the county, but one that can turn an ignition into a large wildland fire in a very short period of time.

The third issue is the size and scale of the county and the scattered numbers of outlying fire stations. Tied with this issue is the significant reduction in number of people who are willing to volunteer as fire fighters in the county and in particular the ageing population in Neihart.

The fourth issue is the fuel complex that includes fire behavior grass models, brush models, and timber models. The grass and brush models cover the largest part of Cascade County and are the fuel types that result in the highest number of ignitions. In the grass models, the most challenging fire problem results from the Conservation Reserve Program. This program is an excellent wildlife and soil conservation program, but provides for challenging wildland fire suppression efforts if lands that are enrolled in the CRP program are ignited. These parcels of CRP land are scattered around the county, easily ignited, and could result in extreme fire behavior, especially under windy conditions.

A fifth issue is the very high risk subdivision, i.e., Coopers Ranch and the high potential for suffering loss of life, property and resources from a wildland fire. The only difference from the Derby Fire and Coopers Ranch is that the fire occurred at near Big Timber.

6. Risk Assessment

A fundamental part of any fire plan is identifying what you might lose in a wildland fire, known as assets or values at risk.

6.1. Values at Risk

The primary intent of fire protection is to protect the values at risk and maintain healthy forest and grassland ecosystems. The purpose of a successful fire management program is to reduce the risks associated with values that are important to the county, its citizens, and natural resources. Values at risk will be used to assist fire protection agencies in prioritizing mitigation projects.

Some of the values at risk in Cascade County are:

- Health & Safety – Public & Fire Fighters
- Property, Improvements & Facilities – Private & Public
- Recreation/Community Impacts – Economic & Social
- Forest/Ecosystem Health
- Timber and Grazing
- Cultural Resources
- Aesthetics/Scenery

6.1.2. Health and Safety

Fire fighter safety should never be compromised.

Cascade County needs to maintain the safety of their fire fighters. Thorough situational awareness on the part of the fire fighter and strong incident management by the fire department leadership is critical to the safety of fire fighting personnel. Wildland fires are capable of moving over significant distances in a short period of time. It is possible that fire fighting resources could become trapped during one of these events if they do not maintain a constant situational awareness.

Cascade County has the potential to have a series of multiple wildland fire incidents during any fire season. A fire season of this nature could conceivably last for several months. The county fire agencies should work toward expanding their leadership capability so they can deal with simultaneous complex fire ignitions.

In 1997, the "TriData Study: Wildland Firefighter Safety Awareness Study" was commissioned to find ways to improve firefighter safety. Of the 114 recommendations, the #1 recommendation was to "Implement a large-scale, long-range fuel management program.[22]" Fire protection agencies, county officials, and the public must insist on hazardous fuel reduction efforts on a landscape-basis if they are truly serious about improving safety of not only fire fighters but the public in general.

6.1.3. Property, Improvements & Facilities

Few wildland fires burn where there is not some threat to homes, ranch out-buildings or other structures, fences, power lines, communication sites, or some other type of infrastructure. Fuel treatments (asset protection zones) in the immediate area around structures, designed to reduce wildland fire intensity, can dramatically improve their probability of survival. However, restricting treatments to these areas does little to protect other values-at-risk, some of which may be equally or more important from a neighborhood and/or a community standpoint.

One of the largest problems facing wildland protection agencies in Cascade County is the unwillingness

[22] *Wildland Firefighter Safety Awareness Study*, TriData, 1996

of residents to realistically look at the fire environment in which they live and their failure to correct hazardous fuel situations around their homes and other structures. In lieu of county residents undertaking any kind of hazard abatement actions that would mitigate fire behavior potential, the protection organizations have no choice but to take only such actions that will facilitate orderly evacuation of occupants and will insure the safety of their fire fighters. This may mean writing off some structures where the Incident Commander cannot reasonably expect the apparatus or the fire fighters to safely withstand an oncoming fire front.

6.1.4. Recreation

Opportunities to enjoy outdoor recreation activities can also be severely hampered by wildland fire and fires can have an adverse effect on the economy of Cascade County. Areas can be closed to the public for extended periods of time during high fire danger. Often these closures and restrictions occur in early fall during upland bird and big game hunting seasons when many non-county residents have plans to travel to the area.

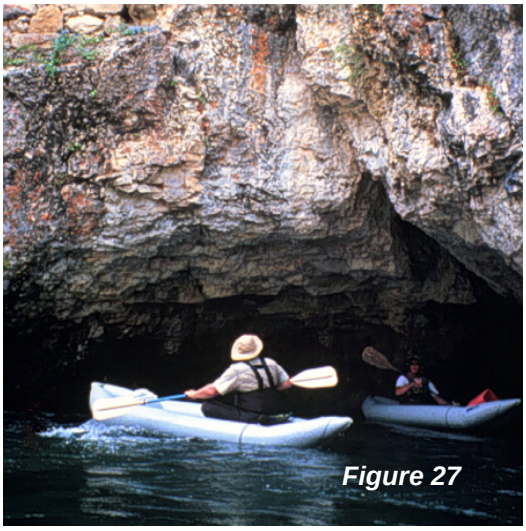


Figure 27

Recreational activities contribute significantly to the economy of the county, but at the same time unattended campfires in the campgrounds cause impacts to the fire protection system (See Figure 27).

6.1.5. Forest/Ecosystem Health

See Section 5.4 Local Fire Ecology.

6.1.6. Grazing and Timber

Agriculture and grazing are two of the primary uses on the private lands in Cascade County. Haying and hay storage are at risk during large wildland fire.

The Bureau of Land Management, Fish and Wildlife Service and State of Montana has scattered land holdings within the county and are tasked with providing rangeland and recreation use on those lands.

There is some potential for timber harvest within the county with some harvests occurring on private ranches.

6.1.7. Cultural Resources

There are cultural resource sites located in Cascade County that need to be protected during fire suppression and fuel reduction activities.

6.1.8. Aesthetics/Scenery

Picturesque long-distance vistas especially in Missouri & Marias River Corridor are a very important component of the landscape. Wildfires impact the aesthetics of an area, which can further impact the economy of the county (See Figure 28).

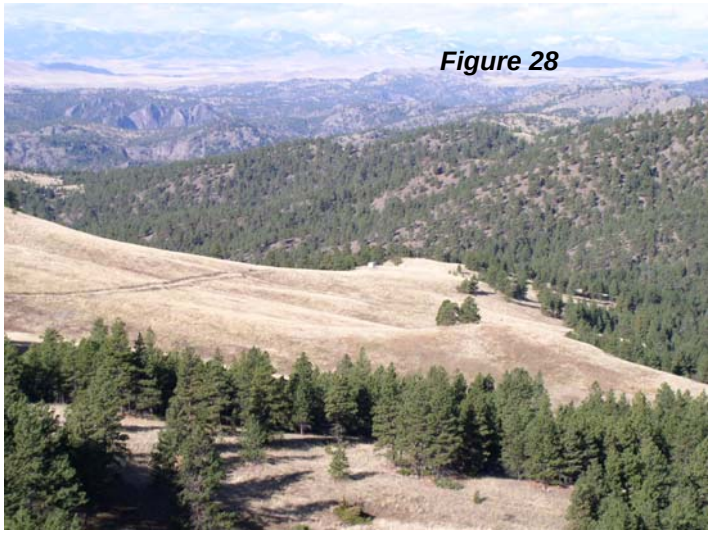


Figure 28

6.2. Risk Estimation

As with the federal agencies, the county's first priority is protection of human life and secondly, personal property.

In order to identify the problem areas in Cascade County a process was developed by Fire Logistics to look at hazard, risk and values in a collective manner (See Figure 29 and Fire Hazard Assessment Model Maps in Map Section 10.5).

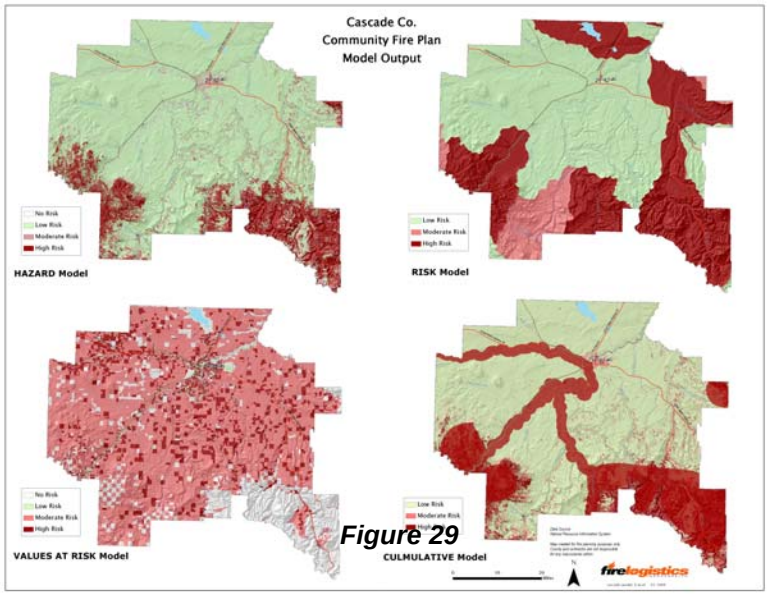


Figure 29

Fire hazard is the interaction of fuels (vegetation, buildings, and other flammables), topography (fires will burn more intensely on south and west slopes, up slopes, in narrow draws, and on upper slopes), and weather (temperature, wind speed and direction, and humidity). The interaction of these factors affects the rate of spread and the intensity of a wildland fire.

Fire risk is the chance that a fire will start in a particular area. Although lightning is an important and leading cause of wildland fires, person caused wildland fire starts are a common source of ignition. The greatest number of human activities with fire starting potential is found close to a home. Common causes of wildland fires include children experimenting with fire, chain saws, grass mowers, debris burning, improper disposal of barbecue coals and ashes, and smoking. Structure fires have the potential to spread into the wildlands. Power lines, agriculture activities, hiking trails, campgrounds, and recreational activities are other activities or uses that are of high fire risk.

Values at risk include life (fire fighters and the public), communities, property, infrastructure, industrial facilities, timber, grazing and natural resources.

The first step was to develop a vegetative layer that placed the prevalent cover types into a high, moderate, low or inflammable category. This was overlain with a map of the historical fire occurrence for the county. This created a good representation of where fires traditionally occur and what their potential for growth would be. The third factor incorporated was the location of structures by parcel. This helped identify where the priorities, in terms of life and property, for protection existed. This composite map gave Fire Logistics a basis for their recommendations to Cascade County for focusing prevention, protection and fuels modification efforts in the areas where they would be of most benefit.

6.2.1. Discussion of Risk

Most working ranches have adequate clearing around them to hypothetically protect them from crown fire or a running surface fire. A problem can occur if there is too much clutter or untended vegetation around their structures however, that would allow for a simple surface fire to ignite those structures.

Subdivision structures are inherently more vulnerable. People who own them often fail to recognize the relationship between the amount of vegetation around their structures and the threat to that structure from a wildfire. Some are even obstinate about that point and they refuse to remove any vegetation even though its continued presence reduces the probability that their home will survive a wildfire to almost

Figure 30 –

zero. Fire fighters must be very careful to look out for their own welfare first when asked to protect a structure where the owner has refused to do any work to enhance that structure's probability of surviving a wildland fire (See Figure 30).

The following list represents current priorities for fire protection within Cascade County:

Dearborn Area, including the Cooper Ranch and Stickney Creek
Hardy Creek – Missouri River Corridor
Monarch
Neihart
Logging Creek Area
Southwest side of the Highwood Mountains, adjacent to National Forest
Missouri, Sun, & Smith River Corridors

In looking at the GIS layered map of Cascade County and the modeled fires, it is apparent why these priorities have been established. These areas are particularly challenging from a fire protection standpoint because of the lack of some basic amenities such as access, telephone service and a water supply. The response times are also lengthy for wildland fire fighters because of the remoteness of these areas.

History has shown that, when enough continuous fuels are available and when certain weather conditions are present, large scale wildland fires will occur. During one of these events, the actions that have been taken beforehand generally prove to be much more effective than any actions taken during the wildland fire event. When conditions of extreme fire behavior exist little can be accomplished aside from evacuating people from harms way and keeping fire fighters in safe positions. Any fuel modification efforts that have been completed prior to the event will greatly enhance the fire fighter's efforts to safely protect property during the incident.

7. Mitigation Strategy -- The Action Plan

This Chapter provides the steps that are being taken or should be taken in Cascade County to reduce the wildland and structure fire threats to public, fire fighters and other values at risk.

7.1. Mitigation Goals

An overarching principle of this Community Wildfire Protection Plan is that fire fighter and public safety is the highest priority!

The mitigation goals of this Community Wildland Protection Plan are to:

1. Identify, designate, and map areas of wildland-urban interface in the county.

2. Develop and implement a comprehensive emergency response plan.

3. Prevent threats to and destruction of property from wildland fire by adopting subdivision regulations, which include access, water supply, communications, and fire stations.

4. Develop and maintain regulations to ensure asset protections zones are created and maintained around structures and improvements in the county.

5. Identifying equipment and training needs to enhance the capabilities of fire protection entities to suppress and mitigate wildfire risks, with financial assistance through competitive grant programs administered by the MT DNRC.

6. Decrease the chances of a wildland fire spreading from federal lands onto private lands while, correspondingly, decreasing the risk of a wildland fire spreading from private lands onto federal lands within the county and promote healthy forest and rangeland ecosystems by reduction of hazardous fuels.

7. Enhance communications between our community and firefighting agencies.

8. Increase availability of water resources for wildland firefighting by strategic placement of water tanks, ponds, and dry hydrants.

9. Improve training and qualifications of personnel to more effectively interface with incoming Incident Management Teams deployed in the county.

10. Position fire protection agencies, county leaders, rural communities, valley residents, and forest owners and managers to be better prepared to protect the county's residents and its natural resources from the potentially devastating impacts of wildland and wildland-urban interface fires.

11. Identify, inventory, and prioritize the risks associated with developing areas of the county.

12. Evaluate, upgrade, and maintain community wildland and structural fire protection and response facilities, and the training and equipment to deal with multiple ignitions.

13. Educate community members to prepare for and respond to wildland fire and to mitigate wildland fire damage.

14. Promote creation of fuel breaks in appropriate locations in Conservation Reserve Program lands.

15. Work as a partner to identify, coordinate, and implement fuels reduction projects between private landowners, the Lewistown field office of the Bureau of Land Management, and the Lewis & Clark National Forest.

16. Identify economic development opportunities for fuel reduction enterprises.

17. Implement the Cascade County CWPP with ongoing monitoring and evaluation.

Planning priorities of the CWPP in order of importance are:

- Protect human health and life
- Protect critical community infrastructure
- Protect private property
- Protect natural resources

7.2. Existing Mitigation Efforts

The following sections describe the existing mitigation measures that are being utilized in Cascade County to decrease the risks from wildland or wildland-urban interface fires. Cascade County and Cascade County fire agencies should ensure that these efforts are supported and continued.

7.2.1. Fire Protection Response

Long travel distances for fire suppression resources are the norm in Cascade County. The Cascade County Fire Departments have located the engines and water tenders as strategically as they can throughout the county. When a fire is reported the Cascade County fire personnel are notified and they respond on a closest forces concept. They also respond to new ignitions reported on BLM and USFS administered lands.

The federal agencies have developed strict requirements for wildland fire fighters including an annual physical fitness-testing requirement. These are the result of a myriad of reviews and investigations of serious incidents that have occurred in wildland firefighting over the years. All Cascade County FD personnel who are dispatched out of their jurisdiction must meet the same standards as their federal counterparts.

7.3. Coordinated Prevention, Protection Projects, and Response Plan

Future efforts in planning and implementation of prevention, mitigation and response projects should be closely coordinated between Cascade County and their cooperating partners, i.e., BLM, USFS, and the State of Montana. It is likely that some projects would be more effective if implemented on the lands of two or more jurisdictions rather than by a single entity. Cooperation and coordination will also result in avoiding duplicating efforts or overlooking opportunities to protect values at risk.

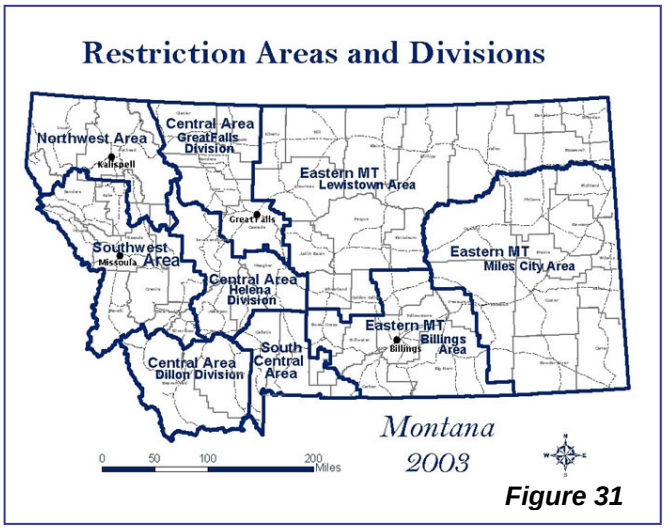


Figure 31

In an effort to reduce new fire starts during periods of very high or extreme fire danger, there is a statewide process for instituting fire restrictions and closures by zone in the Northern Rockies Geographic area (See Figure 31). Cascade County and its cooperators are coordinated in this process through the Great Falls Division – Central Montana Zone, to ensure close communications and common actions occur

during critical periods of fire danger.

7.4. Prioritization Process

Recommended projects have been prioritized based on the risk estimation in Section 6.2. See 7.6 Prioritized Actions.

7.5. Recommended Projects and Programs

This area describes recommended projects and actions that address the mitigation goals of the Cascade County CWPP. The funding mechanism for both the State of Montana and BLM is directed toward projects that show collaboration between private, counties, tribes, state and federal partners.

7.5.1 Wildland-Urban Interface Areas

Recommended Project 7.5.1.1 – The Cascade County Board of County Commissioners should designate the following as wildland-urban interface areas in Cascade County (See Figure 32):

Dearborn Area, including the Cooper Ranch & Stickney Creek
Hardy Creek – Missouri River Corridor
Monarch
Neihart
Logging Creek Area
Southwest side of the Highwood Mountains, adjacent to National Forest
Missouri, Sun, & Smith River Corridors

Figure 32

Project Coordinator – Cascade County DES Coordinator

7.5.2. Fuel Modification Projects

This section addresses specific actions to reduce fuel loads, whether in forests, brush, or grasslands.

Recommended Project 7.5.2.1 – Form a collaborative planning group (Fire Safe Council) with the BLM, ranchers, Cascade County fire agencies, Cascade County Disaster & Emergency Services, Board of County Commissioners, power companies, BNSF and other cooperators to plan on-going fuel reduction projects on a landscape basis.

Project Coordinator – Cascade County Rural Fire Council

7.5.2.1. Vegetation Management

Sivilcultural treatment of fuels is a technique used to eliminate a portion of the fuels in forested areas. Some of the smaller trees are cut and removed to create more growing space between the larger trees. This basic forestry practice of thinning will usually increase timber values for the landowner by concentrating annual growth in a few larger trees rather than many small trees.

Limbing is another technique accomplished by removing the lower branches of trees and like thinning it reduces the ladder fuels that allow a fire to climb from the ground up into the forest canopy. General litter cleanup is the removal of dead and downed woody debris on the forest floor that can contribute significantly to fire behavior, as these fuels tend to be very dry and readily combustible.

Recommended Project 7.5.2.1.1 – Reduce the vegetation in those areas within the Dearborn Interface Area where the continued presence of the fuels represents a clear potential to generate high fire intensities. Wildland fires burning under high intensities will pose the greatest threat to structures, their inhabitants or fire fighters. The county could start in those areas where fuel modification projects would have the most potential to positively impact the greatest number of people or structures, i.e., ingress-egress routes. Changing crown density and interrupting the ladder fuel continuity should be highest priority. Fuel modification areas need to be a minimum of 50 feet wide and closer to 100 feet whenever possible. Look for areas of active tree or shrub encroachment where the absence of periodic natural fires has allowed vegetation, like juniper or heavy ponderosa pine regeneration, to survive. Eliminating these trees while they are young is relatively inexpensive and over time it will significantly reduce the resistance to control factor for fire fighters when fighting a fire in that area.

Project Coordinator – Dearborn Fire Chief, DNRC and BLM

Recommended Project 7.5.2.1.2 – Develop a joint strategy with the Lewis and Clark NF to construct a system of fuel breaks that would encompass the private and public lands around Monarch and Neihart.

Project Coordinator – Monarch & Neihart Fire Chiefs and Lewis & Clark NF Belt District FMO

Recommended Project 7.5.2.1.3 – Once the fuels in an area have been reduced to an acceptable level it is critical that they not be allowed to return to the condition they were in prior to treatment. Treated areas should be inspected at 5-10 year intervals to determine if they would still be effective during a wildland fire. Most likely they will need some type of follow up maintenance, at that point in time, but this work should require less effort and at a reduced cost from the original treatment. If it is not accomplished periodically the full treatment costs will be required again in 20-30 years.

Project Coordinator – Cascade County Fire Chiefs, DNRC, USFS and BLM

Recommended Project 7.5.2.1.4 – Develop additional fuel reduction projects around the Logging Creek Area.

Project Coordinator – Monarch Fire Chief, USFS, BLM, the Rocky Mountain Elk Foundation

Recommended Project 7.5.2.1.5 – Develop a fuel reduction plan for the Highwood Mountains area.

Project Coordinator – Belt Rural Fire Chief, USFS, BLM and Rocky Mountain Elk Foundation

Recommended Project 7.5.2.1.6 – Identify strategic fuel break locations, throughout the county, along county roads that are either mail routes or school bus routes to break up the continuity of the CRP. The fuel breaks should be constructed as wide as possible along both sides of the county road to provide an opportunity to anchor or suppress a fire in the CRP.

Project Coordinator – Cascade County Fire Council.

Recommended Project 7.5.2.1.7 – Work with owners of cottonwood river bottoms where an early spring or late fall fire in the river bottoms will threaten developments in Gore Hill FSA and Vaughn FSA or other communities to implement a fuel management prescription that would divide the cottonwood stands into 40 acres blocks separated by plowed lines or mowed fire breaks that are at least 15 feet wide.

Project Coordinator – Cascade County Fire Chiefs

Recommended Project 7.5.2.1.8 – Develop a fuel reduction project that is designed to protect the Neihart municipal watershed.

Project Coordinator – Neihart Fire Chief, and the Lewis & Clark NF Belt Creek FMO

7.5.2.2. Prescribed Burning

Prescribed burning—or controlled burning—is a relatively quick and inexpensive way to reduce fuel loads. However, in many situations, especially where there are structures nearby, preparatory work needs to be done to reduce the overall flammability of the site.

The county may wish to explore the opportunities for using prescribed fire on private lands especially on the CRP lands within the county. There are some tangible benefits to local ranchers and when they use low to moderate intensity prescribed fire to increase the quantity and palatability of grass on pastures and CRP. It will also set back the encroachment of ponderosa pine unto grasslands where this is a problem. Forage levels have been increased two to four times the pre-burn levels on many sites in Montana and sage has been reduced to about 10 percent of pre-burn levels. One drawback to prescribed fire is that the area to be burned should not be grazed for one season prior to burning and one season after burning. The reasons are to insure enough fine fuels are present on the site to adequately carry the fire during burning and to allow the new and/or rejuvenated grass plants adequate time to develop healthy root systems the following growing season. Several research publications completed by the Intermountain Research Station discuss the types of results that can be expected.

One of the greatest benefits to prescribed burning is the training opportunity it provides for the fire fighters. On a wildfire they are often forced to be reactive rather than to plan and execute actions in a more orderly fashion. When conducting a prescribed burn they will be able to observe fire behavior in a non-emergency setting. They will also learn how to effectively ignite the area to be burned and how to deploy the holding forces to make the best use of available skills and equipment. All of this can be accomplished while functioning in the serious but more controlled environment of a prescribed fire.

Recommended Project 7.5.2.2.1 – Opportunities may arise from planning efforts to jointly conduct prescribed fire projects. Cascade County fire agencies should participate in these burns when practical to improve their training, qualifications and experience in wildland fire management. Efforts such as these promote better interagency cooperation and working relationships.

Project Coordinator – Cascade County Fire Chiefs, USFS and BLM

Recommended Project 7.5.2.2.2 – Cascade County Weed Department should establish a wash requirement for contractors, local and government apparatus that conduct prescribed burns within the county.

Project Coordinator – Cascade County Weed Department

7.5.2.3. Grazing

Cascade County can expect the continued encroachment of fires off of timbered grounds, such as BLM and USFS lands, onto private ownership.

Recommended Project 7.5.2.3.1 - Landowners should be encouraged to sustain grass ecosystems through grazing and to control tree encroachment in those areas, particularly where they are adjacent to heavily timbered federal lands.

Project Coordinator – Cascade County Conservation District

Recommended Project 7.5.2.3.2 – Encourage landowners with CPR contracts to utilize drought years to modify this fuel type through haying or grazing or a combination of both.

Project Coordinator- Cascade County DES Coordinator

7.5.3. Industrial Resource Management

Recommended Project 7.5.3.1 – Ensure that railroads within the county control the fire hazard along their right-of-way according to Section 69-14-721 MCA. If a fire occurs as a result of an ignition along the railroad right-of-way, the Cascade County Fire Departments should ensure that a fire investigation occurs to document that the cause and origin of the fire was the railroad and then bill the railroad for suppression costs for all railroad fires.

Project Coordinator – Cascade County Fire Chiefs and Cascade County DES Coordinator

7.5.4. Biomass Utilization

Recommended Project 7.5.4.1 – Explore any opportunities to dispose of biomass material on either a profit or break even basis. If there is no market for chips or hog fuel in the area and no possibility of utilization for posts or poles, look at designating a site or sites where material can be safely piled and burned during low fire danger periods.

Project Coordinator – Economic Development Groups in Cascade County

Recommended Project 7.5.4.2 – Explore involving the local RC&D or other economic development agencies within the Cascade County area to develop companies which might utilize the biomass generated from the fuel reduction projects (See Figure 33).

Figure 33

Project Coordinator – Economic Development Groups in Cascade County

7.5.5. Safety Zones

Location of safety zones within some of the subdivisions is probably the best approach to protecting human life during a fast moving fire, especially when residents are faced with the alternative of trying to navigate narrow roads under smoky conditions. Any required clearance work on these identified areas should be accomplished prior to fire season as labor and equipment become available. One important point is to insure that the development of procedures, such as when to occupy them and what should and should not be taken into them, are clearly understood by anyone who may need to use them.

Recommended Project 7.5.5.1 – Identify potential safety zones in the Dearborn & Cooper's Ranch area to utilize if evacuation is not possible due to ingress and egress issues as well as the surrounding fuel type.

Project Coordinator – Dearborn Fire Chief, DNRC, Cascade County Sheriff and Cascade County DES Coordinator

7.5.6. Infrastructure Improvements

Improvements to improve local infrastructure are discussed in this section.

7.5.6.1. Water Supply

Although water supply is not a direct function of the Cascade County fire agencies, water supply unquestionably impacts the structure fire suppression performance of the department. Water supply, or lack of water supply, indirectly affects the whole community through the insurance rates they pay.

Recommended Project 7.5.6.1.1 – Prepare a strategic water source plan for the county, which shows the most efficient sources of water needed to support firefighting efforts. It may be necessary to develop new sources in some isolated dry locations in order to reduce refill times to an acceptable level. Explore opportunities to use dry hydrants and stored water facilities. GPS the location of water supply points to develop a water supply map for Cascade County.

Project Coordinator – Cascade County DES Coordinator and Fire Chiefs

Recommended Project 7.5.6.1.2 – Continue to encourage individuals to develop water sources that can be used by fire protection personnel.

Project Coordinator – Cascade County Fire Chiefs

Recommended Project 7.5.6.1.3 – Develop water supply points in the Monarch FSA in the area of the Lazy Doe, Monarch, and Sun Mountain Road area.

Project Coordinator – Monarch Fire Service Area.

Recommended Project 7.5.6.1.4 – Repair municipal water system leaks to ensure adequate fire flows are available for fire suppression.

Project Coordinator – Neihart Fire Chief & City Council

Recommended Project 7.5.6.1.5 – Begin planning for the long range storage needs of the municipal water system in Neihart.

Project Coordinator – Neihart Fire Chief & City Council


Figure 34

7.5.6.2. Utilities

Recommended Project 7.5.6.2.1 – The Cascade County fire agencies should work with the electric utility companies to ensure that the required clearances are maintained for all electrical transmission lines in the Cascade County (See Figure 34).

Project Coordinator – Cascade County Fire Warden

Recommended Project 7.5.6.2.2 – The Electric Utility Companies that operate in Cascade County should provide power line safety demonstrations to the Cascade County fire agencies and interested subdivision and homeowner associations on a biannual basis.

Project Coordinator – Cascade County Rural Fire Council and Power Company Managers

7.5.6.3. Emergency Response

Emergency response to wildland, wildland-urban interface and structure fires includes the placement of stations, apparatus and personnel to meet the needs of the community.

Recommended Project 7.5.6.3.1 – All the fire departments should develop a capital improvement plans to

up-grade fire apparatus and equipment, within Cascade County.

Project Coordinators – Cascade County Fire Chiefs with assistance of the Board of County Commissioners.

Recommended Project 7.5.6.3.2 – The Cascade County fire agencies should continue to maintain and enhance the interagency cooperation between the all fire departments and MT Department of Natural Resources and Conservation, United States Forest Service and the Bureau of Land Management.

Project Coordinator – Cascade County Fire Chiefs, DNRC Area Manager, L & C NF – Belt Ranger District Fire Management Officer and BLM Fire Management Officer

Recommended Project 7.5.6.3.3 – Develop and provide an educational program that communicates information about the levels of service of the county's fire protection agencies to the public.

Project Coordinator – Cascade County Fire Chiefs

Recommended Project 7.5.6.3.4 – Install mobile repeaters in fire apparatus in those areas where communications with Dispatch and others is problematic, especially in the Dearborn, Monarch and Neihart.

Project Coordinator – Cascade County DES Coordinator

Recommended Project 7.5.6.3.5 – Purchase satellite phones for key rural fire chief officers to ensure communication when on remote incidents in the county.

Project Coordinator – Cascade County DES Coordinator

Recommended Project 7.5.6.3.6 – Install an additional repeater in the southeast portion of the county to facilitate communication with the Monarch and Neihart Fire Departments.

Project Coordinator – Cascade County DES Coordinator.

Recommended Project 7.5.6.3.7 – Cascade County and the City of Great Falls should work together to consolidate the number of individual fire districts that contract with the City to a manageable number.

Project Coordinator – Great Falls Fire/Rescue Chief and the Board of County Commissioners.

7.5.6.3.1. Fire Stations

Recommended Project 7.5.6.3.1.1 – All fire stations should have a well maintained asset protection zone constructed around the fire stations (See Figure 35).

Project Coordinator – Fire Department Fire Chiefs

Recommended Project 7.5.6.3.1.2 – Construct a helipad at the Dearborn Fire Station for use during emergency incidents.

Project Coordinator – Dearborn Fire Chief and DNRC.

Figure 35

7.5.6.3.2. Training, Certification, and Qualification

Recommended Project 7.5.6.3.2.1 – Develop a training program which encompasses County Fire Warden, County Sheriff personnel, Disaster and Emergency Service officials, Mayors, City Councils and Fire Chiefs, and other government officials, to maintain currency with their fire program to include their roles and responsibilities as government officials. This training would provide the skill level to determine the appropriate level of Incident Management Team (IMT) and the ability to write a delegation of authority to the IMT, which would include the management objectives of the local government for the emergency incident.

Project Coordinator – Cascade County Fire Warden in association with MT County Fire Wardens Association

Recommended Project 7.5.6.3.2.2 – Consider adopting the National Wildfire Coordinating Group's 310-1 or National Fire Protection Association Standard 1051 as the minimum training standard for Cascade County Fire personnel as a tool to mitigate liability issues.

Project Coordinator – Cascade County Fire Chiefs.

Recommended Project 7.5.6.3.2.3 – Develop and training fire agency members to ensure that Cascade County has the capability to provide incident management support and staff at the Type 3 and 4 levels.

Project Coordinator – Cascade County Rural Fire Council.

7.5.6.3.3. Operational Procedures & Programs

Recommended Project 7.5.6.3.3.1 – GPS the perimeters of all fires that are 100 acres or larger and develop a fire history database and maps for the county utilizing GIS. Upgrade GSP units so that they are capable of tracks allowing Cascade County Fire personnel to map the perimeter of fires larger than 100 acres so that they interface with the county's GIS program.

Project Coordinator – Cascade County DES Coordinator

Recommended Project 7.5.6.3.3.2 –The Cascade County Weed Plan should be amended to require that fire suppression equipment be washed down prior to fire suppression activities to eliminate weed seeds and other noxious species moving into Cascade County.

Project Coordinator – Cascade County Weed Department with support from the Cascade County DES Coordinator

Recommended Project 7.5.6.3.3.3 – Cascade County should adopt countywide procedures for operating the EOC and responding to Hazmat or Mass Casualty incidents.

Project Coordinator – Cascade County Rural Fire Council & Cascade County DES Coordinator

7.5.6.3.4. Staffing

Recommended Project 7.5.6.3.4.1 – Develop a recruiting and retention program for the Cascade County Fire agencies. A SAFER (Staffing for Adequate Fire & Emergency Response) Grant might be used to fund this project.

Project Coordinator – Cascade County Rural Fire Council

Recommended Project 7.5.6.3.4.2 – Due to the demographics of the town of Neihart, the Fire Department should consider applying for a grant to sprinkle all of the buildings in the Town of Neihart to mitigate the

lack of volunteer fire fighters in the community.

Project Coordinator – Neihart Fire Chief.

7.5.6.4. Access

Recommended Project 7.5.6.4.1 – As road signs are replaced throughout the county, they should be non-combustible reflective road signs that would withstand a wildland fire.

Project Coordinator – Cascade County Road Department and Cascade County Commissioners

Recommended Project 7.5.6.4.2 – Install road name signs that are non-combustible and reflective on all roads that currently do not have signs.

Project Coordinator – Cascade County Road Department

Recommended Project 7.5.6.4.3 – The County should work with the Lewis & Clark NF to re-open Harley Creek Road to provide more efficient access to structures in the area.

Project Coordinator – Monarch Fire Chief, Lewis & Clark NF Belt Ranger District FMO, and Cascade County DES Coordinator.

Figure 36

Recommended Project 7.5.6.4.4 – Identify the bridge GVW capacity for bridges crossing Belt Creek to ensure safe access for fire agencies (See Figure 36).

Project Coordinator – Cascade County DES Coordinator

Recommended Project 7.5.6.4.5 – Fix one of the primary access routes into the Cooper's Ranch and Dearborn River are to ensure adequate fire apparatus access to the area (See Figure 37).

Figure 37

Project Coordinator – Cascade County DES Coordinator, Dearborn Fire Chief, MT DNRC, BLM, Cascade County Road Department, Cascade County Fire Warden, Cascade County Commissioners.

7.5.7. Asset Protection Zone (Defensible Space)

One of the single most important mitigating factors to increase the chances for the home's survival during a wildland-urban interface fire is the creation and maintenance of an asset protection zone (defensible space). An asset protection zone refers to an area around the home where the native vegetation has been modified to reduce the wildland-urban interface fire threat to the home and provides a safe area for fire fighters to work effectively and safely (See Figure 38).

Slope and fuels affect the size of the asset protection zone. Homes near steep slopes and in heavy fuels will need to clear additional vegetation to mitigate the effects of the radiant and convective heat currents and flame lengths. The slopes should be planted to native vegetation that is fire resistant.

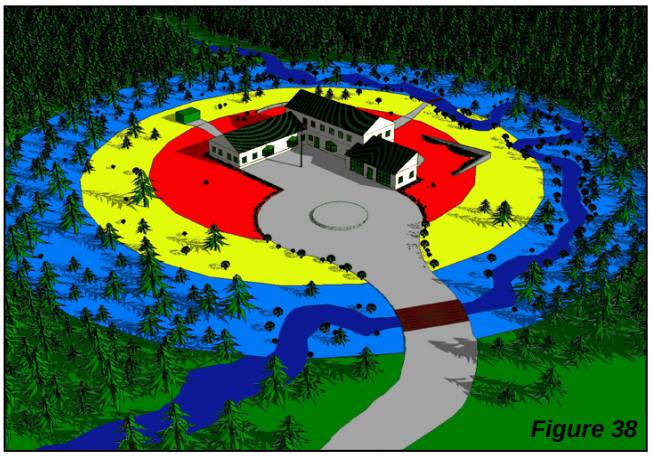


Figure 38

Recommended Project 7.5.7.1 - The National Fire Plan also mandates that local governments develop and adopt local land use plans and ordinances that provide for the maintenance of defensible space and fuel management on municipal and private property.[23] The Cascade County Commissioners need to adopted regulations which would include requirements for asset protection zones (defensible space) and fuel management in designated wildland-urban interface areas (See Asset Protection Zone Guidelines in Resources Section 10.4 of CWPP).

Project Coordinator – Cascade County Rural Fire Council

Recommended Project 7.5.7.2 – The cities of Great Falls, Belt and Neihart should ensure that residences adjacent to wildland areas in these communities are provided with adequate asset protection zones.

Project Coordinator – Fire Department Fire Chiefs

7.5.8. Recommended Building Materials/Fire Wise Construction

A home may be vulnerable to a wildland-urban interface fire because of its design, construction and/or location. There are steps a homeowner or developer can take to reduce the chance of home catching fire, or resist further damage if it does catch fire.

Recommended Project 7.5.8.1 – Recommend the use of Firewise Construction, Design and Materials[24] and Firewise Construction Checklist[25] to developers and homebuilders. See Resources Section 10.4 of CWPP.

Project Coordinator – Cascade County DES Coordinator and Cascade County Fire Chiefs

7.5.9. Fire-Resistant Landscaping

The landscaping plan of the homeowner is an integral component of the defensible space developed by the homeowner. Each lot should be thought of in terms of four zones, with each zone having a different purpose and emphasis in the overall defensible space concept for the property (See Figure 39).

Zone A (Structure Protection Zone) consists of the area from immediately next to the home to a distance of approximately five feet. The primary purpose of this zone is to have the least flammable type of landscaping immediately adjacent to the home to prevent ignition from firebrands and direct flame contact.

[23] *See* www.westgov.org/wga/initiatives/fire/implem_plan.pdf
[24] *Firewise Construction, Design and Materials, Stack, Colorado Forest Service*
[25] *www.firewise.org.*

Zone B (Landscape Zone) lies between six feet and at least 30 feet from the home. This zone provides the critical area where fire fighters can defend the home and where the fuels have been substantially reduced in height and volume.

Zone C (Forest/Wildland Transition Zone) represents the lot from 31 feet to approximately 100 feet from the structure. This area lies outside the formal landscape area and should be modified as described in the asset zone guidelines, which are attached (See Asset Protection Zone Guidelines in Resources Section 10.4 of CWPP).

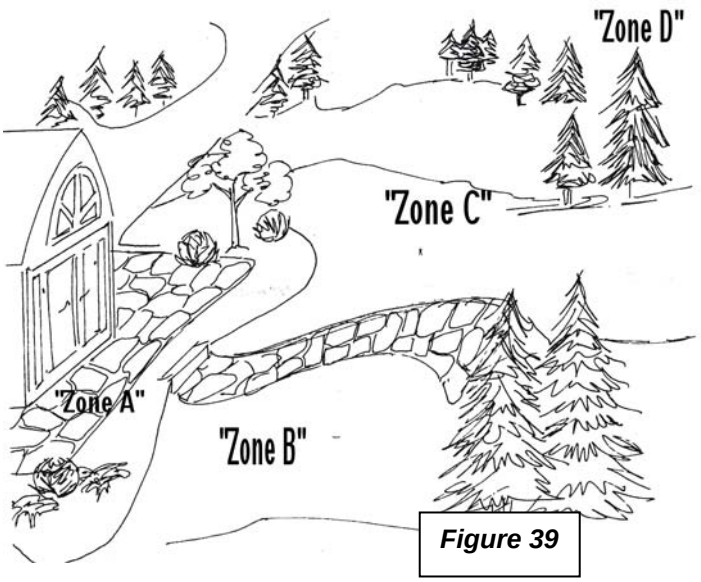


Figure 39

Zone D (Property Perimeter Buffer) is the property perimeter buffer which is 100 feet to the property line for lots 2 ½ acres or less or 100 feet to 200 feet around the perimeter of lots larger than 2.5 acres. This serves as a transition zone where you want to reduce the wildfire rate of spread and intensity, begin bringing the fire from a crown fire into a ground fire so that fire department resources can safely respond.

Provisions should be made as each phase is submitted for review to ensure the landscaping plans are reviewed for their appropriateness as a component of the defensible space requirement for the property. Provisions also need to be made by the developer to ensure long-term continuing maintenance for the defensible space surrounding the homes and businesses in the project (See Asset Protection Zone Guidelines in Resources Section 10.4 of the CWPP).

Recommended Project 7.5.9.1 – Utilize the Firewise Landscaping Checklist[26] and Fire and Your Landscape, Fire Scaping Resources for Montana Homeowners[27] (See Resources Section 10.4 of the CWPP).

Project Coordinator – Cascade County DES Coordinator and Cascade County Fire Chiefs

7.5.10. Evacuation Plan

Getting people out of harms way in a fire is critical. This section addresses specific projects designed to move people quickly, safely, and effectively.

Recommended Project 7.5.10.1 – Annually update evacuation plans for Cooper's Ranch area and conduct a tabletop exercise biannually.

Project Coordinator – Cascade County Sheriff & County Disaster & Emergency Services Coordinator

7.5.11. Public Education

Educating residents about wildland fire issues is one of the most effective ways to reduce fire hazards, whether that be in K-12 schools, or programs designed for adults.

[26] www.firewise.org
[27] *Montana Nursery & Landscape Assoc. 2003*

Recommended Project 7.5.11.1 – Sponsor a Firewise Community Program locally within the county for the public and conduct it biannually. Integrate weed and fire management into any public education that is conducted during the Firewise Community Program.

Project Coordinator – Cascade County DES Coordinator

Recommended Project 7.5.11.2 – Utilize a program such as the "Living with Fire in Montana" developed by Missoula County Fire Protection Association to educate residents, realtors, fire and government officials about living in a wildland fire environment.

Project Coordinator – Cascade County Rural Fire Council

Recommended Project 7.5.11.3 – Continue public education programs, such as the "Annual Clean-Up Day" in Neihart.

Project Coordinator – Cascade County Fire Chiefs

Proposed Project 7.5.11.4 – Develop public education kiosk's in key locations throughout the county with *Firewise* information, fire danger information and public safety messages.

Project Coordinator – Cascade County Rural Fire Council, USFS and BLM

Proposed Project 7.5.11.5 – Locate Fire Danger Rating Signs along primary roadways in the county.

Project Coordinator – Cascade County, USFS and BLM

Proposed Project 7.5.11.6 – Develop a specific Cascade County *Firewise* brochure that details the Cascade County Community Wildfire Protection Plan, asset protection zones (defensible space) guidelines, and fire apparatus ingress and egress requirements.

Project Coordinator – Cascade County Conservation District

Proposed Project 7.5.11.7 – Utilize the Cascade County Conservation District's newsletter to deliver fire safety messages and information about how to prepare for a wildland fire.


Figure 40

Project Coordinator – Cascade County Conservation District

7.5.12. Legal Requirements

Recommended Project 7.5.12.1 – Cascade County needs to resolve the issues with the Cooper's Ranch Subdivision in order to ensure ingress-egress routes are adequate and the public is not endangered (See Figure 40).

Project Coordinator – Dearborn Fire Chief, Cascade County Attorney and Cascade County Board of County Commissioners.

7.5.12.1. Subdivision Regulations

Recommended Project 7.5.12.1.1 – Adopt appropriate subdivision regulations which address the wildland-urban interface (See Model Fire Protection Standards in Resources Section 10.4 of CWPP).

Project Coordinator – Cascade County Rural Fire Council and Board of County Commissioners

Recommended Project 7.5.12.1.2 – The County Fire Chief's need to ensure that fire concerns are addressed in the subdivision review process for any future planned subdivision. The purpose for this input is to avoid creation or perpetuation of any untenable situations, from a fire protection standpoint. Issues such as road systems, water supply, building materials, asset protection zone and covenants covering vegetation management are all of concern to the Fire Chiefs and they can directly affect his/her ability to be effective.

Project Coordinator – Cascade County Planning Board and Cascade County Board of County Commissioners

Recommended Project 7.5.12.1.3 – Develop a mechanism to track new development and structures, which are in the wildland-urban interface areas of the county to enable Cascade County Fire Departments to pre-plan evacuations and fire attack.

Project Coordinator – Cascade County Fire Chiefs

7.5.13. Agreements, MOU's & Operating Plans

Recommended Project 7.5.13.1 – Develop a written mutual aid and/or automatic aid agreements between all of the Cascade County Fire Agencies including Great Falls Fire & Rescue, Malmstrom AFB FD, and the Montana Air National Guard FD.

Project Coordinator – Cascade County DES Coordinator

Recommended Project 7.5.13.2 – Review all agreements and memorandums of understanding with cooperators. Follow up on those that have not yet been up-dated and insure annual operating plans are completed when specified.

Project Coordinator – Cascade County DES Coordinator

Recommended Project 7.5.13.2.2 – Develop materials and training programs to ensure that a delegation of authority is properly executed between the appropriate "Authority Having Jurisdiction" and the Type III, II, or I Incident Commanders when utilized in the County.

Project Coordinator – Cascade County DES Coordinator

7.6. Prioritized Actions, Implementation Timeline

Recommended Project	Short Term (< 1 Year)	Medium Term (1-3 Years)	Long Term (3+ Years)
7.5.1.1	X		
7.5.2.1		X	
7.5.2.1.1	X		
7.5.2.1.2	X		
7.5.2.1.3			X
7.5.2.1.4		X	
7.5.2.1.5		X	
7.5.2.1.6		X	
7.5.2.1.7		X	
7.5.2.1.8		X	
7.5.2.2.1		X	
7.5.2.2.2	X		
7.5.2.3.1		X	
7.5.2.3.2		X	
7.5.3.1		X	
7.5.4.1		X	
7.5.4.2		X	
7.5.5.1	X		
7.5.6.1.1		X	
7.5.6.1.2		X	
7.5.6.1.3	X		
7.5.6.1.4		X	
7.5.6.1.5			X
7.5.6.2.1		X	
7.5.6.2.2		X	
7.5.6.3.1		X	
7.5.6.3.2	X		
7.5.6.3.3			X
7.5.6.3.4	X		
7.5.6.3.5	X		
7.5.6.3.6		X	

Recommended Project Table (continued)

Recommended Project	Short Term (< 1 Year)	Medium Term (1-3 Years)	Long Term (3+ Years)
7.5.6.3.7	X		
7.5.6.3.1.1	X		
7.5.6.3.1.2	X		
7.5.6.3.2.1		X	
7.5.6.3.2.2		X	
7.5.6.3.2.3	X		
7.5.6.3.3.1	X		
7.5.6.3.3.2	X		
7.5.6.3.3.3		X	
7.5.6.3.4.1		X	
7.5.6.3.4.2	X		
7.5.6.4.1	X		
7.5.6.4.2	X		
7.5.6.4.3		X	
7.5.6.4.4	X		
7.5.6.4.5		X	
7.5.7.1		X	
7.5.7.2	X		
7.5.8.1	X		
7.5.9.1	X		
7.5.10.1	X		
7.5.11.1		X	
7.5.11.2		X	
7.5.11.3	X	X	
7.5.11.4		X	
7.5.11.5		X	
7.5.11.6		X	
7.5.11.7		X	
7.5.12.1	X		
7.5.12.1.1	X		
7.5.12.1.2	X		

Recommended Project Table (continued)

Recommended Project	Short Term (< 1 Year)	Medium Term (1-3 Years)	Long Term (3+ Years)
7.5.12.1.3		X	
7.5.13.1	X		
7.5.13.2		X	
7.5.13.3			X

8. Plan Monitoring and Review: How to Keep this Plan Active and Up-to-Date

8.1. Timeline (5 years)

DMA 2000 requires that plans be updated every five years. This does not mean you have to rewrite it or redo this entire process. Rather, you are required to review your mitigation plan.

Recommended projects should be updated as the keeper of the plan becomes aware of new projects that might be implemented to mitigate a wildland fire problem. The prioritized project list should be revised every year based on new data and available dollars. The entire plan should be updated or reviewed on the same cycle as the pre-disaster mitigation plan.

8.2. Incorporation into Local Jurisdictional Plans

This plan should be adopted by local Cascade County and the recommendations be incorporated into their other planning mechanisms, such as a County Growth Policy and Pre-Disaster Mitigation Plan.

9. Summary and Conclusions

9.1. Analysis and Findings

The complexity of the wildland fire program has significantly changed in Cascade County over the last 15 years, due the development of wildland-urban interface, long term drought, and changes in the wildland ecosystems. The leadership and the level of fire preparedness within Cascade County have been able to keep pace with this changing environment through the efforts of the County Fire Warden. The Cascade County Board of Commissioners need to recognize this effort and also need to be supportive of future needs of the County's fire forces to further respond to a changing fire environment and the associated public safety risks.

In the recommended projects and programs section of this report, Section 7.5, significant changes are recommended. Funding for many of these suggested projects and programs can be obtained through the National Fire Plan and FEMA grant programs. The Cascade County Board of Commissioners is strongly encouraged to utilize a grant writer to increase the wildland fire suppression, public education, training and qualifications capability of the Cascade County and Cascade County Fire Departments.