

Sweet Grass County Community Wildfire Protection Plan

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Prepared by Dick Rath

The following have reviewed and approved this plan:

Philip Hathaway
Chair, Sweet Grass County Commission

Doug Lowry
Chair, Boulder River Fuels Reduction Committee

William Avey
District Ranger, USFS Big Timber Ranger District

Daniel Tronrud
Sheriff, Sweet Grass County

Kerry O'Connell
Coordinator, Sweet Grass County Disaster and Emergency Services

Cory Conner
Chief, Big Timber Volunteer Fire Department

James Sparks
Field Manager, Bureau of Land Management

Richard Moore
Area Manager, Montana Department of Natural Resources and Conversation

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Cover Photo: Derby Fire, August 2006, near Greycliff with Interstate-90 in the foreground. Photo provided courtesy of Sweet Grass County Undersheriff Jerry Mahlum.

1. Executive Summary

1.1. Problem Overview

Sweet Grass County is a large and remote county covering just over 1850 square miles. The county covers over 75 air miles from the northern edge to the southern edge. Under the current drought conditions, Sweet Grass County has a high degree of potential for extended [fire seasons](#) ranging from March through December. The Big Timber [Volunteer Fire Department](#) (BTVFD), under the leadership of Cory Conner, is in charge of [wildland fire](#) protection throughout the county. The BTVFD has strategically located [engines](#) based on historical fire occurrence throughout the county. In contrast to most eastern Montana counties, Montana Department of Natural Resources, under the county coop program, provides only a few of the apparatus in the county.

Sweet Grass County has the potential to interact with DNRC, the Gallatin National Forest, and the Bureau of Land Management, thus providing a higher degree of interagency complexity than some other counties in eastern Montana. Frequently the BTVFD has to deal with multiple ignitions throughout the county from lightning storms. As with a lot of counties in Montana, increasing development is occurring in wildland-urban interface areas potentially increasing the numbers and complexity of human-caused fires. This development is also bringing potential access problems and a general lack of understanding from homeowners about the need for an asset protection zone to protect their homes.

1.2. Process Overview

The Sweet Grass County Community Wildfire Protection Plan, hereafter known as “CWPP,” has been developed to assist Sweet Grass County, the BTVFD, the Big Timber Ranger District-GNF, Billings District BLM Office 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 further intended to outline potential fuels management projects and activities targeting on-the-ground activities that will reduce the risk of a catastrophic wildland and/or wildland-urban interface (WUI) fire event. This plan was nearing the final draft stage when 2 catastrophic [wildfire](#) events occurred during the summer of 2006. Both of these fires are described in Section 4.3 Fire History. Included in the descriptions are acres burned and weather conditions that lead to the [extreme fire behavior](#) conditions. This planning document will help emergency planning and implementation officials ensure that the health, safety and welfare of Sweet Grass County residents and visitors 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 the county and the city/county fire department alike, which will result in Sweet Grass County providing its citizens with tools to live more safely in a fire prone ecosystem. The CWPP fosters the preservation of the farming, ranching, and recreational economy of Sweet Grass County by maintaining and improving the fire protection capability of the county and generating business opportunities for companies in the [fuel](#) management arena.

This CWPP will try to accomplish two goals:

- reduce the risk of catastrophic events through fuels reduction and education; and

- improve the planning and suppression capabilities of our emergency services sector

1.4. Methodology

Sweet Grass County uses a Geographic Information System (GIS) based analysis approach to development of the fire hazard assessment. This approach enables personnel from the county to look at specific areas of high risk in the project area such as wildland-urban interface and to focus on items that would be included in the mitigation plan as recommended projects.

1.5. Mitigation Strategy – The Action Plan

This is a summary of specific actions which are developed in Section 6, Mitigation Strategy. The overriding goal of this section is to develop an action plan that reduces the risk of wildland fire for the county. The planning priorities for 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 described include asset protection zones, neighborhood preparedness, fire protection response, and the coordination of prevention protection projects and response plans. Many of the projects listed in this plan were edited to reflect changes in timber stands following the catastrophic Derby and Jungle Fires. Projects and programs are included as part of the mitigation effort for Sweet Grass County.

General objectives from the current Sweet Grass County Pre-Disaster Mitigation Plan to use as a reference include:

1. Support action groups in the county with fuels reduction projects.
2. Continue to assist the public with [defensible space](#) issues.
3. Assist with reseeding in burned areas to prevent flood damage and water contamination.
4. Install dry hydrants in subdivisions.
5. Include wildland fire risk considerations when reviewing subdivision regulations.
6. Purchase better firefighting equipment.
7. Provide more opportunities for advanced training.
8. Provide public education about wildfire mitigation and fuels treatment opportunities.
9. Expand the county website and better publicize it.
10. Recruit more firefighting personnel.

2. Introduction

Wildland fires have been a continuing challenge throughout Montana's history. Sweet Grass County has a very significant [fire load](#) responding to over 35 wildland fires and 150 calls of all types of fire each year. The heaviest work load comes from wildland fires.

Several areas within the county have an extreme danger of wildland-urban interface fire. The Main Boulder has the highest risk, due to the potential consequences resulting in loss of life and personal property. The extremely heavy recreational use, the poor transportation system, and the potential for extreme fire behavior¹ place the Main Boulder in the top category.

Additional areas within the county that have been classified as very high fire risk are those areas of the county that have significant timber vegetation types. Within this high risk category are subdivisions and development of [wildland urban interface](#), such as: Stage Coach Estates, Hump Creek Road, Work Creek Road, and Mallard Springs and Indian Rings subdivisions.

In general, across the county, fires over 100 acres have the potential to threaten some structures due to the increase in development into wildland areas.

The safety of the citizens in Sweet Grass County is a shared responsibility between the citizens; the owners, developers or associations; and the local, county, state, and federal governments. The primary responsibility, however, remains at the citizen/owner and homeowner association level.

The following problems have increased the wildland-urban interface fire risk:

- Desire to live in a secluded area surrounded by natural vegetation with no asset protection zone (defensible space).
- Homes built of flammable materials (wood siding, shakes and decks).
- Long, narrow, or winding access routes prevent fire equipment from reaching some areas in the WUI.
- Long distances from fire protection entities.
- Some misconception that fire protection in rural areas is equal to urban fire protection services.
- Inadequate water supply for structure fires and [structure protection](#).
- Poor signage and access to residences.
- Utility service lines and propane tanks

2.1. Background and History of Accomplishments

In 2003, the county established the Boulder River Fuels Committee (BRFC) that began actively seeking funding to provide fuels treatment work within the Boulder River Canyon.

After receiving grants from the BLM and DNRC, the Boulder River Watershed Fuel committee retained Fire Logistics to:

1. Develop a Strategic Wildfire assessment and mitigation Plan for the Boulder River Canyon to include the following components:
 - a. Develop a hazard assessment for the canyon including, at a minimum:
 - i. Terrain
 - ii. Fuels
 - iii. Flammability of structures
 - b. Suggest mitigation and prevention activities.

¹ Main Boulder Report, by Cohen and Butler, 1997 and 2005

- i. Identify appropriate wildland/urban interface survivable space needs.
 - ii. Identify strategies for residents' involvement.
 - iii. Proposed vegetative management treatments and areas.
- c. Identify appropriate sites for staging wildland fire engines within the canyon.

This plan was completed in August 2004.

In 2004 the Boulder River Watershed Fuels Committee decided to use grant money to assist in developing a county-wide assessment and mitigation plan using the combined expertise of Kerry O'Connell from the Sweet Grass County Disaster and Emergency Services, John Novotny from the BTVFD, and Dick Rath from the Sweet Grass County Conservation District.

2.2. Mission

The mission of the BTVFD is:

- To safely provide structure and wildland fire protections at the lowest possible cost to all residents of Sweet Grass County;
- To develop a wide array of strategies for [fuel reduction](#) and fire suppression that the Sweet Grass County residents and visitors can accept as sensible precautions against catastrophic wildland fires; and
- To improve the fire suppression [resources](#) of the county by identifying equipment and training needs.

2.3. Current Relevant Fire Policies

A brief discussion of the relevant fire policies is provided to educate the leaders and residents of Sweet Grass County. Copies of the following policies and plans should be maintained by the county for reference material.

2.3.1. Federal Policies “Homeland Security is Fire Safety”

This section will briefly describe the relevant policies at the national level, which affect fire planning on the local level. This information should be used as reference material to understand the background of fire management policies and issues as they affect Sweet Grass County.

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 firefighters 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. 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

2.3.1.2. 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:

² See www.fireplan.gov

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

Disaster Mitigation Plans must be approved by 11/04 to receive HMGP funds after that date.³

2.3.1.3. Western Governor's Association

The Western Governor's Association developed two documents: The 10-Year Comprehensive Strategy for Reducing Wildland Fire Risks⁴ 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 establish priorities, cooperation on activities, and increase public awareness and participation to reduce the risks to communities and environments."⁵

2.3.1.4. Local Implementation of Federal Fire Policies

Fire protection objectives on the state and private lands in Sweet Grass County are addressed indirectly in the Cooperative Fire Management Agreement between USDOJ's Bureau of Land Management, National Park Service – Intermountain Region, Bureau of Indian Affairs – Portland and Billings Area, US Fish and 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 governments is encouraged and additional agreements may be made with counties through the State of Montana. 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 program.

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 using a fire investigator when the situation is warranted.

2.3.2. State Policies

Currently there are no State policies that require a rural fire district or county fire organization to develop a community fire plan.

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

³ See www.fema.gov/pdf/fima/howto1.pdf

⁴ See www.westgov.org/wga/initiatives

⁵ See www.westgov.org/wga/initiatives/fire/implem_plan.pdf

direction as noted above.

2.3.3. Local Policies

The following policies have been used in the development of the CWPP:

- Sweet Grass County Growth Policy
- SGC Subdivision Regulations (revised March 2006)
- SGC Pre-Disaster Mitigation Plan (approved 2004)
- 2003-2008 Sweet Grass County Growth Policy
- Flood mitigation plan

2.4. Planning Area Boundaries

The planning area includes all private and public lands within Sweet Grass County. In the southern portions of the county, where the Main Boulder Road winds across the Sweet Grass/Park County line, some portions of Park County are included in this plan. This is in cooperation with Park County officials, public land managers, and private landowners.

3. Community Description

Centrally located in southwestern Montana between Bozeman and Billings, Sweet Grass County covers 1855 square miles and was home to a projected population of 3609 residents according to the 2000 US Census.

One of the earliest records of exploration of Sweet Grass County occurred in 1805 when the Lewis and Clark expedition made their way up the Yellowstone River. The 1800s gold rush in the Main Boulder brought Sweet Grass County its first population with towns such as Independence being established at the head of the Main Boulder River.

Sweet Grass County was established in 1895. The county contains large tracts of National Forest and private landholdings. A large share of the county outside National Forest boundaries is noted for excellence in its agricultural production of sheep and cattle. Sweet Grass County has a wide variety of unique and special areas with opportunities for recreational development. All of the rural outlying areas have an abundance of open landscapes, wildlife, rural agricultural settings, and recreational opportunities.

3.1. Population and Demographics

Table 1. Sweet Grass County Community Statistics (2000 U.S. Census)

Statistic	2000 U.S. Census Data
Population	3609
Percent population change, 1990 to 2000	14.4%
Square Miles of Land Area	1855
Persons per Square Mile	1.9
Persons 65 years old and over	17.6%
Percent Caucasian	97.0%
Percent Black or African American	0.1%
Percent American Indian and Alaska Natives	0.6%
Percent Asians	0.3%
Percent Hispanic or Latino	1.5%
Percent of persons reporting another race	0.7%

Sweet Grass County business trends are best described from the Sweet Grass County Growth Policy (2003-2008):

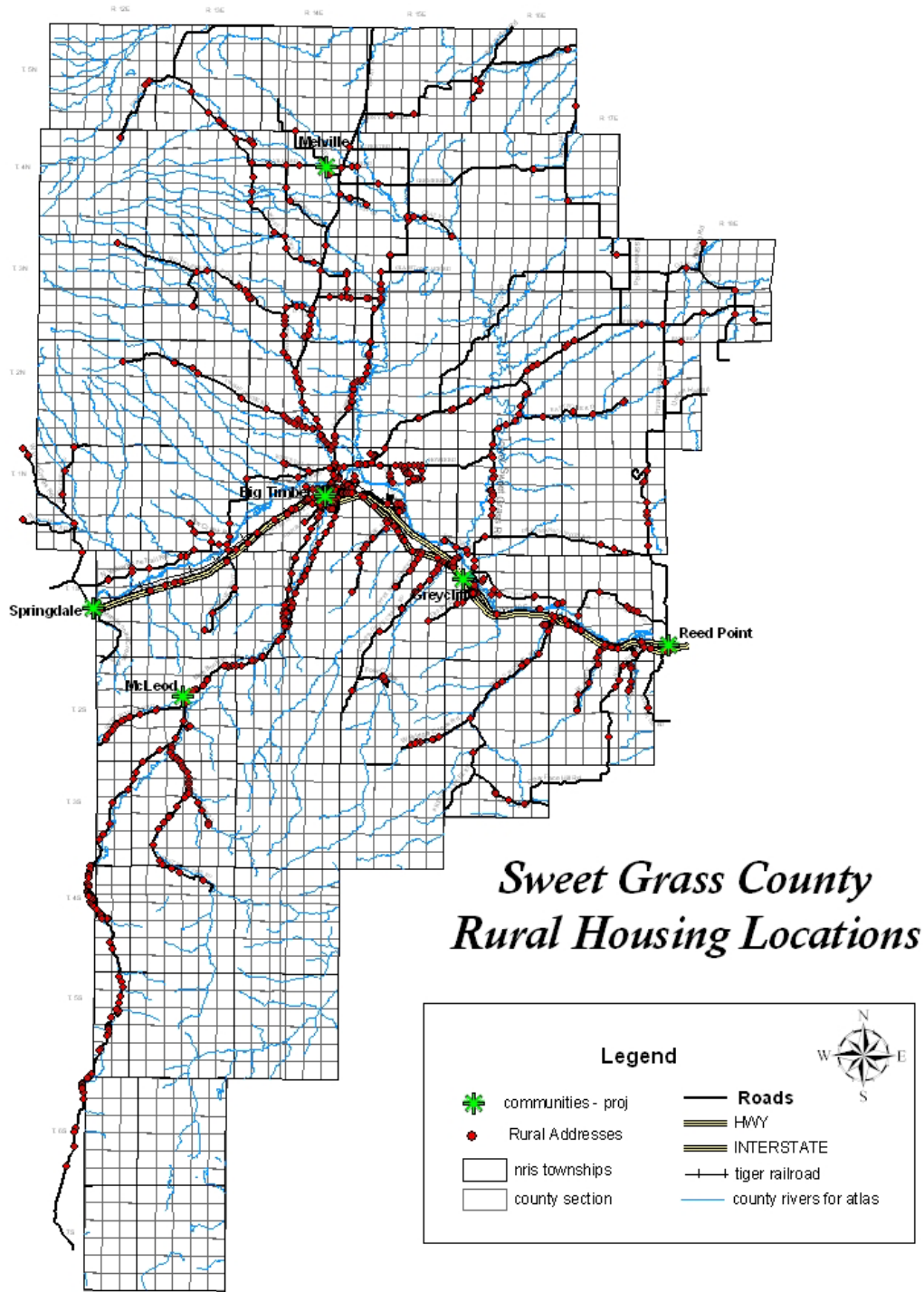
“While still the dominant land use, agriculture has slipped slightly in its leading economic role. In 1970, agricultural jobs accounted for 35% of all county employment. Based on 2000 data, less than 23% of all jobs are in agriculture. Consolidation of land and improved equipment account for most of the reduction of agricultural jobs.

“Retail-related jobs account for 18% of all county jobs partially due to the increase in tourism and travel sectors. Thirty-five retail establishments were operating in the county in 1997. Tourism-related enterprises also bolstered employment and earnings in the service industry. Service now comprises at least 17% of all county employment. The 37 service establishments operating in 1997 included hotel and other lodgings, auto repair, health, personal, legal and other professional services. Government related jobs account for 16% of all county employment. The construction industry has also been steadily increasing since the 1970s in terms of earnings and employment.”

The Growth Policy listed Per Capita income in 2000 at \$19,968, and listed unemployment at 2.6% in 2003. A major employer in the county in recent years is the Stillwater Mining Company, operating a platinum and palladium mine on U.S. Forest Service land in the East Boulder drainage.

About half of the population of Sweet Grass County is concentrated in or near Big Timber, the only incorporated town in the county. Big Timber is centrally located as depicted on Map #1. Other communities include Melville to the north of Big Timber, Greycliff to the east, and McLeod to the south. Springdale is a community just west of the county line in Park County, and Reed Point is just east of the county line in Stillwater County. Sweet Grass County emergency responders often respond to Springdale and Reed Point as part of a mutual aid agreement due to improved response times from Sweet Grass County responders.

Map 1 is intended to show that most of the population in the county is concentrated either in Big Timber or nearest Interstate-90. The further from Big Timber, the more sparse the population, mainly due to the number of large ranches in the outlying parts of the county. The most obvious exception to this is south of Big Timber. The Main Boulder Road extends furthest south ending in Park County and contains mostly summer homes. Four church camps operate in this area in the summer months, as do several U.S. Forest Service campgrounds and cabins. Summer population in this part of the Boulder Valley can easily exceed 3,000 recreationists daily.



Map 1. Sweet Grass County Population Density According to Rural Housing Locations

3.2. Stakeholders

The following stakeholders have participated in the development of this CWPP:

- Big Timber Volunteer Fire Department
- Sweet Grass County Fire Warden
- Sweet Grass County Board of County Commissioners
- Bureau of Land Management-Billings Field Office
- Gallatin National Forest-Big Timber Ranger District
- Northwestern Energy
- Sweet Grass County Disaster and Emergency Services
- City of Big Timber
- Sweet Grass County Sheriff's Office
- Montana Department of Natural Resources and Conservation
- Park Electric Cooperative
- Triangle Telephone Cooperative
- Grazing Association
- Sweet Grass County Conservation District
- Boulder River Fuels Committee

3.3. Geography

3.3.1. Topography, [Slope](#), [Aspect](#), Elevation

Two mountain ranges, the Absaroka/Beartooths along the southern part of the county and the Crazies to the northwest, dominate the higher elevations of Sweet Grass County. Elevations in the Absaroka/Beartooths range from 10,992 feet near Monument Mountain to 5,156 feet at Natural Bridge. Elevations in the Crazies range from 11,214 feet near Crazy Peak dropping to 5,800 feet along the eastern side of the mountain range. The open prairie lands range from 5,800 feet near Melville to 3,800 feet along the Yellowstone River at Reed Point. As you move from the mountains toward the floor of valleys, a series of high gravel capped tablelands are encountered. Below these tablelands are bench lands which are adjacent to moist stream and river bottoms. The most intensive land uses occur on these moist areas, which include farming, town sites and residential uses.

The Boulder River drainage generally flows from south to north. It begins at the hydrologic divide near Monument Mountain at nearly 10,992 feet in elevation and descends to 5,156 feet at the Natural Bridge. As the river flows north it drops over a mile in elevation by the time it travels the twenty-four miles to the Natural Bridge area. From the Natural Bridge the Boulder River continues in a generally north flow past the city of Big Timber and empties into the Yellowstone River just north and east of Big Timber.

3.3.2. Meteorology, Climate, Precipitation, and Fire Weather

Climate directly affects [fire behavior](#), with wind being the major influencing factor. Generally, steering winds aloft in this area prevail out of the south to west with surface winds southeast to southwest. Wind speeds are typically moderate to strong, depending on the elevation and aspect. Southwest and west facing slopes are more exposed to the prevailing winds which dry the fuels relating to increased fire behavior activity. Fires generally spread from southwest to northeast. During calm days, [fire spread](#) will be dictated by topographic configuration and local upslope and downslope winds. During strong wind events, fire spread will be dictated by wind direction and the winds will override the effects of the topographic features.

Local winds in Sweet Grass County are a factor that can have a significant effect on fire spread. Due to the orientation of the drainages along the Absarorka/Beartooth Mountains in the southern portion of the county and to the topographical features of the Crazy Mountains, it is fairly typical for a strong down canyon wind to develop by mid-morning. This wind is the result of the sun heating the prairie grasslands located to the north of the canyon mouth. As the prairie grasslands warm and that air begins to lift, cooler air trapped in mountainous areas of the larger drainages rushes downstream replacing the heated air that is rising. This natural process provides a down canyon wind that at times can be very strong and will last until the air temperature becomes stable. This natural phenomenon is strongest in the Main Boulder, East Boulder, and the larger drainages along the southern portions of the county and the eastern edge of the Crazies.

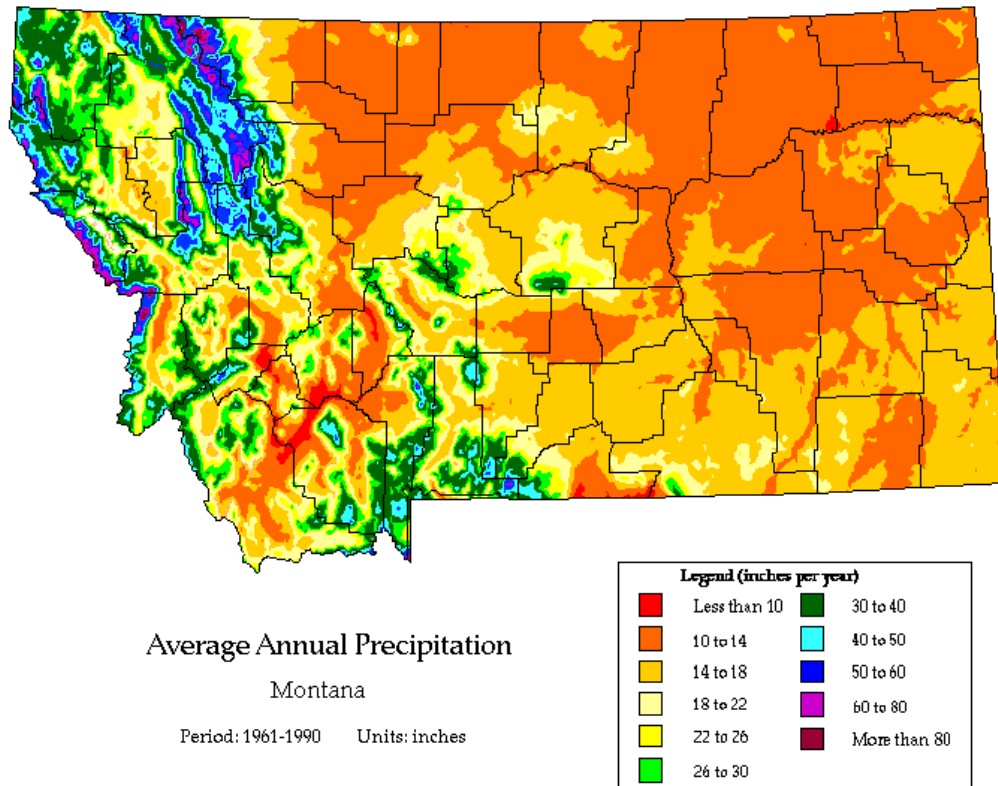
Because of the high frequency of thunderstorm activity in Sweet Grass County, it is not unusual to experience winds blowing from all quadrants of the compass. This wind anomaly challenges all wildland fire suppression efforts and leads to firefighter safety concerns and the potential for large wildland fire growth in unpredictable directions. During warm windless days, fire spread will be dictated by topographic configuration and local upslope/downslope winds. These winds can be considered an every day occurrence that need to be taken into consideration during planning for wildland fire suppression activity. As the current and protracted drought continues, fire suppression personnel need to keep current on fire weather, especially predicted wind direction, through spot weather forecasts from the National Weather Service in Billings.

Moisture regimes can be defined in terms of storm tracks, which generally move across the county from west to east. The storm track affecting Sweet Grass County begins along the western edge of Gallatin County and tracks from west to east across Park and Sweet Grass counties. Typically, any significant moisture associated with these storm tracks has often been depleted prior to reaching Sweet Grass County. The higher elevations in the Absarorka/Beartooth Mountains provide the orographic lifting that provides more moisture to this forested area. This process would begin approximately twenty miles west of the Main Boulder in Paradise Valley. Lightning associated with these storms can continue to contribute to a significant number of fire starts along the storm's path. As the angle of the sun increases from spring into summer, the freezing level increases with the air mass becoming warmer. This allows the lower levels of the atmosphere to dry resulting in thunderstorms that become more dry than wet. These thunderstorms often produce strong down draft winds and produce virga with little, if any, rain reaching the ground.

Rainfall in August and September varies widely through the valley.

August average is	0.53"-0.83" ranging from 0.30"-1.31"
September Average is	0.91"-1.17" ranging from 0.30"-1.65"

Winters have been mild for the past several years and annual moisture continues below normal levels. Winter and spring snow events have been fewer with less snow accumulating over the mountains. Streams and rivers have been flowing at or near record low levels. In addition, subsurface soil moisture continues to be short, stressing vegetation of all types.



Map 2. Montana Annual Precipitation

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 summer. Spring seasons (April through June) are generally moist months with low fire frequencies. Fire ignitions during spring months result in mostly low intensity fires. Minor fire activity can occur in early spring prior to green-up conditions. As the season turns to summer, grasses and shrubs begin to lose their live [fuel moisture](#), down fuels begin to dry, and fire conditions normally peak by August. As autumn approaches, conditions generally begin to cool, but the presence of dry [cold frontal](#) passages become quite common and can promote conditions of extreme fire behavior. Late fall conditions in 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.

The drying of the lower atmosphere also affects thunderstorms that might develop. These thunderstorms are usually five to seven miles wide at their bases and are sufficiently dry to evaporate any moisture falling from the cells. These “dry” thunderstorms also tend to develop strong outflow winds, and commonly produce lightning that can strike within 25 miles of the thunderstorm.

The normal summer weather pattern for Sweet Grass County can best be understood by looking at the larger weather pattern for the entire western United States. High pressure usually establishes over eastern portions of Montana while the typical flow aloft is west or southwest with surface winds following normal diurnal fluctuations in valleys and canyons. The lower levels of the

atmosphere are generally too dry to support much more than cumulus formations as heating from descending air within the ridge aloft produces a stable atmosphere. Upper level systems occasionally transition across the area accompanied by mid and high level moisture often producing mountain thunderstorms that travel only a few tens of miles from the mountains. This is the main mechanism for moisture within Sweet Grass County during the summer months. Generally the higher elevations potentially will receive some moisture, but little of that reaches the prairie lowlands. Occasionally low level moisture from the Gulf of Mexico moves into eastern Montana moving west toward the mountains. This weather anomaly generally occurs during early spring and early fall and is preceded with high winds followed with significant amounts of moisture. This type of weather pattern has resulted in significant fire spread prior to the arrival of moisture.

When thunderstorms develop over the mountains and encounter the low level moisture across the area they move east and north onto the plains. This produces strong to very strong thunderstorms associated with severe weather such as strong outflow winds, large hail, and heavy rains. This low level moisture usually diminishes by the end of June to mid-July as the Bermuda High moves across Texas and New Mexico, cutting off the supply of low-level moisture. As this moisture is diminished, general thunderstorm activity decreases across Montana and allows the lower atmosphere to warm and dry.

As general thunderstorm activity decreases in July, a high-pressure system sets up across Montana with subsistence in the high pressure drying the atmosphere. This subsistence does two things: it brings very warm temperatures (88-96 and warmer in the adjacent plains) to the area, and it lowers the [relative humidity](#). This lower relative humidity begins to dry the fuels of all size classes (1-hour, 10-hour, 100-hour, 1000, and 1000-hour plus time lag fuels). The 1 to 100-hour time lag fuels will show evidence of drying within 3-5 days. The 1000-hour fuels will take significantly longer to dry usually in the range of 3 to 5 weeks.

Long-term drought poses another significant challenge because of its effect on current vegetative conditions i.e., reduction in live fuel moisture content stressing the vegetation and trees allowing insect infestations to occur killing large numbers of trees. Fire records for Sweet Grass County indicate that the current wildland fire suppression actions are effective when the [energy release component](#) (ERC) is below the 97th percentile. When the ERC is above the 97th percentile, wildland fire suppression actions are historically not effective. Since 1988, Sweet Grass County has experienced 8 significant fire seasons. The fire season of 1988 is considered the benchmark year for the county.

The fire history for Sweet Grass County in 1988, 1990, 1991, 1994, 1996, 2000, 2001, 2003, and 2006 were years of significant [large fire](#) growth. In reviewing these nine years, a correlation can be drawn to the month of August.

A review of the fire history for Sweet Grass County for these years showed the following correlations:

- Average maximum temperature 78 degrees.
- Average wind speed was 7 mph consistently from the southwest. Wind gusts from 30-40 mph were common and often exceeded 55 mph. These gusty winds are common throughout the year.
- August is consistently the driest month with weather records showing poor nighttime relative humidity recovery. During the daylight hours the relative humidity begins to drop substantially beginning at 0900 and remains low until 2100. These relative humidity levels bottom at the lower teens around 1700-1800 hours. The month of August consistently remains the month with the lowest relative humidity and poorest humidity recovery. In reviewing the weather history, these are also the days where relative humidity remained low for the entire twenty-four hour period.

- 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.
- Energy Release Components were highest and above the 90th percentile from mid August through mid September.
- Conifer stands and adjacent shrub-dominated communities contributed to large fire spread, where, due to safety concerns, high fire intensities did not allow for aggressive [initial attack](#) or fire suppression with ground forces.

3.4. Infrastructure: Roads, Driveways, Utilities, and Communication

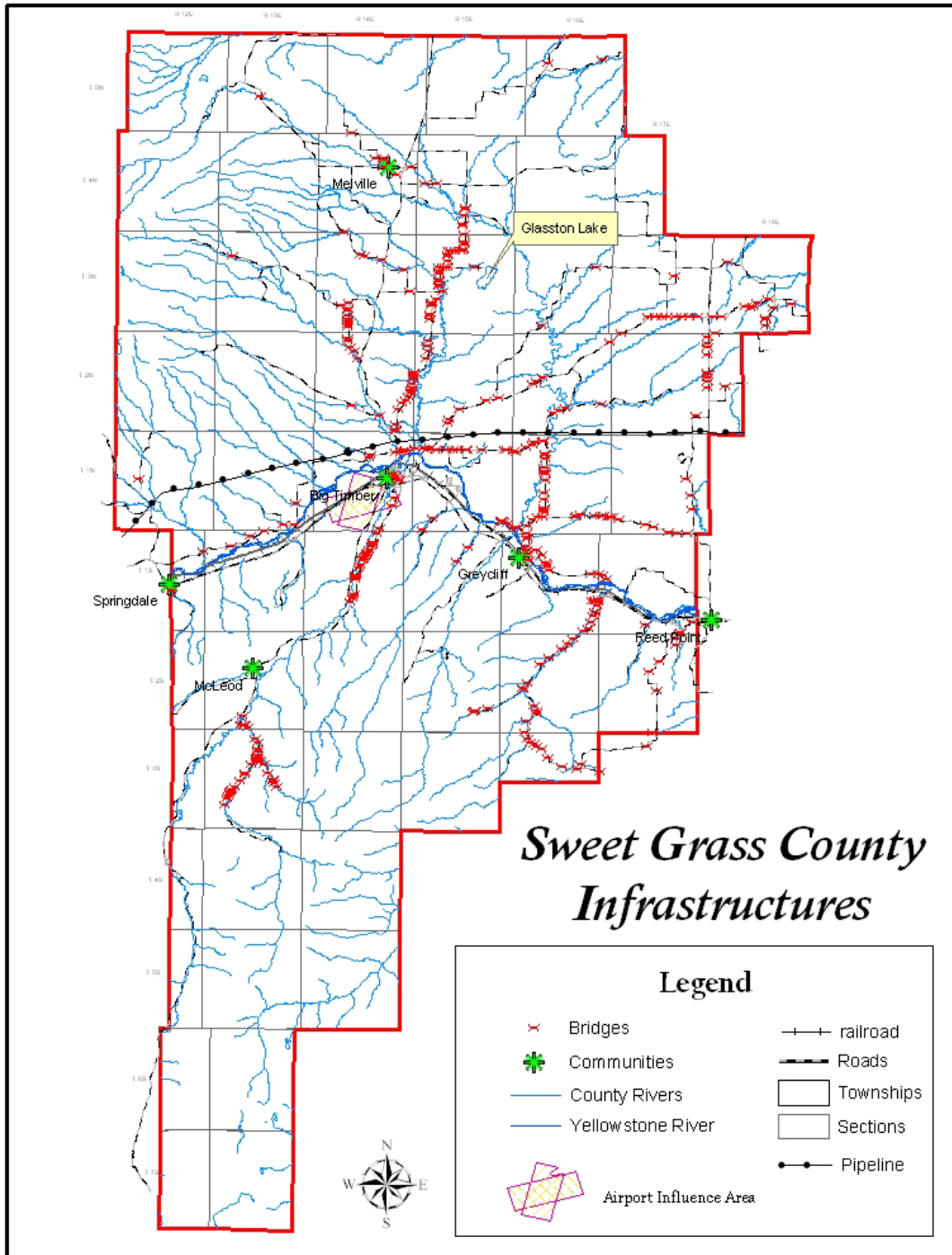
Table 2. Critical Infrastructure Values

Asset	Size of Building (sq. ft.)	Replacement Value (\$)	Contents Value (\$)	Total Value (\$)
Big Timber City Hall	5250	169,000	38,000	207,000
Water Pump Building	200	10,300	34,000	44,300
Water Intake Building	250	14,420	14,420	28,840
Water Tank	N/A	216,800	N/A	216,800
Lift Station	N/A	88,000	N/A	88,000
Yellowstone Lift Station	N/A	80,500	N/A	80,500
Lagoon	N/A	837,000	N/A	837,000
Fire Hall	10,250	404,000	65,000	469,000
Solid Waste Transfer Station	950	60,000	N/A	60,000
County Courthouse	7326	576,000	108,000	684,000
County Shop	6408	42,000	24,000	66,000
Pioneer Medical Center	41,200	5,100,000	234,000	5,334,000
Old Hospital (county offices)	14,601	1,200,000	5,500	1,205,500
Elementary School	34,129	3,905,000	768,000	4,673,000
County High School	57,142	4,857,000	1,591,000	6,448,000
Civic Center (Shelter)	10,432	938,000	87,000	1,025,000
Melville School	1590	136,000	26,000	162,000
McLeod School	1200	125,000	34,000	159,000
Greycliff School	3064	260,000	65,000	325,000
Springdale School	2280	148,000	34,000	182,000

Values still to be determined of other businesses and structures that are considered critical infrastructure:

1. Electrical substation
2. Triangle Telephone building
3. Gas stations
4. Roads and bridges
5. Sewer lines
6. Water lines
7. Gas pipelines
8. Post Office
9. USDA Building

Locations of infrastructure are shown on Map 3 on the next page.



Map 3. Sweet Grass County Infrastructures

3.5. Emergency Services

County government is responsible for services and maintenance of county-owned property outside the city of Big Timber. Emergency services overlap city and county [jurisdictions](#) and the response area includes everything inside the county. Law enforcement services are combined for city and county, as are ambulance services.

The Sweet Grass County Sheriff's Office (SGCSO) employs four full-time deputies, one part-time deputy, one undersheriff, and one sheriff. This force also provides law enforcement services to the city of Big Timber according to a contract that is renewed yearly. Budget constraints are a common problem, as with most law enforcement agencies, and county and city government officials have discussed a public safety mill levy to help alleviate some budget issues. The SGCSO routinely applies for grants to assist with the purchase of new equipment. The SGCSO has a four-bed holding facility to house inmates up to 72 hours. Occasionally, inmates sign a waiver to remain in the facility for longer than 72 hours, or they are transported to a facility in Livingston or Billings.

About fifteen volunteers offer their time to a Reserve Officer force and assist SGCSO personnel with tasks such as transporting prisoners between detention facilities; limited patrol duties; traffic control during planned events or during disasters; and perimeter/crowd control. The Reserve Officers also support a volunteer search and rescue unit of about 10 people. Searches in the wilderness often require outside agencies to assist the local SAR unit. SAR volunteers attend monthly trainings and are currently training to pass a national level testing procedure.

The SGCSO is also responsible for the 911 [dispatch center](#). Six full-time [dispatchers](#) are responsible for all duties. The role of the Sweet Grass County 911 office is to [dispatch](#) all emergency service units in the county; track responding units and coordinate communications during emergencies; assist with jail surveillance; maintain arrest report information and document investigation information; provide SGCSO personnel with criminal history, etc. from the state database system, CJIN; and may include other duties as needed. The 911 office achieved enhanced-911 status in October of 2007. Phase I and II wireless implementation is expected by spring of 2009. The costs of upgrades completed in 2006 approached \$250,000. Technology improvements and maintenance in the dispatch office are funded through 911 charges collected from all phone subscribers. The 911 budget pays for equipment purchases and repairs in dispatch and radio tower sites, as well as a small portion of the salaries paid to dispatchers. The law enforcement budget pays for the remainder of the dispatcher salaries.

The Sweet Grass County Disaster and Emergency Services (DES) department consists of one full-time coordinator and one part-time deputy coordinator. The Sheriff also acts as the on-call deputy coordinator when needed during responses. Duties of the DES department include maintaining and updating operations plans, writing grants for response agencies and for planning projects, acting as manager of the [emergency operations center](#) when needed during responses, acting as public information officer during responses, and coordinating with all response agencies during preparedness, mitigation, response, and recovery phases of all disasters.

The Sweet Grass County Ambulance is a volunteer service operating as part of the community hospital, the Pioneer Medical Center. About 30 volunteer emergency medical technicians (EMTs) share responsibilities to provide 24-hour coverage to the county. Of the 30, two people are trained as paramedics. All training requirements satisfy the national accreditation standards and the service reports all training to the state of Montana. EMTs are paid a stipend when performing patient care. A mil levy supports the operation of the ambulance service and donations and grants supplement the budget, sometimes covering new equipment purchases. The service operates and maintains three ambulances, one of which is 4-wheel-drive. The vehicles are kept in a heated building that includes a small office.

The Pioneer Medical Center (PMC) employs about 100 full-time and part-time staff and is a combination health clinic, hospital, nursing home, and assisted living facility. The PMC is affiliated with Deaconess-Billings Clinic, a facility that provides the PMC management and information system services. The PMC is run by Sweet Grass County government through a 5-person board of directors. The facility provides many medical services including a 24-hour emergency room, X-ray and labs, pre-natal care, physical and speech therapy, geriatric care, and hospice.

3.5.1. Fire Protection

Community fire suppression and protection is provided through one county-wide fire district. Wildland fire protection is provided by the Big Timber Volunteer Fire Department under the direction of the county fire warden with various fire suppression resources throughout the County.

Table 3. Fire Resource Types and Locations

ID	Year	Make	Type	Vin Number	Tank	4 x 4	Location
1	2000	Kenworth	1	2NKMH28X41M874922	1000 Gal	x	Big Timber
2	1983	GMC	1	1GDP7D1Y9EV5129822	900 Gal		Big Timber
3	1964	White	6	DA-20-018-AMC-0398T	1500 Gal	x	Big Timber
4	2000	Chevy	Command	1GNFK16R2XJ441866	N/A	x	Big Timber
5	2007	Ford	6	1FDXX47YX7EA69056	300 Gal	x	Big Timber
6	1979	Ford	Tender	690TVDF1192	3000 Gal		Big Timber
7	2005	Ford	Command	1FDSF354EA50957		x	Big Timber
8		DSL Jeep	6	FED. PROPERTY # 1101244116 MT000DSL0819	200 Gal	x	Big Timber
9	1994	GMC	3	C573604W0128346	700 Gal	x	Big Timber
10	2006	Ford	6	1FDAF57Y77EA03448	300 Gal	x	Big Timber
11	2005	International	3	1HTWEAAR95J038846	1000 Gal	x	Big Timber
12		Pierce Arrow	1-Ladder	E-2477	1000 Gal		Big Timber
13	1994	Kenworth	Tender	1XKDDR9X5RR631964	3000 Gal		Big Timber
13		DSL Jeep	6		200 Gal	x	Melville
14	1973	Jeep 6x6	Tender	05D-67771-C134-10192	3000 Gal	x	Melville
15	1976	Ford	3	F66DVA50322	500 Gal	x	Melville
16	1986	Ford	6	FDKF38LXGPA03640	300 Gal	x	Melville
17		DSL Chevy	6		300 Gal	x	Bridger Crk
18	1989	Chevy	6	1GBJV34K4KJ12001	300 Gal	x	McLeod
20		DSL	6		500 Gal	x	McLeod

Sweet Grass County is a “coop” county within the geographic area of the Montana DNRC Southern Land Office. DNRC provides additional resources such as [air tankers](#) from Billings and West Yellowstone, and helicopters that are under contract to Montana DNRC. In 2008, BLM and the USFS completed a permanent single-engine air tanker (SEAT) retardant base to provide more efficient retardant drops during fires in the county and surrounding areas. The BLM and USFS provide direct protection of their ownership and support Sweet Grass County along the mutual threat zone and as requested for mutual aid.

Sweet Grass County DES assists county agencies maintain mutual aid agreements with surrounding counties and many of these agreements have recently been updated.

3.5.1.1. Fire Engine Pump/Draft Source Sites

Water supply sources for wildland fire protection and structural fire protection throughout Sweet Grass County are relatively scarce. They include stock ponds, holes in creeks, etc. Due to the long-term drought in Sweet Grass 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 brought to the fire, through fire apparatus such as water tenders.

3.5.1.2. 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 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 officials.
- The 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, should have an assigned Incident Commander (IC). The training, certification and qualifications of the Incident Commander (IC) vary by the type of fire. General guidance is:

Type 5 Incidents

- Resources required typically vary from two to six firefighters
- The incident is generally contained within the first [burning period](#) and often within a few hours after resources arrive on scene.

Type 4 Incidents

- [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 in Resources Section).

Type 3 Incidents

- 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 2 or Type 1 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 county fire warden can assess the hazards and complexities of an incident and determine the specific positions needed (See Incident Complexity Analysis in Resources Section).

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 Sweet Grass County for mobilization outside of the county. Within the County, local standards would apply.

3.5.2. Law Enforcement

Law enforcement, perimeter control, road closures, and evacuation services are provided by the SGCSO.

3.6. 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 are:

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

The rating system produces ten different Public Protection Classifications, with Class 1 receiving the most insurance rate recognition and Class 10 receiving no recognition.

Big Timber Volunteer Fire Department currently has an ISO Rating of Class 5/10. This means that those residences within the district and within 5 miles of the Big Timber Fire Station are considered an ISO Class 5 with an approved water supply and all of the rest of the county is an ISO Class 10.

Improvements to the water delivery system, dispatch and to the fire district could improve the ISO rating, which would result in some annual insurance premium savings to the customers of the fire district.

3.7. Land Use/Development Trends

According to the 2003 Sweet Grass County Growth Policy (approved March, 2003), current land classifications show that the county is primarily agriculture-based. Over 64% of the land area is taxed as agriculture; federal land constitutes 25%; private timberlands constitute 6%; state lands constitute 4%; and residential tracts amount to less than 1% of the total land base. Table 4 from the Growth Policy shows a detailed list of land classifications.

Table 4. Land Use Classification

<u>LAND USE CLASSIFICATION</u>	<u>ACRES</u>
Agricultural	
Irrigated	31,965
Non-irrigated	18,417
Wild hay	18,548
Grazing	<u>687,287</u>
Total Agriculture	756,217
One Acre Farmsteads	486
Private Timberland	70,966
Commercial Tracts	176
Industrial Property	585
Tract Land	
Less than 20 acres	1,500
20-160 acres	<u>6,442</u>
Total Tract Land	7,942
City/Town	480
Exempt*	
Agricultural	1,926
Residential	<u>16</u>
Total Exempt	2,123
Federal (F.S., BLM, Water)	299,135
State	48,510
GRAND TOTAL	1,186,620

Projected land use trends are expected to remain fairly consistent to that shown in Table 4. As the agricultural economy goes through cycles of economic pressures, the potential is that some ranch property may convert to recreational use. Citizen value of open space is expected to increase and more encouragement and support may arise for citizen initiated zoning actions that protect open spaces.

The county population is expected to increase between 200 and 700 people within the next 10 years. At an average household population of 2.4, this expected growth could generate a demand for 83 to 292 additional dwelling units. The 1998 East Boulder Hard Rock Mining Impact Plan projected approximately 70% of the mine related population to live in the county. Of that growth, the majority would be located within the city-county planning jurisdiction. Currently close to half the population in the county live within the city limits. It is expected that properties adjacent to Big Timber will develop and developments adjacent to the city would be annexed when they are platted. A reasonable projection for housing needs in the rural county would be approximately 20-30% of the expected growth from the working and leisure populations, or 20 to 80 dwelling units.

With the expansion of the city limits expected, the risk of wildland fire near the city limits will also increase. The number of homes in the urban interface is also expected to increase.

4. Current Fire Environment

4.1. Wildfire Problem Definition

Fire frequency within the confines of Sweet Grass County consistently indicates a workload of 80 wildland fires annually. This wildland fire load has increased significantly over the past 20 years.

This increased fire load can be contributed to the following factors:

- Successful fire suppression activities (keeping fire out of fire-dependent ecosystems)
- Maturing fuel complexes
- Insect and disease outbreaks
- Urban interface development
- Climatic changes
- Large expanse of forest types due to fire exclusion
- Changes in land use due to changes in ownership and management practices.

Large fires are those events that require an active fire suppression activity for more than two operational periods. Prior to 1985, these were rare events. Beginning in 1994 Sweet Grass County has experienced more large fires. Since then, the large fire workload has averaged 1.5 fires annually. Sweet Grass County is not alone in having to deal with this issue. Rural fire districts throughout eastern Montana are experiencing increasing fire workloads.

One hundred years of successful wildland fire suppression efforts and significant vegetative changes place the county and its residents in potentially hazardous situations during periods of moderate to severe fire weather. Fire exclusion in a fire dependent ecosystem has created the potential for what can best be described as a catastrophic fire disaster. An ignition under these conditions produce extreme fire behavior that seriously threaten life and property.

Large fire history in the county indicates a direct correlation between the drought years and large fire growth. 1988, 1990, 1991, 1994, 2000, 2001, 2003, and 2006 were extreme fire years and all meet the criteria for being considered a drought year.

The most recent fires that have burned large acreages and required the assistance of an Incident Management Team were the Hobble Fire (2003), Mysee Fire (2005) Derby Fire (2006), Jungle Fire (2006), and Hicks Park Fire (2007).

As the wildland fire workload has increased, so has the need for apparatus and leadership skills to deal with this complexity. The need for the BTVFD to continue to grow to meet this challenge is very important. The three areas that will be ongoing are:

- Maintaining a highly skilled pool of volunteers to meet the workload;
- Providing the necessary training and equipment to allow firefighters to do their job safely and effectively;
- Developing the leadership and skill levels for the fire workload.

4.2. Local Fire Ecology

Rangeland and the ecology of the plant species that occupy these sites have their own relation 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. Silvertip Sagebrush is the predominant species and dominates some areas. It is a noted sprouter but apparently can be controlled by fire in some parts of its range. Others 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.

The prevalent timber type in Sweet Grass County is ponderosa and limber pine. Minor amounts of Douglas-fir and Engelmann spruce can be found within the county, but the prevalent tree species is pine. Pine types are fire-adapted species that have developed natural mechanisms to cope with frequent fire. They have a thick corky bark that insulates the trees 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. Both tree species can be found on hot, dry sites such as those found in Sweet Grass County.

Because of the frequency of lightning storms in the county, it is estimated that fire burned more than once every 10-20 years in and under most of the natural pine stands. Because of this frequency, fuel loads were kept low because dead limb wood and needle [litter](#) were consumed during these fire events. Fires also tended to thin out patches of heavy regeneration that resulted from good cone crop years and favorable moisture conditions. The density of trees stayed lower because fire killed 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 loads, periodic low intensity fires would have had no significant impact on the older trees that remained. A number of individual trees escaped these fires and grew to maturity. Once reaching that age class, they were able to withstand the natural fire events and began producing seed, which was the catalyst that established the vast stands of trees that are prevalent within the county.

Since the advent of fire protection, 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 than there would have been historically. Often times, continuous fuel exists from the ground to the [crowns](#) of mature trees. This results when too many seedlings survive and because of intense competition for water and nutrients, forming overcrowded pockets of spindly trees. These trees will survive to intermediate heights with many of them bent or broken by snow loads.

Now, when a wildland fire occurs, it is much more likely to have greater negative consequences. The 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 the productivity of the site. Higher intensity fires are also more difficult to keep away from improvements that landowners and firefighters wish to protect. Most importantly, they increase the risk to firefighters.

Wildland fires generally have three possible outcomes on sage/grass and forested areas. They can be lethal, non-lethal or mixed. 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. For example, 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, for example, 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.

Spread throughout the county is a mixture of vegetative types that create various fire behavior models. As a result, it is not an easy task to describe the result of a wildland fire on any given [fuel type](#). The fire effects will correspond directly to the fuel type involved and the actual conditions at the time of the burn.

Generally, early and late season fires tend to burn with a much less lethal nature than those that occur during the height of the fire season. Several good examples of lethal fires are those that have burned in the Reed Point area over the past eight years. Seven fires occurred in the height of the fire season and during periods of extended drought. Each fire resulted in extremely high mortality in all size and age classes of timber. The results of each fire changed each fire area from a timber type to a grass type, the most probable vegetative type prior to fire suppression within the county.

In the Bridger Creek area, a similar large fire that burned in similar fuel types in early winter resulted in some mortality, but not to the extent of those burning during the height of the fire season. The reason for this was the colder air temperature and higher fuel moisture content.

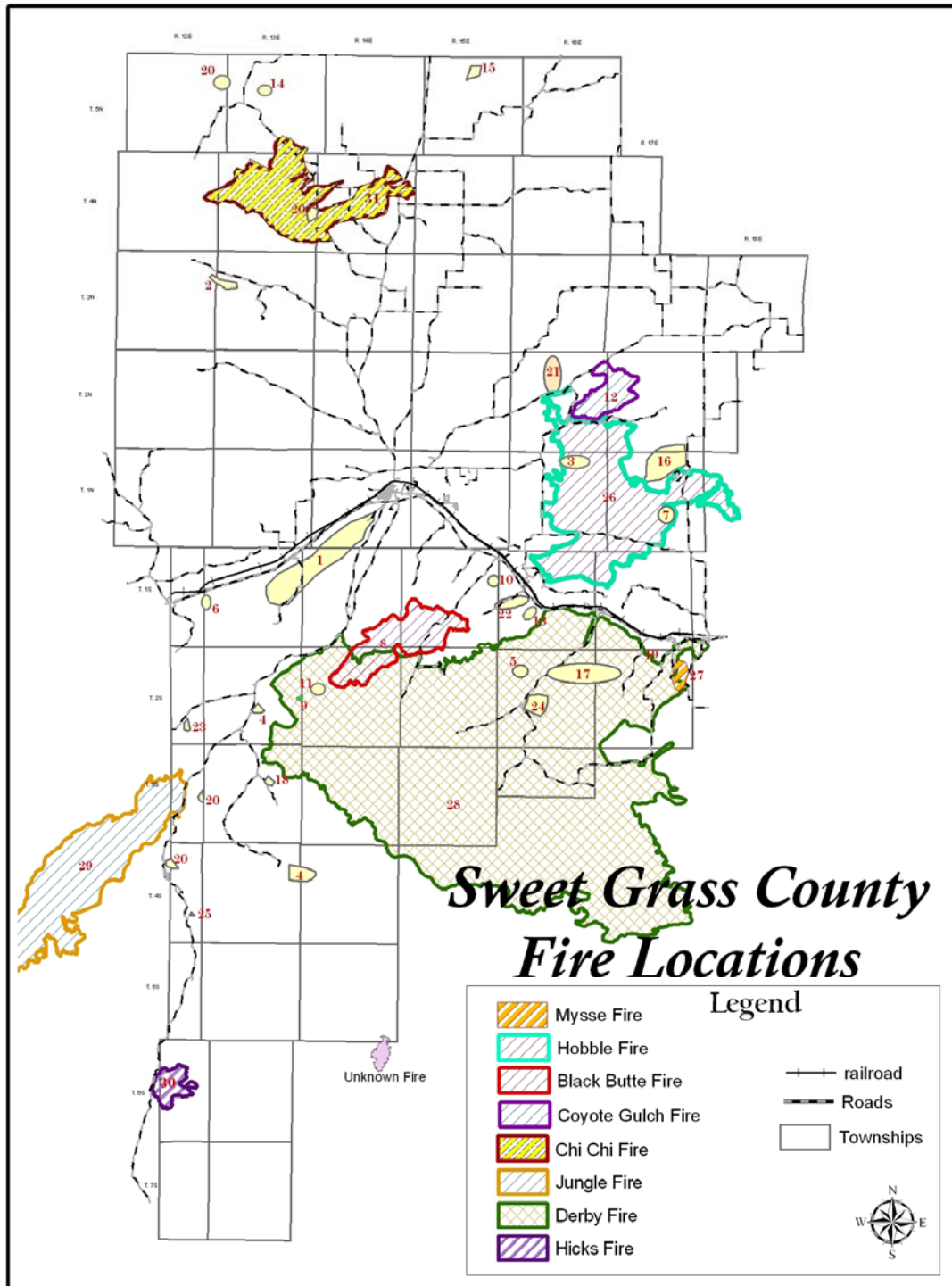
4.3. Fire History

Sweet Grass County has a well-documented history of fire as do nearly all counties in Montana. The only major urban fire, which destroyed houses and businesses, took place in Big Timber on March 13, 1908. House fires in Big Timber have been isolated events since that time with the exception of one fire in the hardware store in 1972, which created an explosion that damaged several other buildings.

Wildland fires have been more frequent than urban fires. The areas affected by wildland fires range from hundreds of acres to thousands of acres. The following is a list of Sweet Grass County fires which required outside resources (fires are shown on Map 4 as numbered in the list):

1. 1963, a wildland fire threatened the town of Big Timber;
2. July 1974, Devil Creek fire in the Crazy Mountains;
3. August 1983, Lone Indian Fire;
4. 1990 (approximately), multiple fires in the West, East and Main Boulder drainages;
5. October 1990 (approximately), Mothershead fire east of Big Timber;
6. Thanksgiving Day, 1991, power line started a fire west of Big Timber which forced the closing of Interstate-90;
7. July 1994, White Beaver Fire east of Big Timber;
8. August 1994, Black Butte Fire east of Big Timber in the Deer Creek drainage;
9. 1995, Castle Creek Fire south of Big Timber
10. April 1996, Lower Deer Creek fire;
11. August 1996, Cherry Creek Fire south of Big Timber;
12. August 1996, Coyote Gulch Fire;
13. August 1998, fire east of Big Timber south of the I-90 rest area;
14. August 1999, Porcupine Butte Fire near Melville;
15. August 1999, Cooney Brothers Fire north of Melville;
16. August 1999, Stephens Hill fire;
17. December 1999, Christmas Fire east of Big Timber (Bridger Creek area);
18. July 2000, multiple fires south of Big Timber;
19. August 2000, Hump Creek Fire east of Big Timber;
20. September 2000, multiple fires in the Crazies and in the Boulder drainages;
21. August 2001, Tin Can Fire north of Big Timber;
22. September 2001, Flat Tire Fire east of Big Timber;

23. July 2002, West Boulder fire;
24. August 2002, Bridger Creek fires;
25. October 2002, Boulder fire near Clydehurst church camp;
26. August 2003, Hobble Fire, 38,000 acres west of and including Stephens Hill;
27. September 4, 2005, Mysee Fire, 1109 acres near Reed Point;
28. August 22, 2006, Derby Fire, 200,000 acres in Sweet Grass and Stillwater Counties;
29. August 24, 2006, Jungle Fire, 28,000 acres in Park and Sweet Grass Counties;
30. August 2007, Hicks Park Fire, 2,500 acres south of Big Timber;
31. November 2007, Chi Chi Fire, 19,000 acres in Melville.



Map 4. Location of Previous Fires

In the late 19th century, John Lieberg conducted a survey for the Department of Interior which included mapping and inventory of the forest reserves within the Absaroka Division of the Yellowstone Forest Reserves. His narrative and mapping indicate that most of the Boulder River Canyon was used for grazing and that a significant portion of the drainage had recently been burned. Analysis of the burn pattern, which is indicated by the even-aged forest cover, suggests that most of the canyon burned in one large stand replacement fire sometime in the late 1800's.

Another example of a lethal stand replacement fire is the Shepard Mountain Fire in Stillwater County which burned through most of the East Rosebud canyon on September 4, 1996. After several days of burning at the head of the canyon above East Rosebud Lake, this fire was influenced by 35-40 mph winds associated with a weather frontal passage resulting in a [crown fire](#) that burned through the entire canyon in less than 10 hours.

Prior to 1900, fire occurred naturally on a somewhat regular interval cleansing the litter mat, down woody material, and understory in the Douglas fir stands. When stands became diseased and [decadent](#), a stand replacement fire would completely regenerate Douglas-fir and lodge pole pine forests. From the turn of the 20th century, local residents started suppressing these fires, thus trying to eliminate the perceived detrimental effects of fire. In reality, however, they were altering a natural disturbance agent in the forest ecosystems. This resulted in an unnatural buildup of forest growth and litter to the point of becoming hazardous. Free burning fire no longer plays its traditional cleansing role in the ecosystems in the Boulder River Canyon. The result is a lower frequency of fires and an increase of biomass accumulation. When fires do occur, they will be more severe and will be more likely to be lethal rather than mixed or non-lethal.

Beginning in the late 1970's the northern front range of the Absaroka Beartooths began to experience wildland fires of a larger size and scope than those that had occurred during the preceding seven decades. The common denominators for each of these wildland fires were:

- Unnaturally heavy fuel loads resulting from long term vegetative changes;
- Very low fuel moistures resulting from climatically induced drought conditions;
- High winds and low relative humidities.

Fires meeting these criteria in the Absaroka Beartooth Mountains begin with the Benbow Fire in 1980, Sand Dunes Fire in 1987, Storm Creek Fire in 1988, Hellroaring Fire in 1988, Iron Mountain Fire in 1990, Thompson Creek Fire in 1991, Black Butte Fire in 1994, Shepard Mountain Fire in 1996, Monument Fire in 2001, Rough Draw [Complex](#) in 2003, Cathedral Peak Fire in 2003, Hobble Fire in 2003, Derby Fire in 2006, and Jungle Fire in 2006.

During the 1988 fire season, two large wildfires (Storm Creek and Hellroaring) were recognized as having the potential to enter the Boulder River drainage from the south. At that time, fire management personnel from the Gallatin National Forest recognized the need for further preplanning to avoid catastrophic losses in the Boulder River drainage. The largest fires in Sweet Grass County history took place more recently.

The 38,000-acre Hobble Fire started on the evening of August 8, 2003. The speed of this fire was staggering as firefighters estimated it grew to 1,000 acres within two hours after lightning ignited it. GPS data showed it stood at 10,000 acres after 24 hours, and 30,000 acres after 48 hours. Each daily progression coincided with hot dry winds that drove the fire for three days. A week later it flared up again along Stephens Hill Road and burned another 8,000 acres and 4 residential buildings. Over the course of two weeks, 11 total outbuildings were also destroyed. Northwestern Energy replaced 42 structures supporting a major transmission line that carries electricity across the state of Montana.

On August 11, 2003, a storm front, associated with mostly dry lightning, passed through the county. County crews chased down and put out at least 14 new fire starts on that day and Forest

Service crews fought three small fires in the Boulder Valley, causing officials to evacuate church camps and trailheads above Aspen Campground. All this occurred on the same day that a Type 2 Incident Management Team took over management of the Hobble Fire (pictured below). By the end of the 2003 fire season, Sweet Grass County had a fire for the record books. Hobble was the largest fire in county history, a record that lasted only 3 years.



On August 22, 2006 lightning ignited the Derby Fire on the northeast ridge of Sugarloaf Mountain in the Big Timber Ranger District of the Gallatin National Forest. A nearby helicopter was able to drop several buckets of water before 17 smokejumpers arrived. Smokejumpers estimated the fire at the time at about 10 acres. Later on the night of August 22nd, smokejumpers were forced from the area due to extreme fire behavior. By the morning of the 23rd, the size was estimated at 300 acres. The night of the 23rd, northwest winds drove the fire 7 miles to the southeast. By the next morning, the winds had shifted and drove the fire back to the west. By the evening of the 24th, fire size was estimated at 18,000 acres.

A Type II Incident Management Team arrived on Friday the 25th and transitioned to a Type I Team starting on the 29th. Plume dominated behavior on the 29th increased the size of the fire by nearly 16,000 acres. Plume dominated behavior repeated on the 30th when a strong storm front passed through the area, shifting wind direction as it passed through. Extreme fire behavior combined with 60-70 mph winds created conditions where the fire was [spotting](#) one-quarter to one-half mile ahead of the main fire. By the morning of the 31st, the fire size was at 154,000 acres (an increase in one night of more than 120,000 acres), hundreds of homes were evacuated, 4 homes in Sweet Grass and 26 homes in Stillwater County were destroyed, the incident command post was evacuated of management team personnel, and the smoke column could be tracked on satellite for several days—even over the state of Wisconsin.

The days following the firestorm on the night of the 30th, an unusual southeasterly wind pattern persisted for approximately the next 10 days. Evacuations of drainages extending east from Upper Deer Creek all the way to Reed Point on the night of the 29th and 30th, were followed in the next 2 weeks by evacuations of the East Boulder Road, including the East Boulder Mine, the east

side of the Main Boulder Road south of Eight Mile bridge, and all residents south of Natural Bridge. The Gallatin National Forest was also closed to all recreation to prevent any human-caused fires.



The Derby Fire (photo above) was a dramatic demonstration of extreme fire behavior with Energy Release Components above the 95th percentile. After September 10th, when winds finally shifted to a more normal southwesterly flow and pushed the fire back into the black, fire season should have been over for 2006. This may have been true except for a lightning-caused fire that started in Park County in the wilderness of the West Boulder drainage.

The Jungle Fire ignited on August 24th and, under normal circumstances, would have been managed as a Fire Use fire. Because the fire burned in the remote wilderness and in steep terrain with unbroken heavy stands of timber, suppression was limited to bucket drops and creating fuel breaks. When the wind shifted and the Derby Fire quieted, the southwesterly pattern lined up with the West Boulder drainage and drove the Jungle Fire north toward residences on the West Boulder Road.



Once again, plume dominated fire behavior (Jungle Fire photo above) created conditions that forced evacuations of the Main Boulder Road south of McLeod, the West Boulder Road, and the town of McLeod. Though no additional homes were lost, smoke columns that rose 30,000 feet in the air demonstrated rotation and produced their own lightning. Season ending moisture finally came in the form of snow on September 15th. The Jungle Fire, which had burned within the wilderness for nearly 2 weeks, ended up at 28,000 acres and reached the Main Boulder Road, spotting across the road at Natural Bridge. When the 2006 fire season was over for Sweet Grass County, 2 Type 1 teams and 2 Type 2 Teams had shared management of the Derby and Jungle Fires, while another Type 2 Team had concentrated on Jungle alone.

4.4. Hazardous Fuels

The continuity of [heavy fuels](#), such as ponderosa and limber pine, is primarily located around and near the foothills of the mountain ranges in Sweet Grass County. Continuous pine fuel type covers thousands of acres in these areas and has the greatest potential for supporting large intense fires. In stands where fire has been absent for several decades, the presence of [ladder fuels](#) and ground litter is much more evident, increasing the vulnerability of the stand to mortality from fire. Wildland fires in the ponderosa pine type may either be terrain or wind driven.

Areas of big sage and sagebrush also have potential for large, intense fires but they are less likely except under wind driven conditions. Thousands of acres of this fuel type are in the county. The most common fuel type is grassland. Fires will normally be of a lower intensity level in this type and may be easier to control. In addition, fires are less likely to start from lightning in this ecosystem, but are still considered dangerous.

4.5. Invasive Plant Prevention and Fire

Normal human activity can easily spread noxious weed seeds and propagules. Firefighting activity greatly increases the risk of spreading noxious weeds. This section outlines methods that county agencies should consider to prevent the spread of noxious weeds.

4.5.1. Fire Planning

Improve the effectiveness of prevention practices through weed awareness and education in the following ways:

- Increase weed awareness and weed prevention in all fire training.
- Provide weed identification aids.
- For prescribed burns, inventory the project area and evaluate potential weed spread with regard to the fire prescription.
- Ensure that a weed specialist is included in a Fire Incident Management Team when wildfire or control operations occur in or near a weed-infested area.

Avoid or remove sources of weed seed and propagules to prevent spreading weeds, such as:

- Using operational practices to reduce weed spread (for example, avoiding weed infestations when locating fire lines).
- Locating and treating weeds in practice jump areas.
- Maintaining a network of airports, helibases, [camps](#), and staging areas in a noxious weed-free condition.

4.5.2. Firefighting

Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds in the following ways:

- Ensure that rental equipment is free of weed seed and propagules.
- Require routine mandatory cleaning of equipment, paying special attention to the undercarriage of vehicles after every fire, drill or routine training.
- Inspect and treat weeds that establish at equipment cleaning sites after fires.

Avoid creating soil conditions that promote weed germination and establishment, such as:

- Use fire suppression [tactics](#) that reduce disturbances to soil and vegetation.
- Avoid moving water buckets from aquatic-weed-infested lakes to lakes that are not infested. There is no hazard in using water infested with aquatic weeds on terrestrial sites for fire suppression.
- Avoid ignition and burning in areas at high risk for weed establishment or spread.
- Treat weeds that establish or spread.

4.5.3. Fire [Rehabilitation](#)

During rehabilitation of fire lines, consider the following guidelines:

- Prevent conditions favoring weed establishment, re-establish vegetation on disturbed ground as soon as possible.
- Treat weeds in burned areas to prevent weed spread. The first preference is prevention, such as planting desired species to compete with unwanted plants and always use a certified weed-free seed mix.
- Determine soon after a fire whether reseeding is needed to speed recovery of a competitive plant community, or whether desirable plants in the burned area will recover naturally. Consider the severity of the burn and the proportion of weeds to desirable plants on the land before it burned. In general, more severe burns and higher pre-burn

weed populations increase the necessity of reseeding. Consider reseeding an area if the desired plant cover is only 20 to 30%.

- Inspect and document weed establishment at fire access roads, cleaning sites, all disturbed staging areas, and within burned areas. Control infestations to prevent spread within burned areas.
- Seed and straw mulch to be used for burn rehabilitation (for wattles, straw bales, dams, etc.) should be inspected and certified that they are free of weed seed and propagules.
- Regulate human, pack animal, and livestock entry into burned areas until desirable vegetation has recovered sufficiently to resist weed invasion.
- Develop a burned area integrated weed management plan, including a monitoring component to detect and eradicate new weeds early.

4.6. Condition Class and Fire Regime

Fire has always been a part of the landscape, changing and shaping the structure and composition of vegetation in the area. To best understand hazardous fuels ranking, a definition system called “vegetative condition class” can be used to define and interpret the importance of fire frequency in the ecosystem. Current “Condition Class” is defined in terms of departures from the historic fire regime, as determined by the number of missed fire return intervals.

The five natural (historical) fire regimes are classified based on the average number of years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation. 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 Sweet Grass County were historically maintained by fire. Because of the predominance of fire dependent grass, shrub and 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 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.

There are three “Condition Classes” that have been developed to categorize the current condition with respect to each of the historic fire regime groups. The following table describes each Condition Class:

Table 5. Condition Classes

Fire Regime Condition Class	Description	Potential Risks
Condition Class 1	Within the natural (historical) range of variability of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	<p>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.</p> <p>Composition and structure of vegetation and fuels are similar to the natural (historical) regime.</p> <p>Risk of loss of key ecosystem components (e.g. native species, large trees, and soil) are low</p>
Condition Class 2	Moderate departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	<p>Fire behavior, effects, and other associated disturbances are moderately departed (more or less severe).</p> <p>Composition and structure of vegetation and fuel are moderately altered.</p> <p>Uncharacteristic conditions range from low to moderate;</p> <p>Risk of loss of key ecosystem components are moderate</p>
Condition Class 3	High departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	<p>Fire behavior, effects, and other associated disturbances are highly departed (more or less severe).</p> <p>Composition and structure of vegetation and fuel are highly altered.</p> <p>Uncharacteristic conditions range from moderate to high.</p> <p>Risk of loss of key ecosystem components are high</p>

Condition classes can be tied to fire regimes in the following manner:

- Fire Regime I and II would fall into condition class one
- Fire Regime III would fall into condition class two
- Fire Regime IV and V would fall into condition class three

Most of Sweet Grass County outside the National Forest boundary falls into each of the three condition classes. The reason for this is that most of the county is grass scrublands fuel type. Some significant areas of encroachment, such as with forested ponderosa and limber pine, do fall into condition class three. These are the areas that have been ranked as high risk areas

4.7. Natural [Fire Breaks](#)

A system of [fuel breaks](#) has been identified and mapped for future fuels projects within the county. These projects will utilize the existing county road system. The rationale behind this system is to develop a fuel free zone along a road that would reduce fire intensity and could be used for:

- An [anchor point](#) for fire suppression operations
- A location where tactically, it would be a safe location to conduct a burn out
- A safe egress for the public that are exiting a wildland fire situation

Projects are listed in Section 6.6.1.1. and are shown on the map in Appendix 8.2.

4.8. Expected Fire Behavior

Fire behavior describes the way fires ignite and spread. Topography, fuel conditions, and weather all influence fire behavior in Sweet Grass 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 the county. It is important to understand this information to determine what areas contribute to the fire problem in the corridor. Fuel types/models that were used for analyzing potential fire behavior are described below.

Fuel Type/Model 1 is dominated by short grass where shrubs or timber cover less than one-third of the area. The fine, porous, and continuous fuels that have cured or are nearly cured govern fire spread.

Fuel Type/Model 2 is dominated by grass with an open timber overstory that covers between one-third and two-thirds of the area. This model represents the open grass and Douglas fir and/or ponderosa pine stands and the harvested areas where an overstory of timber remains. Fire spread is primarily by a surface fire through the [curing](#) of dead grasses with the litter and dead down wood from the open shrub or timber overstory contributing to fire intensity. This would represent an area where Condition Class 1 is present.

Fuel Type/Model 5 predominantly consists of shrubs with an overstory of timber. The live fuel moisture in the shrubs normally has a dampening effect on any surface fire. Surface fires normally burn in the dead and downed woody fuel on the forest floor. Under drought conditions, live fuel moisture is less than normal, causing shrubs to be more flammable.

Fuel Type/Model 8 represents a closed [canopy](#) timber stand of short-needled conifers with a compact litter layer of needles, leaves, and twigs that has little undergrowth present in the stand. This model is represented in the areas of immature lodgepole pine, Douglas fir stands that have little down-dead ground fuels and the higher elevation stands of whitebark pine. Slow burning [ground fires](#) with low [flame lengths](#) are generally the case, although a fire here may encounter an occasional “jackpot” or heavier fuel buildup that can flare up. Late season fires in drought years may cause this fuel type to burn with stand replacement intensities.

Fuel Type/Model 10 consists of mature timber stands that have large fuel loads of dead material on the forest floor. This would include areas that are insect and disease-ridden, wind-thrown stands, and over mature stands with deadfall or heavy accumulations of debris. Ladder fuels are usually present. Fire burns in the surface and ground fuels with greater intensity than the other timber types. Crowning, spotting, and [torching](#) of individual trees are more frequent in this fuel type. This is typical of some Condition Class 2 stands and most Condition Class 3 stands.

Fire behavior calculations for these five fuel types/models were made using the fuels, weather, and topographic conditions prevalent in the 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. These fire behavior outputs were developed using the “Behave” fire behavior program.

Table 6. Weather Conditions for Average and Extreme Fire Behaviors

Weather	Average	Extreme
High Temperature – August -- September	72-89 degrees 64-75 degrees	87-96 degrees 74-83 degrees
Low Relative Humidity – August -- September	21-26% 24-31%	12-19% 14-22%
Mid Flame Wind Speed	5 mph	15 mph

Table 7. Fuel Moistures for Average and Extreme Fire Behaviors

Fuel Moistures		
	Average	Extreme
Fine Fuels , 0-¼ in.	6%	3%
Small Fuels, ¼ - 1 in.	9%	4%
Medium Fuels, 1-3 in.	10%	5%
Large Fuels, >3in.	14%	8%
Shrubs, Live Fuel Moisture	80%	50%
Trees, Live Crown Moisture	100%	60%

The following table represents the predicted fire behavior interpretations that should be used for the fire behavior outputs.

Table 8. Fire Suppression Interpretations from Flame Length

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 firefighters using hand tools. Handline should hold fire.
4 – 8 feet	100 – 500 BTU/ft/sec	Fires are too intense for direct attack on the head with hand tools. Handline cannot be relied upon to hold the fire. Bulldozers, engines, and retardant drops can be effective.
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.

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. These calculations were done using the Behave Plus fire behavior program. The following fuel types/models were used for analyzing potential fire behavior:

Table 9. Fire Behavior Outputs for Average and Extreme Conditions

Fuel Type/Model	Rate of Spread (Chains/hour)		Flame Length (Feet)		Fire Size after 1 hour (Acres)	
	Average	Extreme	Average	Extreme	Average	Extreme
1	101	446	5	10	385	4,812
2	40	372	7	20	61	2,333
5	31	212	7	18	57	752
8	2	8	1	2	<1	2
10	10	68	6	15	4	77

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 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, as experienced in the 2003 Hubble Fire and 2006 Derby and Jungle Fires, the dryness of the fuels and tree crowns caused 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.

[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. It is not uncommon for these fires to start ¼ to ¾ of a mile ahead of the main fire front. These fires create serious problems for fire suppression forces trying to protect lives and property well ahead of an advancing fire. As spot fires start and gain intensity, they can become as active as the main fire front. 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.

Many of the timber stands in Sweet Grass County are ripe for crown fires because of the presence of ladder fuels, heavy, down woody debris on the forest floor and mature or over-mature age classes of the timber stands. These high-risk stands are shown on Current Fire Severity Map in Appendix 8.4 of this CWPP. The fire behavior projections, presented in Table 9 above, often underestimates those experienced under high wind conditions. Sweet Grass County has recently experienced several fires that if not caught would have resulted in loss of structures. High unpredictable winds play a very large part in fires within and outside the expected fire season. The two most recent fires being the Christmas Fire in 1998 and the South of Big Timber fire in 2005. Rates of spread with both ignitions were such that an ignition starting within 1-2 miles of a structure could reach the structure within a one-hour time period.

The wildland urban interface area for the county has used those fire behavior calculations to determine area of high risk for the potential of structure lose. The WUI maps of the county displays this information and provides the reader with an understanding of the potential risk from a wildland fire igniting within 1-2 miles from structures.

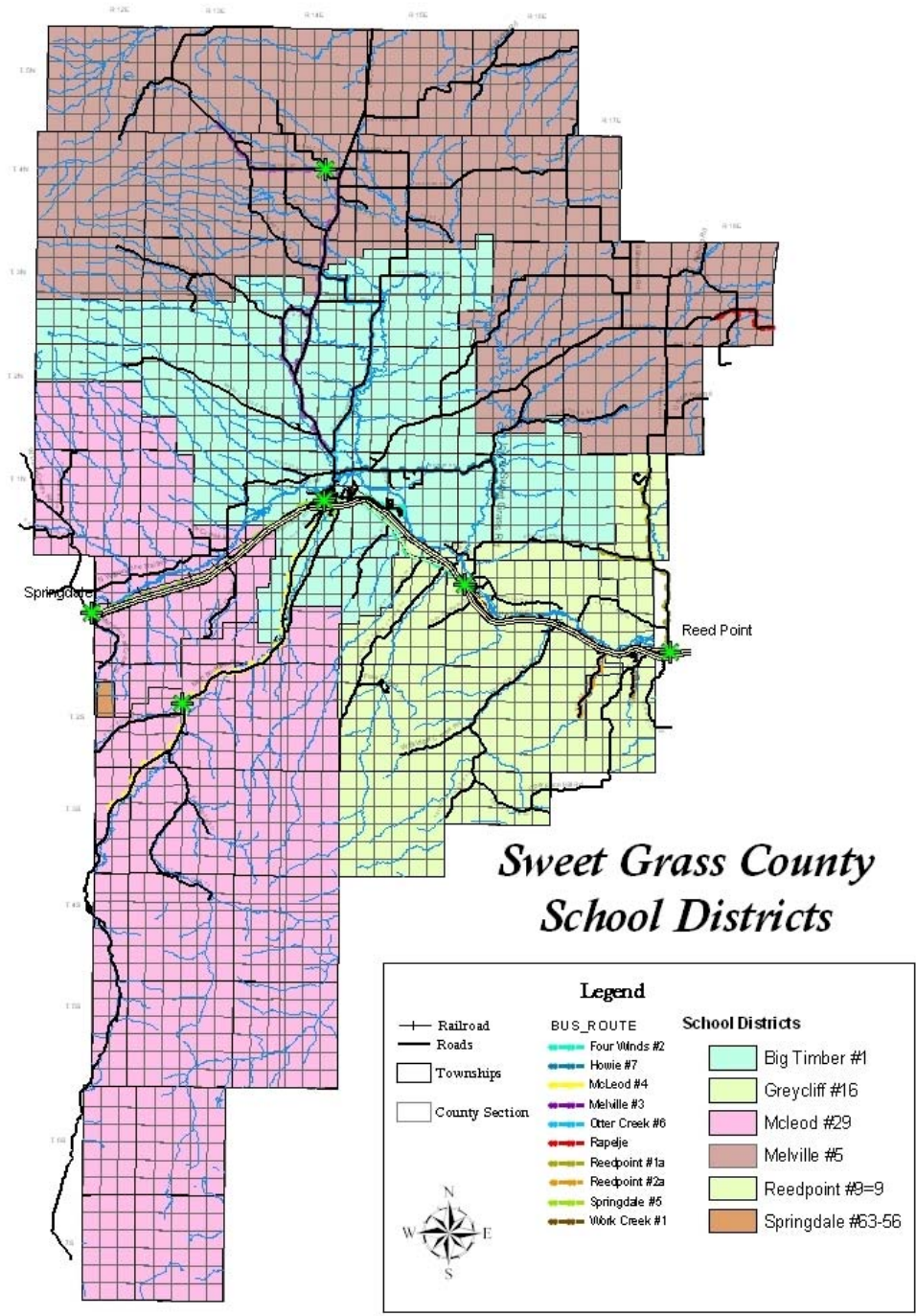
5. Risk Assessment

A fundamental part of any fire plan is identifying what you might lose in a wildland fire, known as assets or [values at risk](#). Most of this section is from the Sweet Grass County Pre-Disaster Mitigation (PDM) Plan, and all-hazard plan that was approved by FEMA in 2005.

5.1. Estimating Losses

5.1.1. Methodology

The methodology for determining the value of all structures and infrastructure comes from the tax assessor's office. Taxable property was broken down by school district with Reed Point and Greycliff districts combined for simplicity. Map 5 shows the location of the school districts used for this assessment.



Map 5. Sweet Grass County School Districts

Because residential and agricultural buildings are assessed together, the PDM Subcommittee estimated 5 ranch buildings for every ranch in the county. With 301 ranches listed in the 1997 USDA census of Agriculture, the total number of ranch buildings was estimated at 1505 for the county. Cost was estimated at \$9,000 for each ranch building which would take into account the buildings that were worth very little (or nothing) and the ones that were worth over \$100,000. The committee agreed that these numbers for agricultural buildings are probably on the low side, but the value of the buildings are not lost because they are assessed together with the residential structures on the ranches.

The value of churches was estimated because tax-exempt properties are not listed on the tax lists. With the information that some of the 12 churches provided, the committee was able to agree that each church could be estimated at \$386,000 and this figure would include parishes and other buildings owned by that church. Using information gathered from some of the church camps in the Boulder Valley, three of the camps were estimated at \$3,500,000 and the smallest church camp was estimated at \$1,750,000. This made the total of the religious buildings in the county worth \$16,882,000.

It was also agreed that machinery would be included in the inventory of assets because machinery is so important to ranchers and businesses in the county. The McLeod school district is a rural district, but includes the Stillwater Mining Company. This is the main reason the value of machinery in this district is so high compared to other similar districts. After reviewing the value of machinery, the PDM Committee felt that it must be included in this plan.

Critical infrastructure was inventoried through the city, county, and school insurance values.

Buildings in Sweet Grass County:

- 1860 residential worth \$78,586,494
- 195 commercial worth \$13,398,946
- 6 industrial worth \$11,562,648
- 1505 agricultural worth \$13,545,000
- 16 religious worth \$16,882,000
- 4,016 machinery worth \$90,881,995

Buildings in the Melville School District:

- 143 residential worth \$5,959,374
- 1 commercial worth \$195,012
- 0 industrial
- 181 agricultural worth \$1,629,000
- 1 religious worth \$386,000
- 1,083 machinery worth \$2,924,610

Buildings in the Big Timber Grade School District:

- 441 residential worth \$26,362,882
- 12 commercial worth \$2,045,697
- 1 industrial worth \$166,518
- 557 agricultural worth \$5,011,650
- 1 religious worth \$386,000
- 1201 machinery worth \$3,083,091

Buildings in the City of Big Timber

- 660 residential worth \$27,664,462
- 180 commercial worth \$10,269,666
- 4 industrial worth \$1,180,590

- 0 agricultural
- 10 religious worth \$3,860,000
- 212 machinery worth \$4,157,095

Buildings in McLeod School District:

- 314 residential worth \$9,756,244
- 1 commercial worth \$577,285
- 1 industrial (mine) worth \$10,215,540
- 389 agricultural worth \$3,501,000
- 4 religious (church camps) worth \$12,250,000
- 730 machinery worth \$79,893,989

Buildings in Springdale School District:

- 3 residential worth \$71,346
- 0 commercial
- 0 industrial
- 2 agricultural worth \$18,000
- 0 religious
- 23 machinery worth \$54,470

Buildings in Greycliff and Reed Point School Districts:

- 299 residential worth \$8,773,536
- 1 commercial worth \$311,286
- 0 industrial
- 376 agricultural worth \$3,384,000
- 0 religious
- 661 machinery worth \$1,834,062

5.2. 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 Sweet Grass County are:

- Health & Safety – Public & Firefighters
- Property, Improvements & Facilities – Private & Public
- Recreation/Community Impacts – Economic & Social
- Forest/Ecosystem Health
- Timber, Farming, and Grazing

5.2.1. Health and Safety

Firefighter and public safety should never be compromised.

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

Sweet Grass County, under current drought conditions, has the potential to have multiple complex wildland fire situations that could conceivably extend for several months. Big Timber Volunteer Fire Department should work toward expanding its leadership capability so the county can simultaneously deal with complex multiple ignitions.

5.2.2. Property, Improvements & Facilities

Few wildland fires burn where there is not some threat to homes, ranch buildings or other structures, fences, power lines, communication sites, or some other type of infrastructure. Fuel treatments (See Section 6.6.4. Asset Protection Zone) designed to reduce wildland fire intensity in the immediate area around structures, can dramatically improve the probability that the structure will survive.

5.2.3. 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 Sweet Grass 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.

5.2.4. Forest/Ecosystem Health

See Section 4.2. Local Fire Ecology.

5.2.5. Farming, Grazing and Timber

Farming and grazing are the two primary uses of the majority of private lands in Sweet Grass County. Wildland fire poses a great potential economic risk to farming, grazing and timber resources in Sweet Grass County. Loss of an annual grain crop could be devastating to any one or group of producers. Loss of perennial vegetation to a livestock producer has an economic impact of one to ten years for the vegetation to reestablish to the productivity of a mature grass stand. The economic impact of a stand replacement fire to timber-dominated land is significant.

The Forest Service is responsible for providing for multiple-use on national forest lands. The western portion of the Big Timber Ranger District of the Gallatin National Forest is located in Sweet Grass County. The most common uses on this national forest land would include grazing, timber management and recreation use. The Bureau of Land Management has a scattering of sections within the county rather than a consolidated block of land like the Forest Service. It is similarly tasked with providing rangeland and recreation use on those BLM lands.

5.3. Fire Risk, Hazard and Occurrence

High risk exists in many locations throughout the county. The reason for this risk is based on fire exclusion and successful wildland fire suppression operation. The reasons for this are:

- Heavy dead and down surface fuels;
- Closed canopies;
- Thick ladder fuels to carry surface fires to the canopies;
- Multiple understories; and
- Steep topography associated with strong down canyon winds.

According to the 2003 USFS study, *Main Boulder Fuels*, a wildfire in this area could travel about one mile per hour on the surface and about three miles per hour in the crowns under average wind speeds of eight miles per hour. A fire advancing at the estimated speed of three miles per hour could mean that the entire Main Boulder corridor would burn in one day.

A large share of the remaining county is rated as high risk which includes all subdivisions. This designation was determined by combining current fuel complex, concentration of structures (subdivisions) and historical large fire activity.

The purpose of our fire hazard assessment model is to develop a basic fire risk assessment and to prioritize areas within the county for suppression as well as fuels reduction efforts. The assessment consists of three sub-groups: risk, fuel hazard, and historic fire occurrence:

Risk is defined as potential risk of wildfire and is determined by the number of fire ignitions over a time period. Fire ignition points will be totaled and a low, moderate, or high rating will be assigned.

In looking at the GIS generated maps of Sweet Grass County some areas of potential risk began to take form. When the [fuel models](#) are overlaid with potential occurrence, the areas most likely to experience a wildland fire can be identified. By adding the areas of human occupation or high value, one can begin to assign priorities for protection. As with the federal agencies, the county's first priority is protection of human life and the second priority is protection of personal property.

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 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, refusing to remove any vegetation even though its continued presence reduces the probability that their home will survive a wildfire to almost zero. Firefighters 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.

The following list represents Sweet Grass County's current priorities in sequential order.

- Whispering Pines Subdivision
- Ken/Dan Acres Subdivision
- Main Boulder
- Stage Coach Estates Subdivision
- Deer Creeks
- Bridger Creeks
- East and West Forks of the Boulder River
- Stephens Hill Subdivision
- Indian Rings Subdivision
- Yellowstone Meadows Subdivision
- Eastern side of the Crazy Mountains

Looking at the GIS layered map of Sweet Grass County it becomes apparent why these priorities have been established. The 6 subdivisions listed are particularly challenging from a protection standpoint because of the lack of adequate water supplies. The response times for the top 4

subdivisions are also lengthy for wildland firefighters because of their distance from Big Timber. (See Urban Interface map in Appendix 8.2.)

County history has proven the high potential for large wildland fires when enough continuous fuels are available and when certain weather conditions are present. When conditions of extreme fire behavior exist, little can be accomplished aside from evacuating people from harm's way and keeping firefighters in safe positions. During one of these events, the actions that have been taken beforehand will generally prove to be much more effective than any actions taken during the event. A perfect example of this was the private fuels reduction project that slowed the advance of the Derby Fire in the Lower Deer Creek drainage. Any fuel modification efforts that have been completed prior to the event will greatly enhance the firefighter's efforts to protect property during the event.

6. Mitigation Strategy – The Action Plan

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

6.1. Mitigation Strategy

6.1.1. Hazard Prioritization

The PDM Subcommittee determined a mitigation strategy to develop goals and objectives to help guide officials to prioritize mitigation projects. Much of the strategy concentrated on communication and response capabilities because these goals would affect all hazards. The rest of the goals were developed from a ranking method that considered the history of events, the maximum impact of an event, and the projected frequency of the event occurring within a ten-year period. Members of the subcommittee relied heavily on the past history of events to rate the projected frequency. They used the following analysis criteria in 2004 to designate hazard rankings (rating scores are in parentheses):

History:

0-1 major event during any ten-year period	Low (1)
1-5 major events during any ten-year period	Moderate (2)
More than 5 major events in a ten-year period	High (3)

Maximum Impact:

Less than 5% casualties and/or property damage	Low (1)
5% to 25% casualties and/or property damage	Moderate (2)
More than 25% casualties and/or property damage	High (3)

Projected Frequency:

0-1 major event expected in the next ten years	Low (1)
1-5 major events expected in the next ten years	Moderate (2)
More than 5 events expected in the next ten years	High (3)

Table 10. Hazard Prioritization

Hazard	History	Maximum Impact	Projected Frequency	Weighted Score	Rank
Wildland Fire	High	Moderate	High	8	1
Flood/Severe Weather	Moderate	Moderate	Moderate	6	2
HazMat Accident	Low	Moderate	Moderate	5	3
Infectious Diseases	Low	High	Low	5	4
Terrorism	Low	High	Low	5	5
Nuclear	Low	High	Low	5	6
Earthquake	Low	High	Low	5	7
Volcanic Fallout	Low	Moderate	Low	4	8

Scores were calculated as shown above and several hazards had equal scores. Ties were broken through committee discussion. It was decided that flooding and severe weather were closely related and could be combined for the purposes of the first PDM Plan but may be separated in later revisions as mitigation projects are completed. Agriterrorism was specifically

addressed in the mitigation strategy because of the severe economic impact and the perception that the ease of execution may increase the risk above that of traditional terrorist activity. Specifically mentioning existing and future buildings in the strategy is an attempt to help with incorporating other plans into the PDM Plan.

6.1.2. Local Hazard Mitigation Goals

The PDM Subcommittee determined seven mitigation goals.

1. Improve communications capabilities.
2. Improve first responder capabilities.
3. Reduce wildland fire risk in the urban interface.
4. Reduce the risk from floods/severe weather events.
5. Reduce the risk from hazardous materials.
6. Reduce the risk from biological/infectious hazards.
7. Reduce the risk from agricultural threats.
8. Reduce the risk to existing and future buildings from all hazards.

6.1.3. Identification of Mitigation Measures

PDM Subcommittee members developed mitigation measures and classified them within each identified goal.

Communications:

1. Improve security in and around the dispatch center.
2. Purchase a mobile command post trailer.
3. Expand the county Web site and better publicize it.
4. Assess communication needs in the county.
5. Research additional locations for radio repeaters and/or cell phone towers.
6. Install additional radio repeaters and/or cell phone towers.
7. Purchase additional handheld radios for emergency services.
8. Improve the county early warning system, including radio, TV, and sirens.
9. Develop public education to inform the public about county disasters.
10. Develop an official network of ham radio operators and research funding sources for improved equipment.

First Responders:

1. Improve the 911 system by implementing E911 in a timely manner.
2. Purchase a mobile command post trailer.
3. Assess and improve the Emergency Operations Center and determine when to include a joint information center.
4. Improve the county early warning system.
5. Provide more opportunities for training, including sending three first responders to “train-the-trainer” sessions when available.
6. Establish a schedule of training exercises.

Wildland Fire:

1. Support action groups in the county with fuels reductions projects.
2. Continue to assist the public with defensible space issues.
3. Assist with reseeding in burned areas to prevent flood damage and water contamination.
4. Install dry hydrants in subdivisions.
5. Include wildland fire risk considerations when reviewing subdivision regulations.
6. Purchase better firefighting equipment.
7. Provide more opportunities for advanced training.
8. Provide public education about wildfire mitigation.

9. Expand the county Web site and better publicize it.
10. Recruit more firefighting and fire prevention personnel.
11. Develop and implement a long term fire education and prevention program

Flooding/Severe Weather:

1. Prioritize bridge replacement throughout the county, starting with the bridge across the Yellowstone on Lower Sweet Grass Rd. near Greycliff.
2. Provide bank stabilization, using natural stabilization methods whenever practical.
3. Assist with reseeding of wildland burn areas to prevent flood damage and water contamination.
4. Establish and prioritize culvert and road projects.
5. Continue to reassess and revise floodplain regulations in conjunction with future development planning.
6. Improve the county early warning system.
7. Provide more opportunities for public education in cooperation with the National Weather Service.
8. Establish an emergency notification system after enhanced 911 is implemented.
9. Assess the need for portable electronic warning signs for law enforcement.
10. Expand the county Web site and better publicize it.

Hazardous Materials:

1. Research better security options for the current hazardous materials in the county.
2. Work more closely with the railroad to develop mitigation projects.
3. Research and/or establish truck routes.
4. Improve city/county regulations where applicable.

Biological Hazards:

1. Establish pest control measures when appropriate.
2. Monitor disease outbreaks in neighboring counties and states through the use of the Public Health Network.
3. Support updates and exercise of the mass vaccination plan.
4. Support public health planning.
5. Provide more opportunities for public education in cooperation with Public Health.
6. Expand the county Web site and better publicize it.
7. Work with Public Health to prepare press releases for the diseases at highest risk for county residents to contract.

Bioterrorism/Agricultural Threats:

1. Plan for mass vaccination of livestock.
2. Establish reporting practices in conjunction with the local veterinarians.
3. Provide more opportunities for public education.
4. Provide appropriate training for first responders and ranchers when appropriate.

Existing and New Buildings

1. Continue to reassess and revise flood plain regulations in conjunction with new development plans.
2. Incorporate better wildland fire regulations into subdivision plans.
3. Support community groups for present and future fuels reduction projects.
4. Research instituting zoning to include more stringent floodplain regulations, codes for tolerance to wind loads, and/or seismic code regulations for new buildings in Big Timber and throughout the county.
5. Relocate the county road department with all-hazard protection considerations, including security of machinery and fuel, earthquake and wind tolerance, and flood protection.

6. Construct a new county courthouse/law and justice center with all-hazard protection considerations, including security (particularly of dispatch personnel), earthquake and wind tolerance, and hazardous materials plans (due to the close proximity of the train).

6.1.4. Implementation of Mitigation Strategy

The PDM Subcommittee decided to choose 10 of the mitigation measures identified in section 6.3 to score for prioritization. Projects that were not included in the list are projects that may already be in progress and partially funded, or determined by the Subcommittee to be of a lower priority. The committee chose the following projects to score:

1. Improve security in and around dispatch;
2. Purchase a mobile command post trailer;
3. Assess communication needs;
4. Implement E911;
5. Support action groups in the county with fuels reduction projects;
6. Assist the public with defensible space issues;
7. Install dry hydrants in subdivisions;
8. Take mitigation action for the Greycliff bridge over the Yellowstone;
9. Provide bank stabilization where practical;
10. Prioritize culvert and road projects.

The scoring system allowed for 4 factors:

Estimated Cost:

Less than \$10,000	Low (3)
Between \$10,000-\$50,000	Moderate (2)
More than \$50,000	High (1)

(\$50,000 is the local threshold before a formal bid process is required)

Funding Availability:

Local funds only	Low (1)
Local match with non-local funds	Moderate (2)
Non-local funds only	High (3)

Urgency:

Recommended within 5 years	Low (1)
Recommended within 3 years	Moderate (2)
Required by regulations deadline or imminent threat	High (3)

Community Benefit (protection of both residents and property):

Less than 10% of the community benefits	Low (1)
10%-50% of the community benefits	Moderate (2)
More than 50% of the community benefits	High (3)

Table 11. Mitigation Project Prioritization Scores

Project	Cost	Funding Avail.	Urgency	Community Benefit	Score
1. Dispatch security	High	Low	Moderate	High	7
2. Command Trailer	Low	Moderate	Moderate	High	10
3. Assess Communications	High	High	Moderate	High	9
4. Implement E911	High	High	High	High	10
5. Fuels Reduction Projects	High	High	High	High	10
6. Defensible Space	Low	High	High	High	12
7. Install dry hydrants	Moderate	Moderate	Moderate	Moderate	8
8. Greycliff Bridge	High	Moderate	High	High	9
9. Provide Bank Stabilization	Moderate	Moderate	Low	Moderate	9
10. Culvert and Road Projects	Low	Low	Moderate	High	9

The top 5 ranked projects are:

1. Wildland fire mitigation support in the form of helping local groups and helping the public with defensible space issues. These objectives are being addressed through the local fuels reduction committee projects in the Main Boulder corridor (our number 1 risk area) and county assistance with the countywide fire plan, projected to be complete in the summer of 2005. Current projects are funded, but more projects will be added throughout the county as current projects are completed.
2. Implement E911. This is an ongoing project funded with 911 surcharges distributed by the State Public Safety Office. Budget shortfalls may occur but may be avoided with careful planning. Implementation should be complete by summer of 2005.
3. Purchase a command post trailer. The trailer has been purchased with Homeland Security funds. Purchase of equipment and cabinetry to be installed in the trailer is nearly complete and the trailer should be fully functional by late spring of 2005.
4. Assess communication needs. This project has just begun as part of the South Central Montana Interoperability Consortium. Consultants will include Sweet Grass County in a 5-county communications assessment and produce a recommended communications system. The plan and design is projected to be completed in the Fall of 2005 and is funded with Homeland Security and Law Enforcement Terrorism Prevention funds. No funds are allocated for implementation of the communications system design.
5. Mitigate the effects of erosion on the Greycliff bridge and assess other bridge projects. This project was prioritized above other flood mitigation projects because of the urgency of the Greycliff bridge project. This project is not currently funded and no local dollars have been budgeted for this project. Engineered bank stabilization will most likely be the solution to bank erosion upstream of the bridge.

Many of the objectives listed in section 6.1.3 are ongoing through normal departmental activities. The LEPC will serve as the funnel to perform the cost-benefit analyses of any new proposed projects.

6.1.5. Monitoring, Evaluating, and Updating

The LEPC will assign updating responsibilities to the PDM Subcommittee. The county Disaster and Emergency Services has been the lead agency throughout the process and will continue to be the main responsible party for performing updates and seeking approval, working through the LEPC. LEPC meetings are scheduled for the fourth Thursday of every month at 9:00 AM. Once a

year, the PDM Plan will be listed on the agenda and the public will be notified through press releases to the local newspaper, The Big Timber Pioneer, and listed on the county Web site. All updates will be approved through the LEPC, which includes the county commissioners, and at least one city council member. LEPC members will incorporate existing plans (such as capital improvement plans, flood mitigation plans, subdivision plans, etc.) into the PDM revision process. Any updates to risk assessments, maps, and projects, will be approved through LEPC and then posted to the county Web site for a public comment period. Significant updates will be sent to Montana Disaster and Emergency Services each year. Every fifth year, the LEPC will resubmit the plan to Montana DES and to FEMA for approval.

It has been discussed that this document should be in a continuous revision process. As projects move up the list in priority or are completed, a more detailed assessment will be performed and included in the Plan. For example, as mentioned above, the fire assessment section will be expanded by summer of 2005. All wildland mitigation projects scheduled throughout the county will be added to the Plan as they are researched and planned. This will constitute a significant update and will be submitted to the state DES office.

6.2. CWPP Mitigation Goals

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

- A. Sweet Grass County will evaluate, upgrade and maintain community wildland and structural fire preparation and response facilities, training and equipment to deal with multiple ignitions.
- B. Sweet Grass County will prevent threats to and destruction of property from wildland fire by adopting subdivision regulations, which include access, water supply, communications and fire stations.
- C. Sweet Grass County will decrease fuels to reduce wildfire intensity and impact in and around the improvements in the county.
- D. Sweet Grass County will help educate community members to prepare and respond to wildfire.
- E. Sweet Grass County will implement and maintain a comprehensive emergency response plan.
- F. Sweet Grass County will improve training and qualifications of their personnel to more effectively interface with incoming Incident Management Teams deployed in the county.
- G. Sweet Grass County will coordinate fuels reduction opportunities between private landowners and the Gallatin National Forest and the Billings Field Office of the Bureau of Land Management.
- H. Fire prevention and education is a continuing program that needs to be developed and emphasized.

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

6.3. Existing Mitigation Efforts

The following sections describe the existing mitigation measures that are being done in Sweet Grass County to decrease the risks from wildland or wildland-urban interface fire. Sweet Grass

County and the Big Timber Volunteer Fire Department should ensure that these efforts are supported and continued.

6.3.1. Asset Protection Zone (Defensible Space)

Generally when you look at a county in Eastern Montana where the residents are native to Montana and have experience with the fire history in a county, you will see that these residents generally construct, on an annual basis, a fire break around their homes and ranch improvements.

The problem lies with either people inexperienced with the fire history in Sweet Grass County or people who build summer cabins who do not realize they need to protect themselves from wildland fires. As future development occurs within the county, the Board of County Commissioners should ensure that *Firewise* principles are adopted and that there are adequate development regulations to provide safety for residents and emergency personnel.

6.3.2. Neighborhood Preparedness

The BTVFD has branch locations set up in Melville, McLeod and Bridger Creek. Fire suppression apparatus and trained personnel are pre-positioned at each location. This strategy allows for a much quicker response time for responding to a fire call.

A program to develop a dry hydrant program was implemented within the county in the 1990's. This program gave the BTVFD wider access to water sources and thus cut down on travel times during critical fire suppression timeframes.

During the last five years, a fuels committee was established by the Boulder River Watershed to develop and implement fuels reduction projects on private ownership that are at high risk from the wildland fire. Initially, this was completed for the Main Boulder River canyon, but with this plan has been expanded to include the entirety of Sweet Grass County.

In 2004, a program was initiated within the Main Boulder River drainage to help landowners protect their homes, cabin and church camps from a catastrophic wildland fire. Since that program began, over eighteen projects have been completed within the canyon. In August 2005, a separate fuels reduction project was initiated on the eastern side of the county in the Stage Coach Estates subdivision. Presently, there are six projects ongoing within the subdivision.

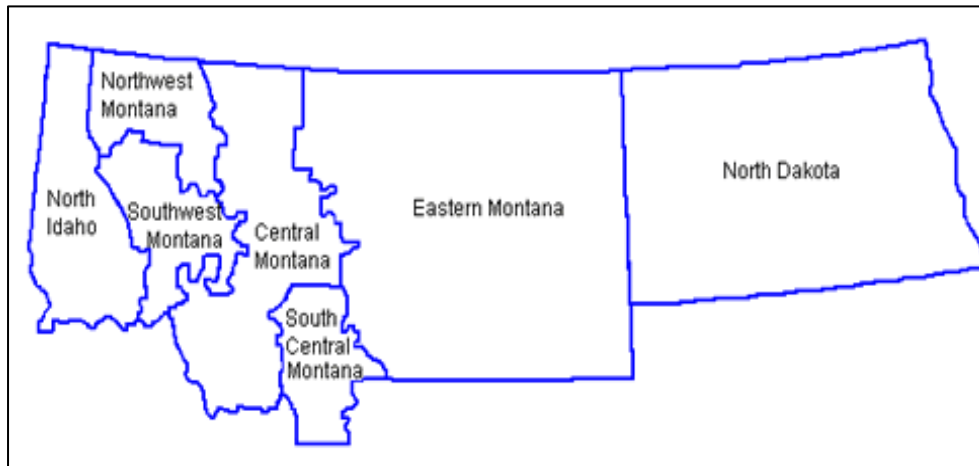
6.3.3. Fire Protection Response

Long travel distances for fire suppression resources are the norm in Sweet Grass County. The County Fire Warden has located the Department of Natural Resource engines and county engines as strategically as he can throughout the county within the opportunities that exist. Each engine must be hosted, maintained, and operated by a willing volunteer. When a fire is reported anywhere in the county, the volunteers are notified and they respond on a closest forces concept. This includes response to new ignitions reported on BLM administered lands and national forest lands. In those cases, the department needs to report those fires following the 310.1 reporting guidelines.⁶ Usually, the actual land ownership cannot be accurately determined until initial attack is in progress. When fires are located on lands other than Forest Service or BLM, the county volunteers continue their actions until the fire is controlled or until relieved by the fire warden.

⁶ See the National Fire Policy, www.nifc.gov/policies/1995_fire_policy.htm

6.4. Coordinated Prevention and Protection Projects

Future efforts in planning and implementation of prevention, mitigation and response projects should be closely coordinated between Sweet Grass 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 duplicate efforts or overlooking opportunities to protect values at risk.



Map 6. Fire Restriction Zone Boundaries

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. Sweet Grass County Commissioners, Big Timber Volunteer Fire Department and its cooperators need to be coordinated in this process to ensure close communications and common actions occur during critical periods of fire danger.

6.5. Prioritization Process

Recommended projects have been prioritized based on the risk estimation. See oversized map in Appendix 4,

6.6. Recommended Projects and Programs

This area describes recommended projects and actions that address the mitigation goals of the Sweet Grass County CWPP and includes:

- Fuel Reduction programs
- Fire prevention education
- Identified high risk areas
- Joint projects between private ownership, Sweet Grass County, Montana Department of Natural Resources, the Bureau of Land Management, and U.S. Forest Service

6.6.1. Vegetation Management/Fuel Modification Projects

This section addresses specific actions to reduce fuel loads, whether in forests, [brush](#), or

grasslands.

6.6.1.1. Thinning, Limbing, and Fuel Breaks

Sivicultural 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. The fuel breaks identified in this section are outside the work required by the county in their normal course of work, but is tied directly to vegetative management on both sides of an existing road.

Proposed Project 6.6.1.1.1—Project Coordinator: Fuels Committee—Homeowner education and defensible space. Sweet Grass County has seventeen subdivisions and each area is considered high risk due to the potential threat and loss from a wildland fire. In each subdivision, the on-going goal is to continue an education program with the residents. At the same time, the residents must reduce the vegetation within the subdivisions 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 firefighters. 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. Normally, these areas would be on the western or southern edges of the subdivisions or down slope from improvements. 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, to regenerate and survive. Eliminating these plants while they are young is relatively inexpensive, and over time will significantly reduce the resistance to control factor when firefighters are fighting a fire in that area. This is a treatment that can be especially effective upwind from subdivisions.

Proposed project 6.6.1.1.2—Project Coordinator: Fuel Committee—Hobble fuel break and structure protection. Reduce the dead and down fuels along the transportation system inside and adjacent to the Hobble fire burn area. This project will provide a fuel free zone and anchor point for future fire suppression operations. This project encompasses all roads and jeep trails within the fire area.

Proposed project 6.6.1.1.3—Project Coordinator: US Forest Service with the Fuels Committee—National Forest fuel breaks. Multiple areas of fuel breaks using the existing road systems to develop a fuel free zone or thinning for a distance of one or more chains on one or both sides of the roads. Areas of for these projects include Packsaddle, Gas Line Hill, Silver Creek, Derby Mountain, Boyland's, Smoot's, Brownlee, Davenport, and Sierra properties where it meets National Forest, Black Butte, Castle, East Boulder, Basin Creek, Fish Creek, and Tory Creek. The final projects will be determined through normal US Forest Service procedures.

Proposed project 6.6.1.1.4—Project Coordinator: Fuels Committee—Hump Creek fuel break and structure protection. Work with local landowners to tie together a fuel break system that incorporates existing burned areas to provide protection for residents living in the area.

Proposed project 6.6.1.1.5—Project Coordinator: Fuels Committee—Work Creek fuel break. Develop a fuel break within the heavy fuel loads that have been created naturally in the bottom of Work Creek. The project will utilize the existing road system and Work Creek to develop a fuel

free zone.

Proposed project 6.6.1.1.6—Project Coordinator: Fuels Committee—Bridger Creek fuel break. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would include structure protection within the project area.

Proposed project 6.6.1.1.7—Project Coordinator: Fuels Committee—West Bridger Creek fuel break. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would include structure protection within project area.

Proposed project 6.6.1.1.8—Project Coordinator: Fuels Committee—Bob Sierra’s Four Creek Ranch fuel break and structure protection. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would include structure protection within project area.

Proposed project 6.6.1.1.9—Project Coordinator: Fuels Committee—Upper Deer Creek fuel break. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would include structure protection within project area.

Proposed project 6.6.1.1.10—Project Coordinator: Fuels Committee—Boulder River Ranch fuel break and structure protection. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road and river bottom. Project would incorporate structure protection within the ranch area.

Proposed project 6.6.1.1.11—Project Coordinator: Fuels Committee—Beaver Meadows Ranch fuel break and structure protection. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. Project would incorporate projects that include structure protection to ranch structures.

Proposed project 6.6.1.1.12—Project Coordinator: Fuels Committee—Little Timber fuel break and structure protection. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would incorporate structure protection of high risk structures within this drainage.

Proposed project 6.6.1.1.13—Project Coordinator: Fuels Committee—Swamp Creek fuel break and structure protection. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would incorporate structure protection of high risk structures within this drainage.

Proposed project 6.6.1.1.14—Project Coordinator: Fuels Committee—Big Timber Canyon fuel break and structure protection. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would incorporate structure protection of high risk structures within this drainage.

Proposed project 6.6.1.1.15—Project Coordinator: Fuels Committee—Sweet Grass fuel break and structure protection. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would incorporate structure protection of high risk structures within this drainage.

Proposed project 6.6.1.1.16—Project Coordinator: Fuels Committee—Bohee fuel break. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would incorporate structure protection of high risk

structures within this drainage.

Proposed project 6.6.1.1.17—Project Coordinator: Fuels Committee—Elk Creek fuel break. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would incorporate structure protection of high risk structures within this drainage.

Proposed project 6.6.1.1.18—Project Coordinator: Fuels Committee—Lower Otter Creek fuel break. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would incorporate structure protection of high risk structures within this drainage.

Proposed project 6.6.1.1.19—Project Coordinator: Fuels Committee—Otter Creek fuel break. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would incorporate structure protection of high risk structures within this drainage.

Proposed project 6.6.1.1.20—Project Coordinator: Fuels Committee—Coyote Gulch fuel break. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would incorporate structure protection of high risk structures within this drainage.

Proposed project 6.6.1.1.21—Project Coordinator: Fuels Committee—East Fork of Sweet Grass Creek fuel break. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would incorporate structure protection of high risk structures within this drainage.

Proposed project 6.6.1.1.22—Project Coordinator: Fuels Committee—Stephens Hill fuel break. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would incorporate structure protection of high risk structures within this drainage.

Proposed project 6.6.1.1.23—Project Coordinator: Fuels Committee—North Reed Point fuel break. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would incorporate structure protection of high risk structures within this drainage.

Proposed project 6.6.1.1.24—Project Coordinator: Fuels Committee—Arlene Pile fuel break. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road.

Proposed project 6.6.1.1.25—Project Coordinator: Fuels Committee--Lusk's fuel break. Use the existing road system to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would incorporate structure protection of high risk structures within this drainage.

Proposed project 6.6.1.1.26—Project Coordinator: Fuels Committee—Terland fuel break. Use the existing road system and high risk stands of timber to develop a fuel free zone or thinning for a distance of one chain on one or both sides of the road. This project would incorporate structure protection of high risk structures within this drainage.

Proposed project 6.6.1.1.27—Project Coordinator: Fuels Committee—Todd fuel project. Use the existing road system to develop a fuel free zone or thinning of high risk stands for a distance of one chain on one or both sides of the road. This project would incorporate structure protection of high risk structures within this drainage.

6.6.1.2. Prescribed Burning

Prescribed burning—or controlled burning—is a relatively quick and inexpensive way to reduce fuel loads. 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 within the county. There are some tangible benefits to local ranchers when they use low to moderate intensity prescribed fire to increase the quantity and palatability of grass on pastures, especially on those now occupied by sagebrush or other brushy hardwood species. It will also set back the encroachment of ponderosa pine into 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 for most sagebrush species in this area. 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 ensure 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. Another drawback is the potential for noxious weed species to invade a recently burned site. Several research publications completed by the Intermountain Research Station discuss the types of results that can be expected.

Areas that have been previously treated by prescribed fire make effective fuel breaks when attempting to control a wildland fire. The lighter nature of the grassy fuels reduces rates of spread and resistance to control for fire suppression operations. Grazed lands have often been used as a fuel break or anchor point for fire suppression activities.

One of the greatest benefits to prescribed burning is the training opportunity it provides for the volunteers. 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.

The BTVFD annually conducts prescribed burns around the city limits of Big Timber. The objective of these projects is to reduce the potential spread of a wildland fire into the town of Big Timber. Some limited prescribe burning has been done in the Twin Ponds subdivision.

Proposed Project 6.6.1.2.1—Project Coordinator: Big Timber Volunteer Fire Department & BLM—Joint BLM project with Beaver Meadows ranch. Project would treat a stand of encroachment to the east of the ranch which is held by the BLM. The second part of the project would develop a fire safe area between the ranch buildings and the BLM ownership. This project, would protect ranch structures and reduce the fire behavior associated with a crown fire from threatening the ranch.

Proposed Project 6.6.1.2.2—Project Coordinator: Big Timber Volunteer Fire Department & USFS/BLM—Various prescribed burn projects. Opportunities may arise from planning efforts to jointly conduct prescribed fire projects. Big Timber Volunteer Fire Department should participate in these burns to improve their training, qualifications, and experience in wildland fire management. Efforts such as these promote better interagency cooperation and working relationships.

Proposed Project 6.6.1.2.3—Project Coordinator: Sweet Grass County Weed Board and Big Timber Volunteer Fire Department—Weed wash policy project. Work with the Sweet Grass

County Weed Department to establish a wash requirement for contractors, other local and government apparatus that conduct prescribed burns within the county (see the Weed Management Plan).

Proposed Project 6.6.1.2.4—Project Coordinator Big Timber Ranger District—Various prescribed burn fuels projects. These will be projects that use prescribed burns on an undetermined number of acres of hazardous fuels in the areas of Bridger Creek, Dry Fork, Grouse Creek, Basin Creek, Sweet Grass Creek, Main Boulder River, Big Timber Canyon, East Boulder Canyon, Castle/Enos Mountain, Long Mountain, and Counting Corral.

Proposed project 6.6.1.2.5—Project Coordinator: Big Timber Ranger District—Small Sale project. This is a Forest Service project that would use prescribed burns on an undetermined number of acres of activity related fuels generated by the small timber sales program.

6.6.1.3. Grazing

Many new “recreational” property owners are moving into Sweet Grass County. Active grazing management plans should be developed with these non-agricultural landowners to reduce dead and decadent grass materials on a regular basis. Grazing can be used effectively to reduce the severity of fire behavior in grassland plant communities.

Proposed Project 6.6.1.3.1—Project Coordinator: Fuels Committee education program—Landowner education project. Landowners should be encouraged and, where possible, educated to sustain grass ecosystems through grazing and to control tree encroachment in those areas, particularly where they are adjacent to heavily timbered federal lands.

6.6.1.4. Industrial Resource Management

Proposed Project 6.6.1.4.1—Project Coordinator: Big Timber Volunteer Fire Department—Railroad fire plan project. Ensure that Montana Rail Link Railroad develops and maintains the fire management plan required by the Memorandum of Agreement between the counties and the railroad.

Proposed Project 6.6.1.4.2—Project Coordinator: Big Timber Volunteer Fire Department—Railroad compliance project. Ensure that railroads within the county control the fire hazard along their right-of-way according to Section 69-14-721. This an opportunity to work with the railroads and initiate a fire prevention and fuels treatment plan for the railroad’s right-of-way. If a fire occurs as a result of an ignition along the railroad right-of-way, the Big Timber Volunteer Fire Department 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.

6.6.1.5. Biomass Utilization

Proposed Project 6.6.1.5.1—Project Coordinator: Sweet Grass County Economic Development—Biomass Disposal project. 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.

Proposed Project 6.6.1.5.2—Project Coordinator: Sweet Grass County Economic Development—Economic Development Coordination project. Explore using the local RC&D or other economic development agencies within central Montana to work with new businesses, which are located in or around Big Timber, to use these biomass resources creatively.

6.6.2. 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 ensure that any written procedures for the use of safety zones are clearly understood by anyone who may need to use them. Procedures should include when to occupy safety zones and what should and should not be taken into them. A clear understanding of the proper use of safety zones is best accomplished through training.

Proposed Project 6.6.2.1—Project Coordinator: County Planner, Big Timber Volunteer Fire Department and Sheriff's Office—Safety Zone Determination project. Review each established subdivision and determine if safety zones may be necessary considering ingress and egress issues as well as the surrounding fuel type. Where they are appropriate, assist the subdivision residents in determining where to locate them, what maintenance work needs to be done and how and when they should be used.

6.6.3. Infrastructure Improvements

Improvements to local infrastructure are discussed in this section.

6.6.3.1. Water Supply

Although water supplies are not a direct function of the Big Timber Volunteer Fire Department, the availability of adequate water supplies unquestionably impacts the structure fire suppression performance of the department. A water supply, or the lack of a water supply, indirectly affects the whole community through the insurance rates they pay. Numerous dry hydrants have been placed at various locations within the county.

Proposed Project 6.6.3.1.1—Project Coordinator: Big Timber Volunteer Fire Department—Water Source Plan project. Prepare a strategic water source plan for the county, which shows the most efficient sources of water to support wildland 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. GPS the location of water supply points and work with the Sweet Grass County Planning Department and Weed Department to develop a water supply map for Sweet Grass County.

6.6.3.2. Utilities

Proposed Project 6.6.3.2.1—Project Coordinator: Big Timber Volunteer Fire Department—Transmission Line Clearance project. Big Timber Volunteer Fire Department should work with Northwestern Energy and Park Electric Cooperative to ensure that the required clearances are maintained for all electrical transmission lines in Sweet Grass County.

Proposed Project 6.6.3.2.2—Project Coordinator: Big Timber Volunteer Fire Department and Power Company Managers—Power Line Safety Training project. The Park Electric Cooperative and Northwestern Energy should provide power line safety demonstrations to the Big Timber Volunteer Fire Department members and subdivision and homeowner associations on a biannual basis.

6.6.3.3. 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.

Fire Stations

The main fire station for the county is located in Big Timber, with branch stations at Melville, McLeod, and Bridger Creek.

Training, Certification, and Qualification

In a needs assessment of the US Fire Service conducted by US Fire Administration in an NFPA in December of 2002, one of the items that was found regarding training was that an estimated 41% of the fire department personnel involved in wildland fire fighting lack formal training in those duties with substantial needs in all sizes of communities.⁷ The Needs Assessment also found that only 26% of the fire departments could handle wildland/urban interface fire affecting 500 acres with locally trained personnel. The Big Timber Volunteer Fire Department greatly exceeds this capability. It is not unusual for them to handle a fire of 1000 acres or larger, either a wildland/urban interface fire or a wildland fire.

Proposed Project 6.6.3.3.1—Project Coordinator: Sweet Grass County Attorney—Training Requirement project. Encourage volunteers to meet training requirements, wear their personal protective equipment and to take the firefighter [pack test](#) each spring. The County Attorney should determine if existing county standards are adequate to protect the county from any litigation concerning the injury or death of a volunteer firefighter.

Operational Procedures & Programs

Proposed Project 6.6.3.3.2—Project Coordinator: Big Timber Volunteer Fire Department—LDS Demonstration project. Work with BLM to obtain a real time representation of their Lightning Detection System for the Big Timber Volunteer Fire Department. This will give the County Fire Chief a marked advantage in deploying county fire protection assets during periods of lightning activity.

Proposed Project 6.6.3.3.3—Project Coordinator: Big Timber Volunteer Fire Department—[Fire Perimeter](#) Mapping project. GPS the perimeters of all fires that are 100 acres or larger and develop a fire history database and maps for the county using GIS. Upgrade GPS units so that they are capable of tracks. This will allow the Big Timber Volunteer Fire Department personnel to map the perimeter of fires larger than 100 acres and interface with the county's GIS program at the Sweet Grass County Weed Department and County Planning Office.

Proposed Project 6.6.3.3.4—Project Coordinator: Big Timber Volunteer Fire Department—Response Assistance project. Big Timber Volunteer Fire Department should order the County Assistance Team (CAT) as early as possible during an emerging incident to avoid experiencing key overhead shortages and overloading Sweet Grass County personnel.

Proposed Project 6.6.3.3.5—Project Coordinator: Sweet Grass County Weed Department with support from the Big Timber Volunteer Fire Department—Weed Wash Sites project. The Sweet Grass County Weed Plan recognizes the need for fire suppression equipment to be washed down prior to fire suppression and training activities to eliminate weed seeds and other noxious species moving into Sweet Grass County. Selected spots throughout the county should be established, and a wash-down facility, which is transportable, be developed and moved to a site. Engage interagency partners in this effort.

⁷ Needs Assessment US Fire Administration NFPA December 2002

6.6.3.4. Access

Proposed Project 6.6.3.4.1—Project Coordinator: Sweet Grass County Road Department and Sweet Grass County Commissioners—Road Sign project. As road signs are replaced throughout the county, replace them with non-combustible reflective road signs that would withstand a wildland fire and be easily seen by fire personnel.

6.6.4. 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). Defensible space 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 firefighters to work effectively and safely, Figure 13



Map 7. Defensible Space

Slope and fuels affect the size of the defensible space. 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.

6.6.5. Recommended Building Materials/Firewise 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. See www.firewise.org for additional information concerning building materials and Firewise construction.

6.6.6. Fire-Resistant Landscaping

The landscaping plan 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. Zone A 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.

Zone B lies between five feet and at least 30 feet from the home. This zone provides the critical area where firefighters can defend the home and where the fuels have been substantially reduced in height and volume.

Zone C represents the lot from 30 feet to approximately 60 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.

Zone D is the property perimeter buffer which is 60 feet to the property line for lots 2 ½ acres or less or 60 feet to 200 feet around the perimeter of lots larger than 2.5 acres. This serves as a transition zone where proper fuels reduction could 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, Firewise Landscaping Checklist⁸, Fire and Your Landscape, Fire Scaping Resources for Montana Homeowners⁹)

Proposed Project 6.6.6.1—Project Coordinator: Big Timber Volunteer Fire Department—Firewise project. Use the Firewise Landscaping Checklist (See Appendix 8.3) and other resources located at the firewise.org website.

Proposed project 6.6.6.2—Project Coordinator: Big Timber Volunteer Fire Department—Firewise Implementation project. Swamp Creek, Acres Across, Solberg, Twin Ponds, Mountain View, Mallard Springs, Indian Rings, Collenbourne, Lower Deer subdivision. Implement the Firewise program within these high risk areas. These subdivisions contain numerous homes and outbuildings. Risk of wildland fire and loss is very high. Continued work between homeowner, fire department and fuels projects will be an annual occurrence.

Proposed project 6.6.6.3—Project Coordinator: Fuel Committee and Big Timber Volunteer Fire Department—Stage Coach Firewise project. Implement the Firewise program within this high risk area of Stage Coach Estates. The subdivision contains over twenty-two homes and numerous outbuildings. Recent wildland fires have threatened the subdivision on five separate occasions.

Proposed project 6.6.6.4—Project Coordinator: Fuel Committee—Hump Creek Structure Protection project. Implement the Firewise program within this drainage. The Hump Creek road is a dead end road that provides single entry/exit for a number of homeowners. This project would be coupled with a fuel break that would be developed along the road in several locations where dense stand of dog-hair ponderosa pine reach the right of way of the road.

⁸ www.firewise.org

⁹ *Montana Nursery & Landscape Assoc. 2003*

Proposed project 6.6.6.5—Project Coordinator: Fuel Committee--Work Creek Structure Protection project. Implement the Firewise program within this drainage. This project would implement the Firewise program for structures from the interstate to the end of Work Creek. Work Creek is a dead end public road that provides ingress/egress for a number of ranches and private homeowners. The road dead ends where it becomes a wheel track into private ownership. During a period of evacuation, this and several other wheel track roads may be used as an exit from the drainage. This project would be tied to a proposed fuel break along Work Creek. See Work Creek Fuel Break, Proposed Project 6.6.1.1.5.

Proposed project 6.6.6.6—Project Coordinator: Fuel Committee—Reed Point North Structure Protection project. Implement the Firewise program to cover the road system and area north and west of Reed Point for structure protection. Numerous structures exist in this area and a number of these homes and home sites have been threatened by recent large fire activity since the 2000 fire season. Several homes were lost in this area during the 2003 fire season.

Proposed project 6.6.6.7—Project Coordinator: Fuel Committee—Yellowstone River Structure Protection project. Implement the Firewise program within in the area north of the Yellowstone River and west of Reed Point. This project would cover structure protection and would be connected to an adjacent proposed project that would develop a fuel break system along the road system that provides access into this area.

Proposed project 6.6.6.8—Project Coordinator: Fuel Committee—Bridger Creek Structure Protection project. Implement the Firewise program beginning at the I-90 exit along Bridger Creek and follow the road south until it reaches the county line. This project would implement the Firewise program along main Bridger Creek Road and subsequent side drainages that contain a number of homes and cabins. This project would be in conjunction with a proposed fuel break project along the road right of way, where mature and dog hair ponderosa pine exist next to the road. See fuel break project proposals.

Proposed project 6.6.6.9—Project Coordinator: Fuel Committee--West Bridger Creek Structure Protection project. Implement the Firewise program within this drainage. This project begins where the West Bridger road starts at the old home site of the Mother's Head Ranch. This project would implement the Firewise program within the drainage where a subdivision has recently been developed.

Proposed project 6.6.6.10—Project Coordinator: Fuel Committee—Derby Structure Protection project. Implement the Firewise program within this drainage. This project begins where the Derby Gulch road takes off from the West Bridger road. It would implement the Firewise program within the private ownership. A second proposed project would be to develop a draft site and the pond along the road for use in structure protection and as a dip site for bucket work for wild land fire suppression operations.

Proposed project 6.6.6.11—Project Coordinator: Fuel Committee—Greycliff Creek, Lower and Upper Deer Creek Structure Protection project. Implement the Firewise program within these drainages. This project would also identify high risk areas of heavily timbered private landholding that could be treated to add additional protection to structure protection. These projects would take into account potential fire behavior that would be similar to that displayed during the Black Butte Fire in 1994. These projects would be aimed at mitigating fires of similar size and scope.

Proposed project 6.6.6.12—Project Coordinator: Fuel Committee--East Boulder River Structure Protection project. Implement the Firewise program within this drainage. This project would also identify high risk areas of heavily timbered private landholding that could be treated to add additional protection to structure protection. These projects would take into account potential fire behavior that would be similar to that displayed during the Black Butte Fire in 1994. These

projects would be aimed at mitigating fires of similar size and scope.

Proposed project 6.6.6.13—Project Coordinator: Fuel Committee—Elk Creek Structure Protection project. Implement the Firewise program within this drainage. This project would also identify high risk areas of heavily timbered private landholding that could be treated to add additional protection to structure protection. These projects would take into account potential fire behavior that would be similar to that displayed during the Black Butte Fire in 1994. These projects would be aimed at mitigating fires of similar size and scope.

Proposed project 6.6.6.14—Project Coordinator: Fuel Committee—West Boulder River Structure Protection project. Implement the Firewise program within this drainage. This project would also identify high risk areas of heavily timbered private landholding that could be treated to add additional protection to structure protection. These projects would take into account potential fire behavior that would be similar to that displayed during the Black Butte Fire in 1994. These projects would be aimed at mitigating fires of similar size and scope.

Proposed project 6.6.6.15—Project Coordinator: Fuel Committee—Yellowstone River Structure Protection project. Implement the Firewise program within this drainage.

Proposed project 6.6.6.16—Project Coordinator: Fuel Committee—Sweet Grass Creek Structure Protection project. Implement the Firewise program within this drainage. This project would also identify high risk areas of heavily timbered private landholding that could be treated to add additional protection to structure protection. These projects would take into account potential fire behavior that would be similar to that displayed during the Hobble Fire in 2003. These projects would be aimed at mitigating fires of similar size and scope.

Proposed project 6.6.6.17—Project Coordinator: Fuel Committee—East Fork Sweet Grass Creek Structure Protection project. Implement the Firewise program within this drainage. This project would also identify high risk areas of heavily timbered private landholding that could be treated to add additional protection to structure protection. These projects would take into account potential fire behavior that would be similar to that displayed during the Hobble Fire in 2003. These projects would be aimed at mitigating fires of similar size and scope.

Proposed project 6.6.6.18—Project Coordinator: Fuels Committee—Class IV to Class II Vegetation project. This proposed project is a joint effort between the County Rural Fire Department, DNRC, and Federal agencies. This effort would develop a strategy of using those stand replacement wildland fires that have occurred during the past decade and develop fuel break system that would use those unburned island of over mature vegetation thus maintaining age class diversity and provide anchor points for future suppression activities. This strategy would prioritize areas of wildland urban interface, but would not be limited to those areas. The implementation of this strategy would be aimed at changing the current vegetation from condition class IV to condition class II. Emphasis would be placed on maintaining those condition classes in both the fuel break area and the recent burn. This would be accomplished with coordination of both the landowner and government agencies.

6.6.7. Evacuation Plan

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

Proposed Project 6.6.7.1—Project Coordinator: Sweet Grass County Sheriff—Evacuation Plan project. Update and review evacuation plans for the Main Boulder and all Subdivisions in the county.

6.6.8. 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.

Proposed Project 6.6.8.1—Project Coordinator: Big Timber Volunteer Fire Department/Sweet Grass County Disaster and Emergency Services—Firewise Community Program project. Sponsor a Firewise Community Program (fire prevention/education) locally within the county for the public and continue that every other year. Integrate this into a year long fire education program that would include schools, rodeos, county fair. This program would include information concerning both invasive species and fire into any public education that is conducted during the Firewise Community Program.

6.6.9. Legal Requirements

6.6.9.1. Agreements, MOU's & Operating Plans

Proposed Project 6.6.9.1.1--Project Coordinator – Big Timber Volunteer Fire Department/Sweet Grass County Disaster and Emergency Services—Plan Update and Review project. Review all agreements and memorandums of understanding with cooperators. Follow up on those that have not yet been completed and ensure annual operating plans are completed when specified. The following key points should be adequately covered within the agreements so that there are no unanswered questions:

- Clearly state who has jurisdiction for and will provide an IC for fires on BLM, national forest and county lands, respectively.
- When one agency responds first to another agency's fire, clarify what the rules of engagement, disengagement and expectations are for that agency when the responsible agency arrives at the scene.
- When a complexity analysis indicates a Type III, Type II or Type I Incident Management Team is needed, how is that request processed and who must approve it.
- Who will be the county liaison with that overhead team?
- Detail the process that the county needs to follow in order to obtain aviation resources such as air tankers and helicopters in a timely manner.
- Lay out reimbursement procedures.

Proposed Project 6.6.9.1.2--Project Coordinator – Big Timber Volunteer Fire Department/Sweet Grass County Disaster and Emergency Services—Jurisdictional Responsibility project. One issue that it might be helpful to periodically review is the jurisdictional responsibilities for wildland fire on Gallatin National Forest and Bureau of Land Management lands within Sweet Grass County. The Organic Act, the Protection Act, and the Taylor Grazing Act place the responsibility for fire protection on the respective federal agencies for the lands administered by them. There are exceptions when another agency has been designated as the Protecting Agency by virtue of an agreement. This assigned protection responsibility only involves initial attack on new fire starts. Once a fire escapes initial and extended attack efforts, the responsibility falls back to the home agency. A clear understanding of jurisdictional authorities will help all firefighters understand their roles within the county. Agreements and operating plans with BLM, USFS, State of Montana and adjoining counties must be current and valid. Without these operating plan requirements being fulfilled, the likelihood of a misunderstanding among the parties concerned continues.

6.7. Prioritized Actions, Implementation Timeline

Table 12. Proposed Projects

Proposed Project	Short Term (< 1 Year)	Medium Term (1-3 Years)	Long Term (3+ Years)
All projects that involve protection of structures within the seventeen subdivision and structures that fall under the urban interface fall into this project category.		X	
All Fuel break proposals are ranked equally			X
6.6.1.2.2 6.6.1.2.4 6.6.1.2.5 Forest Service projects			X
6.6.1.2.1 Bureau of Land Management project		X	
6.6.1.2.3		X	
6.6.1.3.1		X	
6.6.1.3.2		X	
6.6.1.4.1		X	
6.6.1.4.2		X	
6.6.1.5.1		X	
6.6.1.5.2		X	
6.6.2.1		X	
6.6.3.1.1		X	
6.6.3.2.1		X	
6.6.3.2.2	X		
6.6.3.3.1—6.6.3.3.5	X		
6.6.3.4.1		X	
6.6.6.1--18		X	
6.6.7.1		X	
6.6.8.1		X	
6.6.9.1.1--2		X	

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.

Proposed 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.

6.8. Incorporation into Local Jurisdictional Plans

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

7. Summary, Analysis and Finding

The complexity of the wildland fire program has significantly changed in Sweet Grass County over the last 15 years, due to long-term drought, and changes in the wildland ecosystems. The leadership and the level of fire preparedness within Sweet Grass County have been able to keep pace with this changing environment due to the efforts of the County Fire Warden and a strong fire department. The Sweet Grass County Board of Commissioners need to recognize this effort and also need to be supportive of future needs of the County 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 6.6, 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 Sweet Grass County Board of Commissioners are strongly encouraged to use a grant writer to increase the wildland fire suppression, public education, training and qualifications capability of the Big Timber Volunteer Fire Department.

8. Appendices

8.1. 2007 Sweet Grass County Weed Plan

The following is the basic 2007 Sweet Grass County Weed Plan. Appendices to the Weed Plan are available on the web at www.co.sweetgrass.mt.us.

I Introduction

Invasive non-native plants are a serious threat to native species, communities, and ecosystems in many areas around the world. They can compete with and displace native plants, animals, and other organisms that depend on them, alter ecosystem functions and cycles significantly, hybridize with native species, and promote other invaders. The good news is that many plant invasions can be reversed, halted or slowed, and in certain situations, even badly infested areas can be restored to healthy systems dominated by native species. In most instances this requires taking action to control and manage the invasive plants.

A. Purpose and objectives of the Weed Management Plan

1. This management plan is considered for all intent and purposes, a working document and is subject to future changes and revisions. The intent of the plan is to provide a statement of public policy regarding the management of invasive species. The purpose of this plan is to provide standards and guidelines for the implementation of a successful noxious weed management program and to comply with the County Noxious Weed Control Act. This plan shall govern activities as they pertain to the County Noxious Weed Control Act and shall prevail over any conflicts arising there from. These standards and guidelines are established in order to help maintain, preserve and enhance the environmental, ecological, aesthetic, and historical qualities of Sweet Grass County.

B. County Mission and Direction - Sweet Grass County Noxious Weed Program is dedicated to serve and protect the resource and land base as noxious weeds in most instances pose the single greatest threat to the environment and healthy ecosystems.

The direction of the noxious weed program is to be as proactive as possible through public education and awareness, progressive weed management and cooperation with all entities-private, local, state, and federal.

C. Definition of weed management areas

1. Sweet Grass County Weed District recognizes that the county is comprised of several different watersheds, habitats, soil types, and ecosystems. For this reason, all of Sweet Grass County is considered a weed management area and therefore noxious weed management will be addressed on a site/area specific, individual basis taking into serious consideration all environmental factors.

2. A specific or cooperative weed management area may be formed for the purpose of concentrated weed management efforts by affected individuals. The formation of such localized weed management areas is necessary for any grants through the Montana Noxious Weed Trust Fund and/or other funding sources.

D. Goals and Priorities

1. Short Term Goals (1-5 years)

- a. Spotted and Diffuse knapweed eradication and containment program

- b. Memorandums Of Understanding (MOU's)/Cooperative agreements with local, state and federal land management agencies.
 - c. Aggressively expand integrated weed management program on leafy spurge in county on all affected acres.
 - d. Move county ROW spray program into a maintenance spray program.
 - e. Expand current Biological Control Program
2. Long Term Goals (5-10years)
- a. Increase the technical and financial assistance to private landowners through grants and cooperative cost share programs.
 - b. Reverse trend of the spread of noxious weeds to containment and eradication
 - c. Involve local High School in research and demonstration projects
 - d. Capital Building improvements for facilities.

II Statement of the Weed Problem

Weeds are plants that interfere with the management objectives of a given area of land. Noxious weeds are those weeds that the State of Montana has declared as a legal responsibility to manage because of their negative impacts on the environment and the economy. Sweet Grass County Weed District recognizes that weeds are an economic and environmental threat and that education, prevention and proper management are the keys to slowing the threat of noxious weeds.

A. See Appendix for current state list.

B. Land Administration - Sweet Grass County contains approximately 1850 square miles or 1,185,781 acres of land with multiple landownership. The following is an approximate breakdown of the land ownership in Sweet Grass County:

- a. Bureau Of Land Management 16,022 acres
- b. Forest Service 282,941 acres
- c. State Lands 48,910 acres
- d. Private Land 815,693 acres

C. Impacts of Weeds Noxious weeds displace native plant communities, reduce biodiversity, eliminate threatened and endangered plant species, alter normal ecological processes, decrease wildlife habitat, reduce recreational value, and increase soil erosion and stream sediment. These negative ecological impacts result in major economic losses.

1. Agriculture is the largest industry in Montana. Livestock production is a major contributor to the local economy. Leafy spurge and spotted knapweed have the ability to render range useless for cattle production by displacing desirable key forages. Grazing capacities for livestock can be reduced 65-90% from original capacity. Noxious weeds also cost Montana million of dollars every year in herbicide allocation costs and decreased production.

2. Recreation – Hikers, fisherman, and outdoor enthusiasts often unknowingly contribute to noxious weeds by transportation of new weeds into uninfected areas. This can permanently damage the ecosystem. This can cost millions of dollars in lost habitat and close areas to recreation and hunting.

D. Estimation of current acreage infested -The last known estimates of infestations was in the early 1990's. The following is a gross reflection of the estimated acreages infested by species. Most significant weed populations occur on private lands. The following is a description of state listed noxious weeds by categories. The categories and their management criteria are defined in the Montana County Noxious Weed Control Act.

1. **Category 1** - Category 1 noxious weeds are weeds that are currently established and generally widespread in many counties of the state. Management criteria include awareness and education, containment, and suppression of existing infestations and prevention of new infestations. These weeds are capable of rapid spread and render land unfit or greatly limit beneficial uses.

- a. Canada Thistle (*Cirsium arvense*) - Canada thistle occurs in small infestations mostly in irrigated hay lands, disturbed sites and right-of-ways. Estimated acres infested are to be approximately 1000 acres.
- b. Spotted knapweed (*Centaurea maculosa*) - Spotted knapweed is established in the county. Significant sized infestations of this plant are located at various sites throughout the county. It has been estimated there are approximately 3500 acres of spotted knapweed with the highest populations occurring within a 10-mile radius of the City of Big Timber and along transportation corridors, gravel pits and other waste sites. Significant infestations also occur in Grey Cliff Creek area.
- c. Diffuse knapweed (*Centaurea diffusa*) - Diffuse knapweed is most heavily concentrated south of the Yellowstone River and East of the Boulder River with satellite infestations also occurring North of the Yellowstone River in the Cow Creek road area. This weed has also shown up in isolated patches throughout the county. This plant also has the potential to invade areas similar to spotted knapweed and poses a threat to rangelands dominated by short grass prairie. Estimated infested acres to be 3000.
- d. Leafy Spurge (*Euphorbia esula*) - Leafy spurge infests the largest number of acres in Sweet Grass County. The most prominent infestations are known to occur along the Yellowstone River, Boulder River, and Sweet Grass Creek and in the Melville area. It is also very prevalent in the Dry Creek and Upper & lower Deer Creek drainages. 1990 estimates Leafy spurge infests approximately 60,000 acres. Current estimates are closer to 100,000 acres.
- e. Russian Knapweed (*Centaurea repens*) - Russian knapweed is sparsely dispersed throughout the county. The largest known infestations are located in the Otter Creek-Glasston areas. Smaller infestations occur at the east end of Big Timber-Rapelje road and along the Railroad right of way west of Big Timber near where the Prather ditch runs under the rails. Estimated acres infested are less than 100.
- f. Whitetop (*Cardia draba*) - Whitetop can be found in several areas in Sweet Grass County. Significant infestations occur in the Sweet Grass Creek and Otter Creek drainages. Small patches are located along I-90, main boulder above McLeod and along the frontages roads. The East end of the county in the Deadmans Canyon area and near Reed Point also holds several acres. Estimated acres infested to be 100.
- g. Dalmatian Toadflax (*Linaria dalmatica*) - The railroad Right-of-way contains the largest amount of Dalmatian Toadflax, which is encroaching onto neighboring properties. It can be found along the rail lines in scattered patches from Big Timber East to and including the Pelican Fishing Access Site. There is also a small infestation west of Big Timber along the railroad between Grey Bear Bridge and Springdale. Estimated acres infested 20.
- h. Field Bindweed (*Convolvulus arvensis*) - This weed is widespread throughout the county. It is most common in croplands, irrigation ditches and roadsides and is considered a low priority.
- i. St. Johnswort (*Hyepicum perforatum*) - This plant has been identified along the Main Boulder road – scattered infestations from 18-mile marker to as far as above Camp on the Boulder. Estimated acres to be 25.
- j. Sulfur Cinquefoil (*Potentilla recta*) - Sulfur Cinquefoil infestations are located in the Lower Deer Creek drainage, Big Timber Canyon, Main Boulder above Clydehurst, East Boulder West Bridger and Bridger Creek. Estimated acres infested are to be 500.
- k. Houndstongue (*Cynoglossum officinale*) - Houndstongue infestations are found at various sites throughout the county. It occurs most often in areas where cattle bed down and in overgrazed pastures. The largest and most severe known infestations occur in Big

Timber Canyon, Sweet Grass Canyon and West Boulder. Estimated acres infested are 500.

l. Common Tansy (*Tanacetum vulgare*) - Common Tansy can be found scattered throughout the City of Big Timber as an ornamental. It also occurs along the Main Boulder River and occasionally along the Yellowstone River. The Main Boulder contains the largest concentration of common tansy most of which occurs from Natural Bridge south to the Clydehurst Christian Ranch. Estimated acres infested is 200.

m. Oxeye Daisy (*Chrysanthemum leucanthemum* L.) - Oxeye Daisy occurs scattered along the East Boulder and Main Boulder river drainages. There is not enough information to conclude estimated acres infested.

n. Yellow Toadflax (*Linaria vulgaris*) - The only known infestations of Yellow Toadflax occur in the Big Timber Canyon area and occasionally along the railroad east of Big Timber and transportation corridors. Estimated acres to be infested less than 20.

2. **Category 2** - Category 2 noxious weeds have recently been introduced into the state or are rapidly spreading from their current infestation sites. These weeds are capable of rapid spread and invasion of lands, rendering lands unfit for beneficial uses. Management criteria include awareness and education, monitoring and containment of known infestations and eradication where possible.

a. Dyers Woad (*Isatis tinctora*) - Dyers Woad has been located in the eastern part of Park County and is a potential threat to western Sweet Grass County.

b. Tamarisk or Salt cedar (*Tamarix spp.*) - Salt cedar has been found in isolated occurrences along the Yellowstone River. In 2004 the Yellowstone River, Otter Creek and Lower Sweet Grass were flown using a helicopter to look for salt cedar. In 2004 one plant was mapped and treated just west of Big Timber on the Yellowstone. A river survey in 2006 revealed more salt cedar occurring mostly from Reed Point to Grey Cliff.

c. Orange Hawkweed (*Heiracium aurantiacum* L.) - Orange Hawkweed was found in Big Timber Canyon at the falls in 2003 on Forest Service. Estimated infested acres to be 10.

d. Tall Buttercup (*Ranunculus acris*) - Tall Buttercup was discovered in the fall of 2002 along the Main Boulder just below Whispering Pines Subdivision. Estimated acres infested are 40.

e. Purple Loosestrife (*Lythrum salicaria*), Tansy Ragwort (*Senecio jacobaea* L.), Perennial pepperweed (*Lepidum latifolium*) and Meadow hawkweed complex (*Hieracium pratense*, *H. floribundum*, and *H. piloselloides*) have not been detected in Sweet Grass County as of March 2007.

3. **Category 3** - Category 3 noxious weeds have not been detected in the state or may be found only in small, scattered, localized infestations. Management criteria include awareness and education, early detection and immediate action to eradicate infestations. These weeds are known pests in nearby states and are capable of rapid spread and render land unfit for beneficial uses.

a. Rush skeleton (*Chondrilla juncea*) - One plant was documented in the late 90's in the Northeastern part of the county. No new plants have been reported from this site.

b. Yellow star thistle (*Centaurea solstitialis*), Common crupina (*Crupina vulgaris*), Eurasian watermilfoil (*Myriophyllum spicatum*) and Yellow Flag Iris (*Iris pseudacorus*) have not been detected in Sweet Grass County as of March 2007.

4. **Sweet Grass County Designated Noxious Weeds:** Montana Code Annotated 7-22-2101 (8)(ii) gives a county the authority to list local invasive species of concern. These weeds are capable of rapid spread and invasion of lands, rendering lands unfit for beneficial uses. Management criteria include awareness and education, monitoring and containment of known infestations and eradication where possible. A native plant may not be listed on the State Noxious Weed List or be listed as a county designated noxious weed.

a. Woodland sage (*Salvia nemorosa*) - This plant was introduced as an ornamental plant that has escaped and infested large areas. The most significant infestation is located on

the Beaver Meadows ranch just below the Natural Bridge. This plant has also been found in isolated patches along Upper Deer Creek, Swamp Creek road and in the Wormser Loop road area. Estimated acres to be 100.

b. Musk Thistle (*Cardus nutans L.*) – The two most significant infestations of this plant occur along the county line in the West Boulder area and above the Sweet Grass Ranch on Forest Service. Estimated acres to be infested 600.

c. Black Henbane (*Hyoscyamus niger L.*) – This plant was actually introduced as a cultivar during World War II. It was raised for its pain-relieving properties and shipped out on the railroad, thus every time there is a disturbance along a road or the railway Black Henbane is usually the first plant to return. Estimated acres infested to be about 100.

d. Blue Weed (*Echium vulgare*) – This plant was first discovered in 2003. It is unclear exactly how this plant arrived in Sweet Grass County in a gravel pit or how long it had been there. This plant may soon be listed on a state noxious weed watch list. It is currently listed as a county noxious weed in Ravalli and Sanders counties. This is also a listed noxious weed in Canada and has been reported in the Casper Wyoming area. Estimated acres infested to be 20.

e. Urban spurge (*Euphorbia agraria*) – This plant is related to the more common Leafy spurge (*Euphorbia esula*), but has some distinctly different growth characteristics. This plant was originally discovered in the Northeastern part of the County in 2002. It is not known when or how this species was introduced to the area. For many years this plant was thought to be leafy spurge. A survey of where and the extent of the infestations were conducted in 2005 and there are estimated to about 600 acres infested.

III. Cooperative Weed Management Areas

A. Building coalitions and cooperative weed management areas - Sweet Grass County recognizes that successful weed management programs must involve every stakeholder. That is why Sweet Grass County Weed Program will attempt to facilitate the establishment of Cooperative Weed Management Areas where there is an interest and a need. The establishment of working CWMA's is a priority of Sweet Grass County Noxious Weed Program.

1. A Cooperative Weed Management Area (CWMA) is a distinguishable zone based on similar geography, invasive species, climate or human use patterns. The purpose of a CWMA is to facilitate cooperation among all land managers and owners to address a noxious weed problem in a common area. The goals of the CWMA's are to collectively work towards solving a weed problem long term.

a. Criteria for CWMA's

i. Common weed problem

ii. General consensus among stakeholders

iii. Significant participation by stakeholders

b. Sweet Grass County will attempt to attain cost share funding to assist those involved in a CWMA for noxious weed management. These sources could include but are not limited to the Montana Noxious Weed Trust Fund and other funding sources that give support towards this effort. Sweet Grass County will administer the program and the funding. Please refer to Appendix for applications and forms.

c. Compliance in CWMA's – If there is a land owner in a CWMA;

i. That has a noxious weed problem,

ii. Is considered non-compliant due to lack of effort,

iii. Has been given ample opportunity to enter into compliance,

iv. And does not control/manage their weeds, then;

v. They are considered in non-compliance and Sweet Grass County or a contractor working under Sweet Grass County will enter the property and perform the management/control measures and the landowner will pay for the cost plus,

up to 50%. Sweet Grass County will have access to any CWMA grant funds to help pay for the cost of management/control.

d. Long-term practices – The end goal for any CWMA is to establish long-term weed management practices. As a participant of a CWMA each landowner is expected to carry on the management practices long term and not to abandon the practices in the absence of funding assistance.

2. Cost Share

a. Labor Match Assistance Policy

i. Sweet Grass County may, if resources are available provide a labor match of up to 3 people along with necessary equipment to assist landowners with noxious weed control. The landowner must sign a waiver of liability holding Sweet Grass County free from any and all liability.

ii. The landowner must provide;

1. Herbicide

2. Water

3. Persons and equipment for match

iii. There is a time limit of maximum of 20 hours per person. The landowner must request assistance at least 10 days prior to needing the match. Only Sweet Grass County personnel may operate County equipment.

IV. Integrated Weed Management Strategies and Methods

Integrated Weed Management (IWM) approach is based on combined strategies for weed management based on site-specific information, which determines the best combination of treatment choices to achieve management goals. IWM is a multidisciplinary, ecological approach for managing noxious weeds. The tools for IWM include prevention, education, herbicide Sweet Grass County's primary goal of IWM is to develop and/or maintain ecologically healthy plant communities that are relatively weed resistant, while meeting other land use objectives such as forage production, wildlife habitat and recreation. The tools for IWM include prevention, early detection/eradication, education, cultural/mechanical, chemical and biological.

A. Prevention - The most cost effective method for managing noxious weeds is to prevent their invasion. Developing a noxious weed prevention program requires using a combination of methods to limit invasion and spread of non-native species. Preventive methods include education as to the impacts of noxious weeds and how to recognize a weed, limiting weed dispersal, containing adjacent infestations, minimizing soil disturbance, detecting and eradicating species early, establishing competitive grasses and properly managing existing lands.

B. Early Detection & Eradication - Sweet Grass County will implement early detection & eradication practices where applicable. Such practices will occur anywhere Category II or III species are found and any new occurrences of Category I.

1. Eradication methods will be determined at the time of discovery (within 72 hours) and will depend on influencing environmental and resource constraints. Sweet Grass County Noxious Weed Program will assist with technical support and funding if possible during the eradication of Category II & III species. Early detection relies heavily on the private landowner. A continuous aggressive noxious weed education program will enhance early detection. Sweet Grass County will survey and monitor designated county roads for new invaders as a part of an on going noxious weed program.

C. Education – Sweet Grass County will provide noxious weed educational opportunities for all groups, organizations, landowners and the public in general. Sweet Grass County acknowledges that noxious weeds are a social and economic issue as much as they are an

environmental problem. This includes annual trainings for credit towards private and commercial applicators licenses’.

D. Cultural

1. The board or its representative on a case-by-case basis will determine acceptable cultural/mechanical practices. The methods for each plan submitted will approved/disapproved based upon site-specific situations and outside influencing factors. If a person or agency is considering cultural methods as a sole method for noxious weed management it is in most cases unacceptable.

E. Chemical – Sweet Grass County Weed District and Noxious Weed Program will determine which herbicide to use on a case-by-case and site-specific basis. Herbicides most commonly used for Right of Way and Range & Pasture work on the state listed noxious weeds are as follows:

1. 2,4D Amine (2,4 Dimethylamine salt phenoxyacetic acid)
2. Tordon (picloram)
3. Cimarron (Metsulfuron Methyl)
4. Plateau (Imazapic ammonium salt)
5. Curtail (clopyralid MEA salt, 2,4-Dichlorophenoxyacetic acid)
6. Transline (clopyralid)
7. Redeem (triclopyr TEA, clopyralid TEA)
8. Telar (chlorsulfuron)
9. Milestone (aminopyralid)
10. Forefront (aminopyralid, 24D)

These herbicides will be used along County right of way and other properties. When Sweet Grass County does contract herbicide application on other lands specific herbicides will be used based on the site, plant species and other environmental factors as to insure proper control with the least impact. Sweet Grass County also reserves the right and ability to use new chemistries for research and demonstration purposes.

Other herbicides that may be used for vegetation management and manipulation are as follows:

11. Glyphosate
12. Aquatic glyphosates
13. 24D Ester (2,4 Dimethylester salt phenoxyacetic acid)
14. Arsenal (Imazapyr)
15. Campaign (glyphosate & 24D amine)
16. Vanquish (diglycoamine)

Please refer to Appendix for herbicide labels.

F. Biological - Biological control (Biocontrol) is the intentional use of a living organism to reduce the population of a pest. Noxious weeds are non-indigenous plant species brought to the United States from other parts of the world. Therefore biological control of weeds involves the importation and release of natural enemies that attack the plant in its indigenous environment. Rigorous and heavily regulated testing prior to introduction and release ensures that selected insects are not a threat to crops, native flora or fauna.

1. Sweet Grass County will collect and distribute biocontrol agents. Sweet Grass County will require any private landowner/manager who receives biocontrol agents to sign a biocontrol agreement. Please see appendix for a copy. This agreement allows Sweet Grass County to monitor and collect bio agents to help propagate the program.
2. The target plant for biocontrol in Sweet Grass County is leafy spurge. The priority target areas are: Boulder River Drainage below the Natural Bridge, Upper Deer Creek, Lower Deer Creek, Yellowstone River and the Lower Sweet Grass.

V. Special Management Zones and Requirements

A. Gravel Pits - Sweet Grass County recognizes that these areas have a very high potential to establish and perpetuate noxious weeds. These areas will receive special attention and requirements.

1. Existing Gravel mine sites –
 - a. [Buffer Zone](#) - All gravel/mine sites will have a buffer zone of at least 100 yards or to the property boundary surrounding the mine and/or operation site that is to be free of noxious weeds at all times. All haul roads and stockpiles will also be kept free of noxious weeds at all times. Failure to do so will result in immediate non-compliance.
 - b. Inspections - Inspections will occur at least 2 times per year for the state and county listed noxious weeds. The operator and/or landowner will receive advance notification and a report as to the findings. If noxious weeds are found to be present the owner/operator will be notified immediately and will have 5 working days to treat the infestation. If nothing is done in five working days, Sweet Grass County will treat the infestation and bill the owner/operator.
2. New Mine sites – All of the above requirements apply to new mine sites as well as the below listed requirements.
 - a. All persons applying for a Gravel pit permit through Montana Department of Environmental Quality must also contact Sweet Grass County Noxious Weed Program for a verification of Noxious Weed Control Plan. A representative of Sweet Grass County Noxious Weed Program will inspect the proposed area. A noxious weed control plan must be approved and signed by Sweet Grass County Noxious Weed Program Coordinator.
 - b. No new mining sites will be permitted on lands severely infested with noxious weeds and with no history of active weed management.
3. All contractors bidding state or federal highway projects must contact Sweet Grass County Noxious Weed Program prior to submitting a bid and/ or selecting a site.
4. Time limits – A time limit of one season will be placed on DEQ Verification of Noxious Weed Control Permits. If the site is not permitted within one year from date of signature, the permittee must have the site re-inspected.

B. Utility Companies

1. The construction and maintenance of utility lines in the county right of way causes a significant disturbance and opens up the landscape to the invasion of noxious weeds.
 - a. Utility companies and their subcontractors are all required to have all construction related equipment washed, including undercarriages.
 - b. Sweet Grass County may inspect equipment prior to commencement of construction activities or at designated wash areas.
2. Any person or agency performing work, which may result in disturbance in the county right of way, must sign a letter of agreement and submit a written plan for revegetation in accordance with MCA, 7-22-2152.
3. Easement will not be granted from Sweet Grass County until the above listed condition and terms are met to the satisfaction of the Sweet Grass County Weed Board.

C. Subdivisions - Sweet Grass County Weed District recognizes that development and growth are inevitable. Subdivisions are also a concentrated breeding ground for noxious weed growth and spread. This potential is cause for strict prevention and management requirements. As per the Sweet Grass County Subdivision Regulations a noxious weed plan is required as a part of subdivision approval.

1. Sweet Grass County Noxious Weed Program requires the following for Subdivision approval:

- a. Property inspection + Fee – Sweet Grass County will inspect proposed subdivided property to determine the presence/absence of noxious weeds and there is a fee associated with inspection (subject to change).
- b. Letter of Agreement – Terms by which the landowner must abide.
- c. Management Plan - a plan for the long-term treatment of any found noxious weeds, prevention of the spread of noxious weeds and revegetation of disturbed lands.
- d. Homeowners Association and Covenants – as stated in the Letter of Agreement, if a Homeowners Association or Covenants are required they must include specific language to address the control of noxious weeds on all lands within the subdivision as well as a way to pay for the cost of control. Sweet Grass County Noxious Weed Program must approve any language in the Covenants regarding noxious weeds and their management.
- e. Financial Guarantee – Sweet Grass County may require a bond for the subdivisions noxious weed problem. This will be determined by the number and size of lots, extent of noxious weed problem and other relevant environmental factors.

D. City Of Big Timber – The City of Big Timber holds about 50% of the population of Sweet Grass County. Due to the large concentration of people and activity, the City and its' properties are considered a special management zone. The City has it's own weed code 6-6-1-6-6-5. Please see Appendix for a copy of the City code. Montana Code Annotated 7-22-2151 (2) states *“the board and the governing body of each municipality with in the district shall enter into a written agreement and shall cooperatively plan for the management of noxious weeds within the boundaries of the municipality.”* The City of Big Timber and Sweet Grass County have agreed on a City Weed Management Plan. A copy of the plan can be viewed at the City offices.

E. Montana Department of Transportation

1. Roadways are a significant contributor to the spread of noxious weeds. Because of this high risk factor state and federally owned highways are considered to be a special management zone. In accordance with Montana Code Annotated, 7-22-2151, Cooperative Agreements. Sweet Grass County and the Montana Department of Transportation have a 6-year agreement/plan. Please refer the appendices for a copy of the agreement.

- a. Revegetation – In accordance with MCA, 7-22-2152 *any disturbance that can result in the potential for noxious weed infestation shall;*
 - i. *Revegetation of Disturbed Areas - 7-22-2152. Revegetation of rights-of-way and areas that have potential for noxious weed infestation.*
 - ii. *Any person or state agency proposing a mine, a major facility under Title 75, chapter 20, an electric, communication, gas, or liquid transmission line, a solid waste facility, a highway or road, a subdivision, a commercial, industrial, or government development, or any other development that needs state or local approval and that results in the potential for noxious weed infestation within a district shall notify the board at least 15 days prior to the activity.*
 - iii. *(2) Whenever any person or agency constructs a road, an irrigation or drainage ditch, a pipeline, an electric, communication, gas, or liquid transmission line, or any other development on an easement or right-of-way, the board shall require that the areas be seeded, planted, or otherwise managed to reestablish a cover of beneficial plants.*
 - iv. *(3) (a) The person or agency committing the action shall submit to the board a written plan specifying the methods to be used to accomplish revegetation at least 15 days prior to the activity. The plan must describe the time and method of seeding, fertilization practices, recommended plant species, use of weed-free seed, and the weed management*

procedures to be used. (b) The plan is subject to approval by the board, which may require revisions to bring the revegetation plan into compliance with the district weed management plan. The activity for which notice is given may not occur until the plan is approved by the board and signed by the presiding officer of the board and by the person or a representative of the agency responsible for the action. The signed plan constitutes a binding agreement between the board and the person or agency. The plan must be approved, with revisions if necessary, within 10 days of receipt by the board.

2. Notice of construction –

- a. MDT must notify Sweet Grass County Noxious Weed Program Coordinator of any construction activities prior to the activity occurring through its' pre-construction noticing process.
- b. As described in MDT's manual 107.11.5, MDT is required to make all contractors bidding for jobs follow any applicable terms as set forth in the Sweet Grass County Noxious Weed Management Plan.
- c. Non – compliance – In the event that noxious weed management is not being met as set for the agreement between MDT and Sweet Grass County Noxious Weed Program, then the terms of 7-22-2144 shall apply.

F. County Roads – Sweet Grass County Noxious Weed Program is tasked with controlling the noxious weeds occurring in County right of ways.

1. Application techniques – Sweet Grass County will employ site-specific techniques taking into consideration relevant environmental conditions and concerns.
2. Target vegetation – Sweet Grass County is responsible for state and county listed noxious weeds only.

G. Natural Caused Disturbances – The ecosystems of the West are adapted to a long history of naturally caused disturbances such as flooding and wildfire. These can substantially alter ecosystems. The most environmentally and economically damaging impact from natural disasters is the post event invasion of noxious weeds. Minimizing the weed opportunity requires post event, intensive weed management. Sweet Grass County will work with affected landowners in aggressively addressing post natural disaster noxious weed issues.

1. Fire – Wildfires require immediate action. Therefore, it is important to plan weed management strategies, prepare equipment, and educate firefighters before emergency situations strike.
 - a. Fire Planning – Improve effectiveness of prevention practices noxious weed education and awareness.
 - b. Fire fighting – Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing noxious weeds.
 - i. Portable Wash Unit – Sweet Grass County has access to a self-contained portable wash station. Use of a portable wash unit is required on all fires where fire equipment and personnel are not local.
 - ii. Local fire fighting equipment will be cleaned after each incident so to provide prevention of weed spread.
 - c. Fire Rehabilitation – To prevent conditions favoring weed establishment, as soon as possible after a fire revegetate disturbed ground that is unlikely to recover to desired plants naturally using noxious weed seed free seed mixes.

H. Spotted knapweed - 2006 Sweet Grass County will implement a countywide knapweed control and eradication program. The goals of this program are to stop the spread and eradicate current populations over a period of ten years.

1. Zero Tolerance
 - a. 10 acres or less – aggressive eradication with a 90% reduction in population in two years.

- b. 11 acres or more – must enter into a knapweed eradication plan that must address specifics such as long-term control and prevention measures, annual inspections and treatments at least two times per growing season.
2. Cost Share – Sweet Grass County may make available a locally funded cost share program to help off set the cost of eradication. The terms and limitations of the cost share program may be modified on an annual basis.

VI. Roles and Responsibilities

A. Board of County Commissioners- In accordance with Montana County Noxious Weed Control Act:

1. 7-22-2102. (1) the commissioners shall appoint a district weed board subject to provisions of 7-1-201-7-1-203.

B. County Weed Board- Refer to MCA 7-22-2109 Powers and Duties of board. In accordance with the Montana County Noxious Weed Control Act 7-22-2109 (2) The board shall:

1. Administer the district's noxious weed management program;
2. Establish criteria for noxious weeds on all land within the district' and
3. Make all reasonable efforts to develop and implement a noxious weed management program covering all land within the district owned or administered by a federal agency.

C. County Weed Personnel

1. All Sweet Grass County Noxious Weed Program employees must adhere to the Sweet Grass County personnel policy handbook. A copy of this handbook is given to each new employee. Additional copies can be picked up at the Clerk & Records office.
2. In addition to the Personnel Policy Handbook, Sweet Grass County Noxious Weed Program employees will also adhere to the policies and procedures as they apply in this plan.

D. Landowners – Sweet Grass County contains approximately 816,000 acres of private land or 68%. This equates to most of the noxious weeds occur or have the potential to occur on private land. Therefore the focus of the Program is directed towards the private landowner.

8.2. Oversized Maps

8.3. Firewise Checklist



Firewise Landscaping Checklist

When designing and installing a firewise landscape, consider the following:

- Local area fire history.
- Site location and overall terrain.
- Prevailing winds and seasonal weather.
- Property contours and boundaries.
- Native vegetation.
- Plant characteristics and placement (duffage, water and salt retention ability, aromatic oils, fuel load per area, and size).
- Irrigation requirements.

To create a firewise landscape, remember that the primary goal is fuel reduction. To this end, initiate the zone concept. Zone 1 is closest to the structure; Zones 2-4 move progressively further away.

- Zone 1. This well-irrigated area encircles the structure for at least 30' on all sides, providing space for fire suppression equipment in the event of an emergency. Plantings should be limited to carefully spaced low flammability species.
- Zone 2. Low flammability plant materials should be used here. Plants should be low-growing, and the irrigation system should extend into this section.
- Zone 3. Place low-growing plants and well-spaced trees in this area, remembering to keep the volume of vegetation (fuel) low.
- Zone 4. This furthest zone from the structure is a natural area. Selectively prune and thin all plants and remove highly flammable vegetation.

Also remember to:

- Be sure to leave a minimum of 30' around the house to accommodate fire equipment, if necessary.
- Widely space and carefully situate the trees you plant.
- Take out the "ladder fuels" — vegetation that serves as a link between grass and tree tops. This arrangement can carry fire to a structure or from a structure to vegetation.
- Give yourself added protection with "fuel breaks" like driveways, gravel walkways, and lawns.

When maintaining a landscape:

- Keep trees and shrubs properly pruned. Prune all trees so the lowest limbs are 6' to 10' from the ground.
- Remove leaf clutter and dead and overhanging branches.
- Mow the lawn regularly.
- Dispose of cuttings and debris promptly, according to local regulations.
- Store firewood away from the house.
- Be sure the irrigation system is well maintained.
- Use care when refueling garden equipment and maintain it regularly.
- Store and use flammable liquids properly.
- Dispose of smoking materials carefully.
- Become familiar with local regulations regarding vegetation clearances, disposal of debris, and fire safety requirements for equipment.
- Follow manufacturers' instructions when using fertilizers and pesticides.

Access additional information on the Firewise home page: www.firewise.org

Please see the other side of this sheet for the *Firewise Construction Checklist*.

8.4. Glossary

The glossary contains definitions of terms.

- A -

ACTION PLAN:

(See Incident Action Plan.)

ABORT:

Abort means to jettison a load of water or retardant from an aircraft.

AERIAL FUELS:

All live and dead vegetation located in the forest canopy or above surface fuels, including tree branches, twigs and cones, snags, moss, and high brush.

AERIAL IGNITION:

Aerial Ignition is the process of dropping or dispensing incendiary devices or materials from an aircraft.

AFFIDAVIT SYSTEM:

A system where private lands, which are not included in a Forest Fire Protection District, and which the landowner has agreed to pay a standard fee through the county tax basis system for wildland fire protection by the recognized protection agency.

AIR TANKER:

A fixed-wing aircraft equipped to drop fire retardants or suppressants.

AGENCY:

An agency is a division of government (e.g., federal, state, or county) with a specific function, or a non-governmental organization (e.g., private contractor, business, etc.) that offers a particular kind of assistance. In ICS, agencies are defined as jurisdictional (having statutory responsibility for incident mitigation) or assisting and/or cooperating (providing resources and/or assistance). (See Assisting Agency, Cooperating Agency, and Multi-agency.)

AGENCY EXECUTIVE OR ADMINISTRATOR:

Chief executive officer (or designee) of the agency or jurisdiction that has responsibility for the incident.

AGENCY DISPATCH:

Agency Dispatch is the agency or jurisdictional facility from which resources are allocated to incidents.

AGENCY REPRESENTATIVE:

An individual assigned to an incident from an assisting or cooperating agency that has been delegated authority to make decisions on matters affecting that agency's participation at the incident. Agency Representatives report to the Incident Liaison Officer.

AGL: (Above Ground Level)

AGL (above ground level) is any fixed-wing aircraft, certified by the FAA, as being capable of transport and delivery of fire suppressant solutions.

AIR OPERATIONS BRANCH DIRECTOR:

The Air Operations Branch Director is primarily responsible for preparing and implementing the air operations portion of the Incident Action Plan. Also responsible for providing logistical support to helicopters operating on the incident.

ALLOCATED RESOURCES:

Resources dispatched to an incident.

ANCHOR POINT:

The Anchor Point is an advantageous location, generally a fire barrier, from which to start constructing a fire line. An anchor point is used to minimize the chance of being out flanked by the fire while the line is being constructed.

ARAMID:

Aramid is the generic name for a high-strength, flame-resistant synthetic fabric, used in the shirts and jeans of firefighters. Nomex, a brand name for Aramid fabric, is the term commonly used by firefighters.

AREA COMMAND:

An organization established to: 1) oversee the management of multiple incidents that are each being handled by an Incident Command System organization; or 2) to oversee the management of a very large incident that has multiple Incident Management Teams assigned to it. Area Command has the responsibility to set overall strategy and priorities, allocate critical resources based on priorities, ensure that incidents are properly managed, and ensure that objectives are met and strategies followed

ASPECT:

Aspect is the direction toward which a slope faces.

ASSIGNED RESOURCES:

Resources checked in and assigned work tasks on an incident.

ASSIGNMENTS:

Tasks given to resources to perform within a given operational period, based upon tactical objectives in the Incident Action Plan.

ASSISTANT:

Assistant is the title used for subordinates of the Command Staff positions. The title indicates a level of technical capability, qualifications, and responsibility subordinate to the primary positions. Assistants may also be used to supervise unit activities at camps.

ASSISTING AGENCY:

An Assisting agency is the agency directly contributing tactical or service resources to another agency.

AVAILABLE RESOURCES:

Available Resources are the Incident-based resources which are ready for deployment.

- B -

BACKFIRE:

A tactic associated with indirect attack. Intentionally setting a fire along the inner edge of a fire line, to consume the fuel in the path of a wildfire and/or change the direction of force of the fire's convection column. Most often used to contain a rapidly spreading fire. Backfiring provides a

wide defense perimeter, and may be further employed to change the force of the convection column. Backfiring is a tactic which makes possible a strategy of locating control lines at places where the fire can be fought on the firefighter's terms. Except for rare circumstances meeting specified criteria, backfiring is executed on a command decision made through line channels of authority. See "Burning Out" for difference.

BACKING FIRE:

Fire spreading or ignited to spread into the wind and/or down slope.

BACKPACK PUMP:

A portable sprayer with hand-pump, fed from a liquid-filled container fitted with straps, used mainly in fire and pest control. (See also "Bladder Bag")

BAMBI BUCKET:

A collapsible bucket slung below a helicopter used to dip water from a variety of sources or fire suppression.

BASE:

The Base is the location at which primary logistics functions for an incident are coordinated and administered. There is only one Base per incident. (Incident name or other designator will be added to the term Base.) The Incident Command Post may be collocated with the Base.

BRANCH:

Branch is the organizational level having functional or geographic responsibility for major parts of incident operations. The Branch level is organizationally between Section and Division/Group in the Operations Section, and between Section and Units in the Logistics Section. Branches are identified by the use of Roman Numerals or by functional name (e.g., medical, security, etc.).

BEHAVE:

A system of interactive computer programs for modeling fuel and fire behavior that consists of two systems: BURN and FUEL.

BERM:

In fire suppression, a blackline denotes a condition where there is no unburned material between the line and the fire edge.

BLACKLINE:

In fire suppression, a blackline denotes a condition where there is no unburned material between the line and the fire edge.

BLADDER BAG:

A collapsible backpack portable sprayer made of neoprene or high-strength nylon fabric fitted with a pump. (See also "Backpack Pump")

BLOW-UP:

A sudden increase in fire intensity or rate of spread strong enough to prevent direct control or to upset control plans. Blow-ups are often accompanied by violent convection and may have other characteristics of a fire storm. (See "Flare-Up")

BREAK/LEFT OR RIGHT:

Means "turn" left or right. Applies to an aircraft in flight that is usually on the drop run and when given as a command to the pilot it implies a prompt compliance. This should be used only in an emergency.

BRUSH:

A collective term that refers to stands of vegetation dominated by shrubby, woody plants, or low growing trees, usually of a type undesirable for livestock or timber management.

BRUSH FIRE:

A fire burning in vegetation that is predominantly shrubs, brush and scrub growth.

BUCKET:

Any device suspended by cables from a helicopter designed to contain and drop retardant or water onto a fire.

BUCKET DROP:

A Bucket Drop is the dropping of fire retardants or suppressants from specially designed buckets slung below a helicopter.

BUFFER ZONE:

A Buffer zone is an area of reduced vegetation that separates wildlands from vulnerable residential or business developments. This barrier is similar to a greenbelt in that it is usually used for another purpose such as agriculture, recreation areas, parks, or golf courses.

BUMP-UP METHOD:

The Bump-up Method is a progressive method of building a fire line on a wildfire without changing relative positions in the line. Work is begun with a suitable space between workers. Whenever one worker overtakes another, all workers ahead move one space forward and resume work on the uncompleted part of the line. The last worker does not move ahead until completing his or her space.

BURNING OUT:

When attack is direct, intentionally setting a fire inside a control line to widen it or consume fuel between the edge of the fire and the control line to strengthen the line. "Burning Out" is almost always done as part of line construction; the control line is considered incomplete unless there is no fuel between the fire and the line. (See "Backfiring" for difference)

BURNING BAN:

A declared ban on open air burning within a specified area, usually due to sustained high fire danger.

BURNING CONDITIONS:

Burning Conditions is the state of the combined factors of the environment that affect fire behavior in a specified fuel type.

BURNING INDEX:

An estimate of the potential difficulty of fire containment as it relates to the flame length at the most rapidly spreading portion of a fire's perimeter.

BURNING PERIOD:

That part of each 24-hour period when fires will spread most rapidly, typically from 10:00 a.m. to sundown.

- C -

CACHE:

A Cache is a pre-determined complement of tools, equipment, and/or supplies stored in a designated location, available for incident use.

CALCULATION OF PROBABILITIES:

The Calculation of Probabilities is the evaluation of all existing factors, pertinent to the probability of future behavior, of an on-going fire and of the potential ability of available forces to carry out control operations on a given time schedule.

CAMP:

A geographical site, within the general incident area, separate from the Incident Base, equipped and staffed to provide sleeping, food, water, and sanitary services to incident personnel.

CAMPFIRE:

As used to classify the cause of a wildland fire, a fire that was started for cooking or warming that spreads sufficiently from its source to require action by a fire control agency.

CANDLE OR CANDLING:

A single tree or a very small clump of trees; which is burning from the bottom up.

CANOPY:

The Canopy is the uppermost spreading, branch layer of vegetation.

CARDINAL DIRECTIONS:

When describing a fire, always use the North, South, East or West when giving directions and information from the ground or air. (e.g., the west flank or east flank, never using right or left flank)

CENTER FIRING:

A method of broadcast burning in which fires are set in the center of the area to create a strong draft; additional fires are then set progressively nearer the outer control lines as in-draft builds up so as to draw them in toward the center.

CHAIN:

A unit of linear measurement equal to 66 feet.

CHAIN OF COMMAND:

A series of management positions in order of authority.

CHIMNEY(S):

Canyons can act as a chimney by funneling heated air up the canyon and creating strong up slop drafts. This accelerates the rate at which a fire moves up the canyon.

CHECK LINE:

A temporary fire line constructed at right angles to the control line and used to interrupt the spread of backfire as a means of regulating the heat or intensity of the backfire.

CHECK-IN:

The process whereby resources first report to an Incident Base, Camps, Staging Areas, Helibases, Helispots, and Division Supervisors (for direct line assignments).

CHIEF:

The ICS title for individuals responsible for command of functional sections: Operations, Planning, Logistics, and Finance/Administration.

CLEAR TEXT:

Clear Text is the use of plain English in radio communications transmissions. No Ten Codes or agency-specific codes are used when utilizing Clear text.

CLOCK METHOD:

The Clock Method is a means of establishing a flight path, to a target on a fire, by reference to clock directions.

CLOSURE:

A Closure is a legal restriction, but not necessarily elimination of specified activities such as smoking, camping, or entry that might cause fires in a given area.

COLD FRONT:

The leading edge of relatively cold air masses that displace warmer air. The heavier cold air may cause some of the warm air to be lifted. If the lifted air contains enough moisture, the result may be cloudiness, precipitation, and thunderstorms. If both air masses are dry, no clouds may form. Following the passage of a cold front in the Northern Hemisphere, westerly or northwesterly of 15 to 30 or more miles per hour often continue for 12 to 24 hours.

COLD TRAILING:

A method of controlling a partly dead fire edge by carefully inspecting and feeling with the hand for heat to detect any fire and extinguishing it by digging out every live spot, and trenching any live edge.

COMMAND:

Command is the act of directing and/or controlling resources by virtue of explicit legal, agency, or delegated authority and may also refer to the Incident Commander.

COMMAND POST:

See "Incident Command Post".

COMMAND STAFF:

The Command Staff consists of the Information Officer, Safety Officer, and Liaison Officer. They report directly to the Incident Commander. They may have an assistant or assistants, as needed.

COMMUNICATIONS UNIT:

An organizational unit in the Logistics Section responsible for providing communication services at an incident. A Communications Unit may also be a facility (e.g., a trailer or mobile van) used to provide the major part of an Incident Communications Center.

COMPACTS:

Compacts are formal working agreements among agencies to obtain mutual aid.

COMPENSATION UNIT/CLAIMS UNIT:

Compensation Unit/Claims Unit is a functional unit within the Finance/Administration Section responsible for financial concerns resulting from property damage, injuries, or fatalities at the incident.

COMPLEX:

Two or more individual incidents located in the same general area, which are assigned to a single Incident Commander or to a Unified Command.

CONDITION OF VEGETATION:

A stage of growth or degree of flammability of vegetation that forms part of a fuel complex. Herbaceous stage is at times used when referring to herbaceous vegetation alone. In grass areas, minimum qualitative distinctions for stages of annual growth are usually green, curing, and dry or cured.

CONFINE A FIRE:

To restrict a fire within determined boundaries established either prior to or during the fire.

CONSTRAINTS:

Constraints are parameters or limitations on the use of specific suppression resources.

CONTAIN A FIRE:

To take suppression action as needed, which can reasonably be expected to check the fire's spread under prevailing conditions.

CONTAINMENT:

The completion of a fuel break around a fire and any associated spot fires. This break may include natural barriers or a manually and/or mechanically constructed line expected to stop fire spread.

CONTROL A FIRE:

To complete a control line around a fire and any spot fires there from, and any interior islands to be saved; burn out any unburned area adjacent to the fire side of the control lines; and cool down all hot spots that are immediate threats to the control line until the lines can reasonably be expected to hold under foreseeable conditions. The control line has been strengthened so that flare-ups from within the perimeter of the fire will not break through this line.

CONTROL FORCES:

Resources used to control a fire.

CONTROL LINE:

All built or natural fire barriers and treated fire edge used to control a fire.

COOPERATING AGENCY:

An agency supplying assistance other than direct tactical, direct suppression, rescue, support or service functions or resources to the incident control effort (e.g., Red Cross, Law Enforcement Agency, Telephone Company, etc.).

COORDINATION:

The process of systematically analyzing a situation, developing relevant information, and informing appropriate command authority of viable alternatives for selection of the most effective combination of available resources to meet specific objectives. The coordination process (which can be either intra- or inter-agency) does not involve dispatch actions. However, personnel responsible for coordination may perform command or dispatch functions within the limits established by specific agency delegations, procedures, legal authority, etc.

COORDINATION CENTER:

Term used to describe any facility that is used for the coordination of agency or jurisdictional resources in support of one or more incidents.

COST SHARING AGREEMENTS:

Agreements between agencies or jurisdictions to share designated costs related to incidents. Cost sharing agreements are normally written but may also be oral between authorized agency and jurisdictional representatives at the incident.

COST UNIT:

Functional unit within the Finance/ Administration Section responsible for tracking costs, analyzing cost data, making cost estimates, and recommending cost-saving measures.

COYOTE TACTIC:

A progressive line construction technique involving self-sufficient crews who build fire line until the end of a shift, remain overnight (RON) at or near the point while off duty, and begin building fire line again on the next shift. Crews should be properly equipped and be prepared to spend several shifts on the line with minimal support from fire camp.

CREEPING FIRE:

Creeping fire is a fire burning with a low flame and spreading slowly.

CREW:

See "Single Resource"

CREW BOSS:

Crew Boss is the person in supervisory charge of usually 16 to 21 firefighters and responsible for their performance, safety, and welfare.

CRITICAL FIRE WEATHER:

Critical fire weather is a set of weather conditions whose effects on fire behavior make control difficult and threaten fire fighter safety.

CROWN:

A tree crown is the primary and secondary branches growing out from the main stem, together with twigs and foliage.

CROWN FIRES: (Crowning)

Crown Fires or Crowning is the uncontrolled movement of a wildfire spreading through tree crowns or shrubs. This fire moves more or less independently from the surface fire. This is different from single trees burning.

CURING:

Drying and browning of herbaceous vegetation or slash.

- D -

DEAD FUELS:

Dead Fuels are fuels with no living tissue in which moisture content is governed almost entirely by atmospheric moisture (relative humidity and precipitation), dry-bulb temperature, and solar radiation.

DEBRIS BURNING:

A fire spreading from any fire originally set for the purpose of clearing land or for rubbish, garbage, range, stubble, or meadow burning.

DECADENT:

In regards to vegetation, it refers to plants of declining vigor; and deteriorating health.

DEFENSIBLE SPACE:

An area either natural or manmade where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildland fire and the loss to life, property, or resources, in practice, "defensible space" is defined as an area a minimum of 30 feet around a structure that is cleared of flammable brush or vegetation.

DEPLOYMENT:

See "Fire Shelter Deployment".

DEPLOYMENT ZONE:

Deployment zones are very similar to safety zones. The key difference is that fire shelters must be deployed to ensure firefighter survival in a deployment zone due to the available space and/or fire behavior conditions at the deployment zone locations. (See “Safety Zone”)

DETECTION:

The act or system of discovering a locating fires.

DIRECT ATTACK:

Any treatment of burning fuel, e.g., by wetting, smothering, or chemically quenching the fire by physically separating the burning from unburned fuel. This is a suppression strategy, in which resources are directed to work close to the fire edge.

DELEGATION OF AUTHORITY:

A statement provided to the Incident Commander by the Agency Executive delegating authority and assigning responsibility. The Delegation of Authority can include objectives, priorities, expectations, constraints, and other considerations or guidelines as needed. Many agencies require written Delegation of Authority to be given to Incident Commanders prior to their assuming command on larger incidents.

DEPUTY:

A fully qualified individual who, in the absence of a superior, could be delegated the authority to manage a functional operation or perform a specific task. In some cases, a Deputy could act as relief for a superior and therefore must be fully qualified in the position. Deputies can be assigned to the Incident Commander, General Staff, and Branch Directors.

DEMOBILIZATION UNIT:

The Demobilization Unit is a functional unit within the Planning Section responsible for assuring orderly, safe and efficient demobilization of incident resources.

DIRECTOR:

The ICS title for individuals responsible for supervision of a Branch.

DISPATCH:

This is the implementation of a command decision to move a resource or resources from one place to another.

DISPATCH CENTER:

The Dispatch Center is a facility from which resources are assigned to an incident.

DISPATCHER:

A person employed who receives reports of discovery and status of fires, confirms their locations, takes action promptly to provide people and equipment likely to be needed for control in first attack, and sends them to the proper place.

DIVISION:

Divisions are used to divide an incident into geographical areas of operation. A Division is located within the ICS organization between the Branch and the Task Force/Strike Team. (See Group.) Divisions are identified by alphabetic characters for horizontal applications and, often, by floor numbers when used in buildings.

DIVISION SUPERVISOR:

The Division Supervisor is responsible for all suppression activities on a specific division of fire.

DOCUMENTATION UNIT:

The Documentation Unit is a functional unit within the Planning Section responsible for collecting, recording, and safeguarding all documents relevant to the incident.

DOWN LOADING:

Down Loading is a reduction to aircraft payload made to compensate for loss of performance due to increase in density altitude.

DOZER:

Any tracked vehicle with a front-mounted blade used for exposing mineral soil.

DOZER BOSS:

A Dozer Boss is a person responsible for supervising one or more dozers.

DOZER COMPANY:

A Dozer Company is any dozer with a minimum complement of two persons.

DOZER LINE:

A Dozer Line is a fire line constructed by a dozer.

DRIP TORCH:

A hand-held device for igniting fires by dripping flaming liquid fuel on the materials to be burned; consists of a fuel fount, burner arm, and igniter. The fuel used is generally a mixture of diesel and gasoline.

DROP CONFIGURATION:

The type of air drop selected to cover the target. Terms which specify drop configuration include: SALVO – Drop the entire load at one time.

DROP ZONE:

The Target area for air tankers, helitankers and cargo dropping that applies to retardant and paracargo.

DROUGHT INDEX:

The Drought Index is a number representing net effect of evaporation, transpiration, and precipitation in producing cumulative moisture depletion in deep duff or upper soil layers.

DRY LIGHTNING STORM:

A Dry Lightning Storm is a thunderstorm in which negligible precipitation reaches the ground. It is also referred to as a “dry storm”.

DRY RUN:

A Dry Run is a trail pass over the target area by an air tanker.

DUFF:

The Duff is the layer of decomposing organic materials lying below the litter layer of freshly fallen twigs, needles, and leaves and immediately above the mineral soil.

DUMMY RUN:

A simulated bombing run made on a target by the lead plane or air tanker. Used to indicate approach and target to air tanker and to check for flight hazards.

- E -

ECOLOGICAL LAND UNITS:

Ecological Land Units are defined by elevation and fire groups, and described environmentally similar conditions, utilized by the US Forest Service in landscape planning.

EMERGENCY MANAGEMENT COORDINATOR/DIRECTOR:

The Emergency Management Coordinator/Director is the individual within each political subdivision that has coordination responsibility for jurisdictional emergency management.

EMERGENCY MEDICAL TECHNICIAN (EMT):

An Emergency Medical Technician (EMT) is a health-care specialist with particular skills and knowledge in pre-hospital emergency medicine.

EMERGENCY OPERATIONS CENTER (EOC):

A pre-designated facility established by an agency or jurisdiction to coordinate the overall agency or jurisdictional response and support to an emergency.

EMERGENCY OPERATIONS PLAN:

The plan that each jurisdiction has and maintains for responding to appropriate hazards.

ENERGY RELEASE COMPONENT (ERC):

The computed total heat released per unit area (British thermal units per square foot) within the fire front at the head of a moving fire.

ENGINE:

An Engine is any ground vehicle providing specified levels of pumping, water and hose capacity.

ENGINE COMPANY:

An Engine Company is any ground vehicle providing specified levels of pumping, water, hose capacity, and personnel.

ENGINE CREW:

An Engine Crew is fire fighters assigned to an engine. The Fireline handbook defines the minimum crew makeup by engine type.

ENTRAPMENT:

An Entrapment is a situation where personnel are unexpectedly caught in a fire behavior-related, life-threatening position where planned escape routes or safety zones are absent, inadequate, or compromised. An entrapment may or may not include deployment of a fire shelter for its intended purpose. These situations may or may not result in injury. They include “near misses”.

ENVIRONMENTAL ASSESSMENT (EA):

EAs were authorized by the national Environmental Policy Act (NEPA) of 1969. They are concise, analytical documents prepared with public participation that determine if an Environmental Impact Statement (EIS) is needed for a particular project or action. If an EA determines an EIS is not needed, the EA becomes the document allowing agency compliance with NEPA requirements.

ENVIRONMENTAL IMPACT STATEMENT (EIS):

EISs were authorized by the national Environmental Policy Act (NEPA) of 1969. Prepared with public participation, they assist decision makers by providing information, analysis and an array of action alternatives, allowing managers to see the probable effects of decisions on the environment. Generally, EISs are written for large-scale actions or geographical areas.

EQUILIBRIUM MOISTURE CONTENT:

Moisture content that a fuel particle will attain if exposed for an infinite period in an environment of specified constant temperature and humidity. When a fuel particle reaches equilibrium moisture content, next exchange of moisture between it and the environment is zero.

ESCAPE ROUTE:

An Escape Route is a pre-planned and understood route firefighters take to move to a safety zone or other low-risk area, such as an already burned area, previously constructed safety area, a meadow that won't burn, natural rocky area that is large enough to take refuge without being burned. When escape routes deviate from a defined physical path, they should be clearly marked (flagged).

ESCAPED FIRE:

Escaped Fire is fire which has exceeded or is expected to exceed initial attack capabilities or prescription.

ESCAPED FIRE SITUATION ANALYSIS:

See "Wildland Fire Situation Analysis".

ETA:

The Estimated Time of Arrival.

ETD:

The Estimated Time of Departure.

EXIT:

A command used to indicate the direction for a pilot to fly after a given maneuver, i.e., "Exit southbound over the lake".

EXTEND:

Extend means to drop retardant in such a way that the load slightly overlaps and lengthens a previous drop. "Extend your last drop".

EXTENDED ATTACK INCIDENT:

A wildland fire that has not been contained or controlled by initial attack forces and for which more firefighting resources are arriving, en route, or being ordered by the initial attack incident commander.

EXTREME FIRE BEHAVIOR:

"Extreme" implies a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One or more of the follow is usually involved: high rate of spread, prolific crowning and/or spotting presence of fire whirls, strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.

EVENT:

An Event is a planned, non-emergency activity. ICS can be used as the management system for a wide range of events, e.g., parades, concerts, or sporting events.

- F -

FACILITIES UNIT:

Functional unit within the Support Branch of the Logistics Section that provides fixed facilities for the incident. These facilities may include the Incident Base, feeding areas, sleeping areas, sanitary facilities, etc.

FALLER:

Faller is a person who fells trees. They can also be called a sawyer or cutter.

FAA:

FAA is the Federal Aviation Administration.

FIELD OPERATIONS GUIDE:

A Field Operations Guide is a pocket-size manual of instructions on the application of the Incident Command System.

FAR:

The Federal Aviation Regulations (FAR) refers to the regulations governing all aviation activities of civil aircraft within the United States and its territories.

FIELD OBSERVER:

The field Observer is responsible to the situation Unit leader for collecting and reporting information about an incident obtained from personal observations and interviews.

FINAL:

Final is when an air tanker is said to be “on final” when it is on line with the target and intends to make the drop on that pass. This also applies to cargo dropping.

FINE (LIGHT) FUELS:

Fine Fuels are fast-drying dead fuels, generally characterized by a comparatively high surface area-to-volume ratio, which are less than ¼ inch in diameter and have a time lag of one hour or less. These fuels (grass, leaves, needles, etc.) ignite readily and are consumed rapidly by fire when dry.

FINANCE/ ADMINISTRATION SECTION:

The Finance/Administration Section is responsible for all incident costs and financial considerations. It includes the Time Unit, Procurement Unit, Compensation/Claims Unit, and Cost Unit.

FINGERS OF A FIRE:

The Fingers of a Fire is the long narrow extensions of a fire projecting from the main body.

FIRE BEHAVIOR:

Fire Behavior is the manner in which a fire reacts to the influences of fuel, weather and topography

FIRE BEHAVIOR FORECAST:

Fire Behavior Forecast is the prediction of probable fire behavior, usually prepared by a Fire Behavior Officer, in support of fire suppression of prescribed burning operations.

FIRE BEHAVIOR SPECIALIST:

The Fire Behavior Specialist is responsible to the Planning Section Chief for establishing a weather data collection system and for developing fire behavior predictions based on fire history, fuel, weather and topography.

FIRE BREAK:

A Fire Break is a natural or constructed barrier in a fuel bed used to segregate, stop and control the spread of fire or to provide a control line from which to suppress a fire.

FIRE CACHE:

A Fire Cache is a supply of fire tools and equipment assembled in planned quantities or standard units at a strategic point for exclusive use in fire suppression.

FIRECREW:

A Fire Crew is an organized group of firefighters under the leadership of a crew leader or other designated official.

FIRE FOAM:

Fire Foam is an extinguishing agent, chemically and/or mechanically produced, that blankets and adheres to the fuel, reducing combustion. It relies on moisture it contains for its effectiveness, so is a short-term suppressant.

FIRE FRONT:

A Fire Front is the part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified, the fire front is assumed to be the leading edge of the fire perimeter. In ground fires, the fire front may be mainly smoldering combustion.

FIRE GROUP:

A Fire Group is a vegetation classification system combining fire frequency information, fire ecology and habitat types. There are twelve fire groups.

FIRE INTENSITY:

Fire Intensity is a general term used to measure the fire in BTU's or flame length to determine control difficulty and the heat energy released by a fire.

FIRE LINE:

A Fire Line is a loose term for any cleared strip used to control a fire. It is a linear fire barrier or control line from which flammable materials have been removed by scraping or digging down into the mineral soil.

FIRE LINE EXPLOSIVES:

Fire Line Explosives (FLE) is specially developed coils containing explosive powder that are detonated to create a fire line through ground fuels.

FIRE LOAD:

A Fire Load is the number and size of fires historically experienced on a specified unit over a specified period (usually one day) at a specified index of fire danger.

FIRE MANAGEMENT PLAN (FMP):

A Fire Management Plan is a strategic plan that defines a program to manage wildland and prescribed fires and documents the Fire Management Program in the approved land use plan. The plan is supplemented by operational plans such as preparedness plans, preplanned dispatch plans, prescribed fire plans, and prevention plans.

FIRE PERIMETER:

The fire Perimeter is the entire outer edge or boundary of a fire.

FIRE RESISTANT CONSTRUCTION:

Fire Resistant Construction is a construction designed to resist the spread of fire. For descriptions, see the "Uniform Building Code".

FIRE RESISTANT LANDSCAPING:

Fire Resistant Landscaping is a vegetative management that removes flammable fuels from around a structure to reduce the structure's exposure to radiant heat. The flammable fuels may

be replaced with green lawn; gardens; decorative stone; certain, individually spaced, green, ornamental shrubs; individually spaced and pruned trees.

FIRE RETARDANT:

Fire Retardant is any substance except plain water that by chemical or physical action reduces the flammability of fuels or slows their rate of combustion, e.g., a liquid or slurry applied aerially or from the ground during a fire suppression operation.

FIRE SEASON:

1. Period(s) of the year during which wildland fires are likely to occur, spread, and affect resource values sufficient to warrant organized fire management activities.
2. A legally enacted time during which burning activities are regulated by State or Local authority.

FIRE SHELTER:

A Fire Shelter is an aluminized tent offering personal protection to firefighters by means of reflecting radiant heat and providing a volume of breathable air in a fire entrapment situation. Fire shelters should only be used in life-threatening situations, as a last resort.

FIRE SHELTER DEPLOYMENT:

Fire Shelter Deployment is the removing of a fire shelter from its case and using it as protection against fire.

FIRE SPREAD:

Fire spread is a measurement of the rate of movement of the flaming front of a wildfire in feet per minute or chains per hour. The rate of spread is used in order to contain and extinguish all the fire.

FIRE STORM:

A Fire Storm is a violent convection caused by a large continuous area of intense fire. These storms are often characterized by destructively violent surface in drafts, near and beyond the perimeter, and sometimes by tornado-like whirls.

FIRE SUPPRESSION:

Fire Suppression is to stop or slow fire spread in order to contain and extinguish all fire.

FIRE TRIANGLE:

A Fire Triangle is an instructional aid in which the sides of a triangle are used to represent the three factors (oxygen, heat, and fuel) necessary for combustion and flame production; removal of any of the three factors causes flame production to cease.

FIRE USE MODULE (PRESCRIBED FIRE MODULE):

The Fire Use Module is a team of skilled mobile personnel dedicated primarily to prescribed fire management. These are national and interagency resources, available throughout the prescribed fire season, that can ignite, hold and monitor prescribed fires.

FIRE WEATHER:

Fire Weather is weather conditions that influence fire ignition, behavior and suppression.

FIRE WEATHER WATCH:

Fire Weather Watch is a term used by fire weather forecasters to notify using agencies, usually 24 to 72 hours ahead of the event that current and developing meteorological conditions may involve into dangerous fire weather.

FIRE WHIRL:

A Fire Whirl is a spinning, vortex column of ascending hot air and gasses rising from a fire and carrying aloft smoke, debris, and flame. Fire whirls range in size from less than one to two feet in diameter to more than 500 feet in diameter. Large fire whirls can have the intensity of a small tornado. They may involve the entire fire area or only a hot spot within the area.

FIREFIGHTING RESOURCES:

Firefighting Resources are all the people and major items of equipment that can or potentially could be assigned to fires.

FIXED TANK:

A device mounted inside or directly underneath an aircraft which can contain water or retardant for dropping onto a fire.

FLAME HEIGHT:

Flame Height is the average maximum vertical extension of flames at the leading edge of the fire front. Occasional flashes that rise above the general level of flames are not considered. This distance is less than the flame length if flames are tilted due to wind or

FLAME LENGTH:

Flame Length is the distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface); an indicator of fire intensity.

FLAMING FRONT:

Flaming Front is the zone of a moving fire where the combustion is primarily flaming. Behind this flaming zone combustion is primarily glowing. Light fuels typically have a shallow flaming front, whereas heavy fuels have a deeper front and is also called fire front.

FLANK FIRE:

A firing technique consisting of treating an area with lines of fire set into the wind which burn outward at right angles to the wind.

FLANKING FIRE SUPPRESSION:

Working along the flanks, whether simultaneously or successively, from a less active or anchor point toward the head of a fire in order to contain the latter.

FLANKS OF A FIRE:

The parts of a fire's perimeter that are roughly parallel to the main direction of the spread.

FLARE-UP:

A Flare-up is any sudden acceleration of fire spread or intensification of a fire. Unlike a blow-up, a flare-up lasts a relatively short time and does not radically change control plans.

FLASH FUELS:

Flash Fuels are fuels such as grass, leaves, draped pine needles, fern, tree moss and some kinds of slash that ignite readily and are consumed rapidly when dry. Flash fuels can also be called fine fuels.

FLASHOVER:

In structural fire terminology, flashover occurs when radiation and convection from burning objects within and enclosure heat the walls and other objects in the enclosure to their ignition temperature and all flammable interior surfaces begin to flame. Flashover in a room is marked by a large increase in flame volume and a sudden, marked rise in gas temperature.

FLIR (Forward Looking Infrared):

FLIR is a hand-held or aircraft-mounted device designed to detect heat differentials and display their images on a video screen. FLIRS have thermal resolution similar to IR line scanners, but their spatial resolution is substantially less. They are commonly used to detect hot spots and flare-ups obscured by smoke to evaluate the effectiveness of firing operations, to detect areas needing mop-up work, and for other purposes.

FOAM:

See Fire Foam.

FOAMING AGENT:

Foaming Agent is an additive that reduces the surface tension of water (producing wet water) causing it to spread and penetrate more effectively and which produces foam through mechanical means.

FOOD UNIT:

The Food unit is a functional unit within the Service Branch of the Logistics Section responsible for providing meals for incident personnel.

FORB:

A Forb is a plant with soft, rather than permanent woody stem, that is not a grass or grass-like plant.

FOREST FIRE PROTECTION DISTRICT:

Forest fire Protection District is a district established by a vote of 51% of the landowners who own 50% of the private lands in the proposed district. Private landowners pay an established fee through the county tax base for which, in return, they receive wildland fire suppression (Montana Code: MCA 76-13-204).

FOREST FUELS:

Forest Fuels are vegetative material, living and dead, found in the wildland environment that contributes to the overall fire hazard.

FUEL:

Fuel is a combustible material which includes vegetation, such as grass, leaves, ground litter, plants, shrubs, and trees that feed a fire (see "Surface Fuels).

FUEL BED:

A Fuel Bed is an array of fuels usually constructed with specific loading, depth and particle size to meet experimental requirements; also commonly used to describe the fuel composition in natural settings.

FUEL BREAK:

Fuel Break is an area, strategically located for fighting anticipated fires, where the native vegetation has been modified or replaced so that fires burning into it can be more easily controlled.

FUEL LOADING:

Fuel loading is the amount of fuel present and expressed quantitatively in terms of weight of fuel per unit area.

FUEL MODIFICATION:

Fuel Modification is a method, or methods, of modifying a fuel load by reducing the amount of non-fire-resistive vegetation or altering the type of vegetation to reduce the fuel load.

FUEL MODEL:

Fuel Model is a simulated fuel complex (or combination of vegetation types) for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified.

FUEL MOISTURE (Fuel Moisture Content):

The Fuel Moisture Content is the quantity of moisture in fuel expressed as a percentage of the weight when thoroughly dried at 212 degrees Fahrenheit.

FUEL REDUCTION:

Fuel Reduction is the manipulation, including combustion, or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control.

FUEL TYPE:

Fuel Type is an identifiable association of fuel elements of a distinctive plant species, form, size, arrangement, or other characteristics that will cause a predictable rate of fire spread or difficulty of control under specified weather conditions.

FUNCTION:

In ICS, function refers to the five major activities in the ICS, i.e., Command, Operations, Planning, Logistics, and Finance/ Administration. The term function is also used when describing the activity involved, e.g., the planning function.

FUSEE:

Fusee is a colored flare designed as a railway warning device and widely used to ignite suppression and prescription fires.

- G -

GENERAL STAFF:

The General Staff is the group of incident management personnel reporting to the Incident Commander. They may each have a deputy, as needed. The General Staff consists of:

- Operations Section Chief
- Planning Section Chief
- Logistics Section Chief
- Finance/ Administration Section Chief

GENERIC ICS:

Generic ICS refers to the description of ICS that is generally applicable to any kind of incident or event.

GEOGRAPHIC AREA:

The Geographic Area is a political boundary designated by the wildland fire protection agencies, where these agencies work together in coordination and effective utilization.

GRAZING:

Grazing is the eating of vegetation by animals.

GREEN BELT:

The Green Belt is an area adjacent to a suburban home cleared of all dead and dying vegetative material and replaced with living, green vegetation which is essentially non-flammable.

GROUND FIRE:

Ground fire is fire that consumes the organic material in the soil layer, e.g., a "peat fire".

GROUND FUEL:

Ground Fuel is all combustible materials below the surface litter, including duff, tree or shrub roots, punchy wood, peat, and sawdust that normally support a glowing combustion without flame.

GROUND SUPPORT UNIT:

The Ground Support Unit is a functional unit within the Support Branch of the Logistics Section responsible for the fueling, maintaining, and repairing of vehicles, and the transportation of personnel and supplies.

GROUP:

Groups are established to divide the incident into functional areas of operation. Groups are composed of resources assembled to perform a special function not necessarily within a single geographic division. (See division.) Groups are located between Branches (when activated) and Resources in the Operations Section.

- H -

HAINES INDEX:

This is an atmospheric index used to indicate the potential for wildfire growth by measuring the stability and dryness of the air over a fire.

HAND LINE:

Hand Line is a fire line built with hand tools.

HAZARD REDUCTION:

A Hazard Reduction is any treatment of a hazard that reduces the threat of ignition and fire intensity or rate of spread.

HEAD FIRE:

A Head Fire is a fire spreading or set to spread with the wind and/or upslope.

HEADING:

The Heading is the compass direction in which the longitudinal axis of the aircraft points.

HEAD OF A FIRE:

Head of a Fire is the side of the fire having the fastest rate of spread.

HEAT PER UNIT AREA:

The Heat per Unit Area is the heat released from a square foot of fuel while the flaming front is in the area.

HEAVY FUELS:

Fuels of large diameter such as snags, logs, large limb wood that ignites and is consumed more slowly than flash fuels.

HELD LINE:

A Held Line is when all of the worked control lines still contain the fire when mop-up is completed.

HELIBASE:

The Helibase is the main location within the general incident area for parking, fueling, maintenance, and loading of helicopters. It is usually located at or near the incident base.

HELIBUCKET:

The Helibucket is specially designed bucket carried by a helicopter like a sling load and used to drop suppressants or retardants.

HELISPOT:

Any designated location where a helicopter can safely take off and land. Some helispots may be used for loading of supplies, equipment, or personnel.

HELITACK:

Helitack is the use of helicopters to transport crews, equipment, and fire retardants or suppressants to the fire line to achieve control of the fire during the initial stages of a fire.

HELITACK CREW:

This is a group of firefighters trained in the technical and logistical use of helicopters for fire suppression.

HELITANKER:

Helitanker is a helicopter equipped with either a helitank or a helibucket.

HELITORCH:

Helitorch is an ignition device suspended under a helicopter, capable of dispensing ignited fuel to the ground to assist in burning out or backfiring.

HIERARCHY OF COMMAND:

See "Chain of Command"

HOLDING ACTIONS:

Holding Actions are planned actions required to achieve wildland prescribed fire management objectives. These actions have specific implementation timeframes for fire use actions but can have less sensitive implementation demands for suppression actions.

HOLDING RESOURCES:

Holding Resources are firefighting personnel and equipment assigned to do all required fire suppression work following fire line construction but generally not including extensive mop-up.

HORIZONTAL CONTINUITY:

Horizontal Continuity is the degree to which fuels form a continuous layer on a horizontal plane.

HOSE LAY:

Hose Lay is an arrangement of connected lengths of fire hose and accessories on the ground, beginning at the first pumping unit and ending at the point of water delivery.

HOTSHOT CREW:

The Hotshot Crew is a highly trained fire crew used mainly to build fire line by hand.

HOT SPOT:

A Hot Spot is a particularly active part of a fire.

HOT SPOTTING:

Hot Spotting is the reducing or stopping the spread of fire at points of particularly rapid rate of spread or special threat. Generally this is the first step in prompt control with emphasis on first priorities.

- I -

INCIDENT:

An occurrence either human caused or by natural phenomena, that requires action by emergency service personnel to prevent or minimize loss of life or damage to property and/or natural resources.

INCIDENT ACTION PLAN (IAP):

This plan contains objectives reflecting the overall incident strategy and specific tactical actions and supporting information for the next operational period. The Plan may be oral or written. When written, the Plan may have a number of forms as attachments (e.g., incident objectives, organization assignment list, division assignment, traffic plan, safety plan, incident radio communications plan, medical plan, incident map, etc.).

INCIDENT BASE:

The Incident Base is the location where the primary logistics functions are coordinated and administered. (Incident name or other designator will be added to the term Base.) The Incident Command Post may be collocated with the Base. There is only one Base per incident.

INCIDENT COMMANDER:

The Incident commander is responsible for the management of all incident operations at the incident site.

INCIDENT COMMAND POST (ICP):

The ICP is the location where the primary command functions are executed. The ICP may be collocated with the incident base or other incident facilities.

INCIDENT COMMAND SYSTEM (ICS):

A standardized on-scene emergency management concept specifically designed to allow its user(s) to adopt an integrated organizational structure equal to the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries.

INCIDENT COMMUNICATIONS CENTER:

This is the location of the Communications Unit and the Message Center.

ICS NATIONAL TRAINING CURRICULUM:

A series of 17 training modules consisting of instructor guides, visuals, tests, and student materials. The modules cover all aspects of ICS operations. The modules can be intermixed to meet specific training needs.

INCIDENT MANAGEMENT TEAM:

The Incident Commander and appropriate Command and General Staff personnel assigned to manage an incident.

INCIDENT OBJECTIVES:

The Incident Objectives are the statements of guidance and direction necessary for the selection of appropriate strategy(s), and the tactical direction of resources. Incident objectives are based on realistic expectations of what can be accomplished when all allocated resources have been effectively deployed. Incident objectives must be achievable and measurable, yet flexible enough to allow for strategic and tactical alternatives.

INDIRECT ATTACK:

An Indirect Attack is a method of suppression in which the control line is located some considerable distance away from the fire's active edge. This is generally done in the case of a fast-spreading or high-intensity fire to utilize natural or constructed fire breaks or fuel breaks and favorable breaks in the topography. The intervening fuel is usually backfired; but occasionally the main fire is allowed to burn to the line, depending on conditions.

INFORMATION OFFICER:

The Information Officer is a member of the Command Staff responsible for interfacing with the public and media or with other agencies requiring information directly from the incident. There is only one Information Officer per incident. The Information Officer may have assistants.

INFRARED DETECTION:

The use of heat sensing equipment, known as Infrared Scanners, for detection of heat sources that are not visually detectable by the normal surveillance methods of either ground or air patrols.

INITIAL ATTACK:

Initial Attack is the actions taken by the first resources to arrive at a wildfire to protect lives and property, and to prevent further extension of the fire.

INCIDENT SUPPORT ORGANIZATION:

This Organization includes any off-incident support provided to an incident. Examples would be Agency Dispatch center, Airports, Mobilization Centers, etc.

INSURANCE SERVICES OFFICE (ISO):

The ISO is an agency that recommends fire insurance rates based on a grading schedule which incorporates evaluation of fire fighting resources and capability. The grading schedule is equally rated, giving 50% credit for water supply and 50% for the fire department. A Class 1 rating is the very best fire protection capability, a class 10 rating equates to no fire protection.

- J -

JOB HAZARD ANALYSIS:

This is an analysis of a project that is completed by staff to identify hazards to employees and the public. It identifies hazards, corrective actions and the required safety equipment to ensure public and employee safety.

JUMP SPOT:

Jump Spot is a selected landing area of smoke jumpers or helijumpers.

JUMP SUIT:

A Jump Suit is an approved protection suit worn by smoke jumpers.

JURISDICTION:

Jurisdiction refers to the agency that has a range or sphere of authority and responsibility for a specific geographical area, or a mandated function. Public agencies have jurisdiction at an incident related to their legal responsibilities and authority for incident mitigation. Jurisdictional authority at an incident can be political/geographical (e.g., city, county, state, or federal boundary lines) or functional (e.g., police department, health department, etc.). (See Multijurisdiction.)

- K -

KEECH BYRAM DROUGHT INDEX (KBDI):

This is a commonly-used drought index adapted for fire management applications, with a numerical range from 0 (no moisture deficiency) to 800 (maximum drought).

KNOCK DOWN:

A Knock Down is used to reduce the flame or heat on the more vigorously burning parts of a fire edge.

- L -

LADDER FUELS:

Ladder Fuels are forest vegetation situated at different heights and close enough together to allow a surface fire to become a potential crown fire.

LANDING ZONE:

See helispot.

LARGE FIRE: (For Statistical Purposes)

1. A fire burning more than a specified area of land, e.g., 300 acres.
2. A fire burning with the size and intensity such that its behavior is determined by interaction between its own convection column and weather conditions above the service.

LEAD PLANE:

The Lead Plane is an aircraft flown to make trial runs over the fire to check wing and smoke conditions and topography and to direct the tactical deployment of air tankers.

LEADER:

The ICS title for an individual responsible for a Task Force, Strike Team, or functional unit.

LIAISON OFFICER:

The Liaison Officer is a member of the Command Staff responsible for coordinating with representatives from cooperating and assisting agencies.

LIFE-SAFETY:

Life Safety refers to the joint consideration of both the life and physical well being of individuals.

LIGHT (FINE) FUELS:

These are fast-drying fuels, generally with a comparatively high surface area-to-volume ratio, which are less than ¼ inch in diameter and have a time lag of one hour or less. These fuels readily ignite and are rapidly consumed by fire when dry.

LIGHTNING ACTIVITY LEVEL (LAL):

A number, on a scale of 1 to 6 that reflects frequency and character of cloud-to-ground lightning. The scale is exponential, based on powers of 3, i.e., LAL 3 indicates twice the lightning of LAL 2).

LIMB-UP:

Limb-up is the removing of lower branches from trees to break the ladder fuels continuity.

LINE SCOUT:

A Line Scout is a firefighter who determines the location of a fire line.

LITTER:

The Litter is the top layer of the forest, scrubland, or grassland floor, directly above the fermentation layer. It is composed of loose debris of dead sticks, branches, twigs, and recently fallen leaves or needles and little is altered in structure by decomposition.

LIVE FUELS:

These fuels consist of living plants, such as trees, grasses, and shrubs, in which the seasonal moisture content cycle is controlled largely by internal physiological mechanisms, rather than by external weather influences.

LOGGING:

Logging is the felling and removal of all or a part of the trees in a given area.

LOGISTICS SECTION:

This section is responsible for providing facilities, services, and materials for the incident.

LONG-TERM RETARDANT:

A Long-Term Retardant is a chemical that has the capability to inhibit spread of flame through chemical reactions between products of combustion and the applied chemicals, even after the water component has evaporated.

- M -

MAFFS:

MAFFS stands for Modular Airborne Firefighting System which is a manufactured unit consisting of five interconnecting tanks, a control pallet, and a nozzle pallet, with a capacity of 3,000 gallons (11,355 liters), designed to be rapidly mounted inside an unmodified C-130 (Hercules) cargo aircraft for use in cascading retardant chemicals on wildfires.

MANAGERS:

Managers are the individuals within ICS organizational units that are assigned specific managerial responsibilities, e.g., Staging Area Manager or Camp Manager.

MANAGEMENT BY OBJECTIVES:

In ICS, this is a top-down management activity which involves a three-step process to achieve the incident goal. The steps are: establishing the incident objectives, selection of appropriate strategy(s) to achieve the objectives, and the tactical direction associated with the selected strategy. Tactical direction includes: selection of tactics, selection of resources, resource assignments, and performance monitoring.

MEDICAL UNIT:

Functional unit within the Service Branch of the Logistics Section responsible for the development of the Medical Emergency Plan, and for providing emergency medical treatment of incident personnel.

MESSAGE CENTER:

The Message Center is part of the Incident Communications Center and is collocated or placed adjacent to it. It receives records, and routes information about resources reporting to the incident, resource status, and administrative and tactical traffic.

MICRO-REMOTE ENVIRONMENTAL MONITORING SYSTEM: (Micro-REMS)

This is the mobile weather monitoring station. A Micro-REMS usually accompanies an incident meteorologist and ATMU to an incident.

MINERAL SOIL:

Mineral Soil is the soil layers below the predominantly organic horizons; soil with little combustible material.

MOBILIZATION:

The process and procedures used by all organizations federal, state, and local for activating, assembling, and transporting all resources that have been requested to respond to or support an incident.

MOBILIZATION CENTER:

An off-incident location at which emergency service personnel and equipment are temporarily located pending assignment, release, or reassignment.

MODIFIED SUPPRESSION:

Modified Suppression is the action dictated by one or more management constraints that affect strategy and/or tactics.

MOP-UP:

Mop-up is the process used to make a fire safe or reduce residual smoke after the fire has been controlled by extinguishing the remaining hot spots to ensure the incident will not re-ignite or continue to spread and/or remove burning material along or near the control line, felling snags, or moving logs so they won't roll downhill.

MOSAIC:

Mosaic is a fuel modification system that provides for the creation of islands and irregular boundaries to reduce the visual and ecological impact of fuel modification.

MULTI-AGENCY INCIDENT:

Multi-Agency incident is an incident where one or more agencies assist a jurisdictional agency or agencies. It may be single or unified command.

MULTI-AGENCY COORDINATION (MAC):

MAC is a generalized term which describes the functions and activities of representatives of involved agencies and/or jurisdictions who come together to make decisions regarding the prioritizing of incidents, and the sharing and use of critical resources. The MAC organization is not a part of the on-scene ICS and is not involved in developing incident strategy or tactics.

MULTI-AGENCY COORDINATION SYSTEM (MACS):

The combination of personnel, facilities, equipment, procedures, and communications integrated into a common system. When activated, MACS has the responsibility for incident mitigation. In ICS these incidents will be managed under Unified Command.

MUTUAL AID AGREEMENT:

Written agreement between agencies and/or jurisdictions in which they agree to assist one another upon request, by furnishing personnel and equipment.

- N -

NATURAL BARRIER:

A Natural Barrier is a naturally occurring obstruction to the spread of a fire.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA):

NEPA is the basic national law for protection of the environment, passed by congress in 1969. It sets policy and procedures for environmental protection, and authorizes Environmental Impact Statements and Environmental Assessments to be used as analytical tools to help federal managers make decisions.

NATIONAL FIRE DANGER RATING SYSTEM (NFDRS):

NFDRS is a uniform fire danger rating system that focuses on the environmental factors that control the moisture content of fuels.

NATIONAL INTERAGENCY INCIDENT MANAGEMENT SYSTEM (NIIMS):

An NWCG-developed program consisting of five major subsystems which collectively provide a total systems approach to all-risk incident management. The subsystems are: The Incident Command System, Training, Qualifications and Certification, Supporting Technologies, and Publications Management.

NATIONAL WILDFIRE COORDINATING GROUP (NWCG):

A group formed under the direction of the Secretaries of the Interior and Agriculture and comprised of representatives of the U.S. Forest Service, Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service and Association of State Foresters. The group's purpose is to facilitate coordination and effectiveness of wildland fire activities, and provide a forum to discuss, recommend appropriate action, or resolve issues and problems of substantive nature. The NWCG is the certifying body for all courses in the National Fire Curriculum of ICS development and training.

NOMEX:

Nomex is the trade name for a fire resistant synthetic material used in the manufacturing of flight suits, pants and shirts used by firefighters (see Aramid).

NON-FOREST ZONE:

Non-Forest Zone is an area which the concentration of residences and other buildings makes the primary fire protection problem one of structural fires rather than forest fires.

NORMAL FIRE SEASON:

1. A season when weather, fire danger, number and distribution of fires are about average.
2. The period of the year that normally comprises the fire season.

NORTHERN REGION:

The Northern Region includes twelve national Forests in northern Idaho, northeastern Washington, and Montana; and one National Grassland in North Dakota and northwestern South Dakota, approximately 25.395 million acres.

- O -

OFFICER:

The ICS title for the personnel responsible for the Command Staff positions of Safety, Liaison, and Information.

OPERATIONAL PERIOD:

The period of time scheduled for execution of a given set of operation actions as specified in the Incident Action Plan. Operational Periods can be of various lengths, although usually not over 24 hours.

OPERATIONS BRANCH DIRECTOR:

The Operations Branch Director is under the direction of the Operations Section Chief who is responsible for implementing that portion of the incident action plan appropriate to the branch.

OPERATIONS SECTION:

The Operations Section responsible for all tactical operations at the incident. It includes Branches, Divisions and/or Groups, Task Forces, Strike Teams, Single Resources, and Staging Areas.

ORBIT:

The Orbit is the circular holding pattern of an air tanker in the vicinity of a fire waiting for orders to make a drop.

OUT-OF-SERVICE RESOURCES:

Resources assigned to an incident but unable to respond for mechanical, rest, or personnel reasons.

OVERHEAD PERSONNEL:

Personnel who are assigned to supervisory positions which include Incident Commander, Command Staff, general Staff, Directors, Supervisors, and Unit Leaders.

- P -

PACK TEST:

The Pack Test is used to determine the aerobic capacity of fire suppression and support personnel and assign physical fitness scores. The test consists of walking a specified distance, with or without a weighted pack, in a pre-determined period of time, with altitude corrections.

PARACARGO:

Anything dropped, or intended for dropping from an aircraft by parachute or by other retardant devices, or by free fall.

PARTS OF A FIRE:

The Parts of a Fire, on typical free-burning fires, the spread is uneven with the main spread moving with the wind or upslope. The most rapidly moving portion is designated the head of the fire. The adjoining portions of the perimeter at right angles to the head are known as the flanks, and the slowest moving portion is known as the rear or the base or (Australia) the back.

PATROL:

Patrol is to go back and forth vigilantly over a length of control line during and/or after construction to prevent slipovers, control spot fires, and extinguish overlooked hot spots.

PEAK FIRE SEASON:

The Peak Fire Season is the period of the fire season during which fires are expected to ignite most readily, to burn with greater than average intensity, and to create damages at an unacceptable level.

PERSONAL PROTECTIVE EQUIPMENT (PPE):

All firefighting personnel must be equipped with proper equipment and clothing in order to mitigate the risk of injury from, or exposure to, hazardous conditions encountered while working. PPE includes, but is not limited to: 8 inch high laced leather boots with lug soles, fire shelter, hard hat with chin strap, goggles, ear plugs, Aramid shirts and trousers, leather gloves and individual first aid kits.

PING PONG BALL DISPENSER: (Premo MK III Aerial Ignition Device)

This aerial ignition device injects ethylene glycol into a plastic sphere containing potassium permanganate. The primed sphere is ejected from an aircraft.

PLANNING MEETING:

A meeting held as needed throughout the duration of an incident, to select specific strategies and tactics for incident control operations, and for service and support planning. On larger incidents, the planning meeting is a major element in the development of the Incident Action Plan.

PLANNING SECTION:

Responsible for the collection, evaluation, and dissemination of tactical information related to the incident, and for the preparation and documentation of Incident Action Plans. The Section also maintains information on the current and forecasted situation, and on the status of resources assigned to the incident. This includes the Situation, Resources, Documentation, and Demobilization Units, as well as Technical Specialists.

PLOW LINE:

A line constructed by a fire line plow.

PREPAREDNESS:

Preparedness is a condition or degree of being ready to cope with a potential fire situation.

PRESCRIBED BURNING:

Prescribed Burning is a controlled application of fire to wildland fuels in either their natural or modified state, under specified environmental conditions which allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to attain planned resource management objectives.

PRESCRIBED FIRE:

A Prescribed Fire is any fire ignited by management actions under certain, predetermined conditions to meet specific objective related to hazardous fuels or habitat improvement. A written, approved prescribed fire plan must exist, and NEPA requirements must be met upon ignition.

PRESCRIBED FIRE PLAN (BURN PLAN):

The Burn Plan is a document that provides the prescribed fire burn boss information needed to implement an individual prescribed fire project.

PRESCRIPTION:

A Prescription is a measurable criterion that defines conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and indicate other required actions. The Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social, or legal considerations.

PREVENTION:

The activities directed a reducing the incidence of fires, including public education, law enforcement, personal contact, and reduction of fuel hazards.

PROCUREMENT UNIT:

The Procurement Unit functions within the Finance/ Administration Section responsible for financial matters involving vendor contracts.

PROGRESSIVE HOSE LAY:

A hose lay in which double shutoff wyes are inserted in the main line at intervals and lateral lines are run from the wyes to the fire edge, thus permitting continuous application of water during extension of the lay.

PRUNING:

Pruning is the removal of live and dead branches in the lower portion of the tree crown.

PROJECT FIRE:

A Project fire is a fire of such size or complexity that a large organization and prolonged activity is required to suppress it.

PULASKI:

Pulaski is a combination chopping and trenching tool which combines a single-bitted axe-blade with a narrow adze-like trenching blade fitted to a straight handle. It is useful for grubbing or trenching in duff and matted roots. It is also well balanced for chopping.

- R -

RADIANT BURN:

A burn received from a radiant heat source.

RADIANT HEAT FLUX:

Radiant Heat Flux is the amount of heat flowing through a given time, usually expressed as calories/square centimeter/second.

RADIO CACHE:

A supply of radios stored in a pre-determined location for assignment to incidents.

RAPPELLING:

Rappelling is a technique of landing specifically trained firefighters from hovering helicopters; involves sliding down ropes with the aid of friction-producing devices.

RATE OF SPREAD:

The Rate of Spread is the relative activity of a fire in extending its horizontal dimensions. It is expressed as a rate of increase of the total perimeter of the fire. As the rate of forward spread of the fire front, or as rate of increase in area, depending on the intended use of the information. Usually it is expressed in chains or acres per hour for a specific period in the fire's history.

REBURN:

Reburn is the burning of an area that has been previously burned but that contains flammable fuel that ignites when burning conditions are more favorable; in an area that has re-burned.

RECORDERS:

Recorders are individuals within ICS organizational units who are responsible for recording information. Recorders may be found in Planning, Logistics, and Finance/ Administration Units.

RED CARD:

A Red Card is the fire qualification card issued to fire rated persons showing their training needs and their qualifications to fill specified fire suppression and support positions in a large fire suppression or incident organization.

RED FLAG CONDITIONS:

The Red Flag Conditions consist of:

1. Dry thunderstorm activity during extremely dry periods or when a marked increase in dry thunderstorm activity is forecast during a drier than normal period.
2. Surface winds are expected to increase 20 mph or higher or change directions abruptly due to the approach and passage of a cold front, squall line, or other weather phenomena other than isolated thunderstorms.
3. Prolonged hot and dry conditions (RH below 205) in combination with a Fire Danger Rating of High or greater.
4. A combination of conditions listed above.
5. Anytime the forecaster foresees a change in weather that would result in a significant increase in fire danger.

RED FLAG WARNING:

The Red Flag Warning is a term used by fire weather forecasters to alert forecast users to an ongoing or imminent critical fire weather pattern.

REHABILITATION:

Rehabilitation is the activities necessary to repair damage or disturbance caused by wildland fires or the fire suppression activity.

REINFORCED RESPONSE:

Those resources requested in addition to the initial response.

RELATIVE HUMIDITY (Rh):

Relative Humidity is the ratio of the amount of moisture in the air, to the maximum amount of moisture that air would contain if it were saturated. It is the ratio of the actual vapor pressure to the saturated vapor pressure.

REMOTE AUTOMATIC WEATHER STATION (RAWS):

RAWS is an apparatus that automatically acquires, processes, and stores local weather data for later transmission to the GOES Satellite, from which data is re-transmitted to an earth-receiving station for use in the National Fire Danger Rating System.

REPORTING LOCATIONS:

The Reporting Location or facilities is the area where incoming resources can check-in at the incident (See Check-in.)

RESCUE:

Rescue is a vehicle capable of providing emergency medical services.

RESIDENCE TIME:

Residence Time is the time required for the flaming zone of a fire to pass a stationary point; the width of the flaming zone divided by the rate of spread of the fire.

RESOURCES:

1. Resources are the personnel and equipment available, or potentially available, for assignment to be used in tactical support or overhead capacities at an incident.
2. The natural resources of an area are described by kind and typed, e.g., timber, grass, ground, watershed values, recreation values, air, and wildlife habitat, etc.

RESOURCE MANAGEMENT PLAN (RMP):

Resource Management Plan is the document prepared by a field office staff with public participation and approved by field office managers. It provides general guidance and direction for land management activities at a field office. The RMP identifies the need for fire in a particular area and for a specific benefit.

RESOURCE ORDER:

Resource Order is an order placed for firefighting or support resources.

RESOURCES UNIT:

Functional unit within the Planning Section responsible for recording the status of resources committed to the incident. The Unit also evaluates resources currently committed to the incident, the impact that additional responding resources will have on the incident, and anticipated resource needs.

RESTRICTED AREA:

A restricted area is the airspace of defined dimensions identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is subject to restrictions.

RETARDANT:

Retardant is the substance or chemical agent which reduced the flammability of combustibles.

RETARDANT COVERAGE:

Retardant Coverage is the area of fuel covered and degree of coverage of the fuel by a retardant. The coverage levels are usually expressed in terms of gallons per hundred square feet or liters per square meter.

RUN (OF A FIRE):

This is the rapid advance of the head of a fire with a marked change in fire line intensity and rate of spread from that noted before and after the advance.

RUNNING:

Running is a rapidly spreading surface fire with a well defined head.

- S -

SECTION:

The Section is responsible for organizing the major functions of the incident, e.g., Operations, Planning, Logistics, Finance/ Administration. The Section is organizationally between Branch and Incident Commander.

SECTOR:

Term used in some applications to describe an organizational level similar to an ICS Division or Group. Sector is not a part of ICS terminology.

SAFE ZONE:

A Safe Zone is a designated area around your home that should be free of fire hazard materials.

SAFETY OFFICER:

A member of the Command Staff responsible for monitoring an assessing safety hazards or unsafe situations, and for developing measures for ensuring personnel safety. The Safety Officer may have assistants.

SAFETY ZONE:

A Safety Zone is an area cleared of flammable materials used for escape in the event the line is outflanked or in case a spot fire causes fuels outside the control line to render the line unsafe. In firing operations, crew progress so as to maintain a safety zone close at hand allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuel breaks; they are greatly enlarged areas which can be used with relative safety by firefighters and their equipment in the event of a blow-up in the vicinity.

SCRATCH LINE:

A Scratch Lin is an unfinished preliminary fire line hastily established or built as an emergency measure to check the spread of fire.

SECONDARY LINE:

A Secondary Line is any fire line constructed at a distance from the fire perimeter concurrently with or after a primary control line has already been constructed on or near to the perimeter of the fire. It is generally constructed as an insurance measure in case the fire escapes control by the primary line.

SEGMENT:

A geographical area in which a task force/strike team leader or supervisor of a single resource is assigned authority and responsibility for the coordination of resources and implementation of planned tactics. A segment may be a portion of a division or an area inside or outside the perimeter of an incident. Segments are identified with Arabic numbers.

SERAL:

Seral is an ecological sere, e.g., a series of ecological communities formed in ecological succession.

SERVICE BRANCH:

The Service Branch is a Branch within the Logistics Section responsible for service activities at the incident. It includes the Communications, Medical, and Food Units.

SEVERITY FUNDING:

Severity Funding are funds provided to increase wildland fire suppression response capability, necessitated by abnormal weather patterns, extended drought, or other events causing abnormal increase in the fire potential and/or danger.

SHORT-TERM RETARDANT:

Short-term retardant is a chemical which has not inherent fire retarding property but which alters the viscosity or retards the evaporation of water.

SIMPLE HOSE LAY:

A Hose Lay consists of consecutively coupled lengths of hose without laterals. The lay is extended by inserting additional lengths of hose in the line between pump and nozzle.

SINGLE RESOURCE:

The Single Resource is an individual, a piece of equipment and its personnel complement, or a crew or team of individuals with an identified work supervisor that can be sued on an incident.

SITUATION UNIT:

Functional unit within the Planning Section responsible for the collection, organization, and analysis of incident status information, and for analysis of the situation as it progresses. This Unit reports to the Planning Section Chief.

SIZE-UP:

Size-up means to evaluate a fire to determine a course of action for fire suppression.

SLASH:

Slash is the debris left after logging, pruning, thinning or brush cutting: This includes logs, chips, bark, branches, stumps and broken understory trees or brush.

SLING LOAD:

Any cargo carried beneath a helicopter and attached by a lead line and swivel.

SLOP-OVER

A fire edge that crosses a control line or natural barrier intended to contain the fire and also the fire that results. Other names are break away, break over, and break over fire.

SLOPE:

Slope is the variation of terrain from the horizontal; the number of feet rises or fall per hundred feet measured horizontally, expressed as a percentage.

SMOKE JUMPER:

A firefighter who travels to fires by aircraft and parachute.

SMOKE MANAGEMENT:

Smoke Management is the application of fire intensities and meteorological processes to minimize degradation of air quality during prescribed fires.

SMOLDERING FIRE:

Smoldering Fire is a fire burning without flame and barely spreading.

SNAG:

A Snag is a standing dead tree or part of a dead tree from which at least the smaller branches have fallen.

SPAN OF CONTROL:

The Span of Control is the maximum number of subordinates who can be directly supervised by one person without loss of efficiency. In fire suppression, the number varies by activity but is usually in the general range of 3 to 7.

SPARK ARRESTER:

A Spark Arrester is a device installed in a chimney, flue, or exhaust pipe to stop the emission of sparks and burning fragments.

SPECIMEN TREES:

Specimen Trees are vigorous trees left within a fuel break to enhance the visual characteristics of the fuel break without compromising its objective.

SPOT FIRE:

A Spot Fire is a fire ignited outside the perimeter of the main fire by flying sparks or embers.

SPOT WEATHER FORECAST:

This is a special forecast issued to fit the time, topography, and weather of each specific fire. These forecasts are issued upon request of the user agency and are more detailed, timely, and specific than zone forecasts.

SPOTTER:

In smoke jumping, the spotter is responsible for selecting drop targets and supervising all aspects of dropping smoke jumpers.

SPOTTING:

Spotting is the behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire.

STAGING AREA:

Staging Areas are locations set up at an incident where resources can be placed while awaiting a tactical assignment. Staging Areas are managed by the Operations Section.

STRATEGY:

Strategy is an overall plan of action for fighting a fire which gives regard to the most cost efficient use of personnel and equipment in consideration of values threatened, fire behavior, legal constraints, and objectives established for resource management. This leaves decisions on the tactical use of personnel and equipment to supervisors and leaders in the operations section.

STRIKE TEAM:

The Strike Team is a team with a specified combination of the same kind and type of resources, with common communications, and a leader.

STRIKE TEAM LEADER:

The Strike Team Leader is responsible to a division/group supervisor for performing tactical assignments given to the strike team.

STRIP FIRING:

Strip Firing is setting fire to more than one strip of fuel and providing for the strips to burn together. Frequently done in burning out against the wind where inner strips are fired first to create drafts which pull flames and sparks away from the control line.

STRUCTURE FIRE:

A structure fire is a fire originating in and burning any part or all of any building, shelter, or other structures.

STRUCTURE FIRE SUPPRESSION:

Structure Fire Suppression is the interior or exterior actions taken to suppress and extinguish a burning structure or improvement.

STRUCTURE PROTECTION:

Structure Protection is the action to protect the structure from the threat of damage from an advancing wildfire. This normally does not include an attack of fire that is inside the structure. It involves the use of fire control lines (constructed or natural) and the extinguishment of spot fires near or on the structure. This protection can be provided by the structural or wildland fire fighter.

SUBURBAN:

Suburban is the residential perimeter of a metropolitan area which lies adjacent to undeveloped rural land.

SUBSIDENCE INVERSION:

Subsidence Inversion is a slow sinking motion of a high level air mass over a broad area. This is often associated with the presence of a high pressure system. Frequently results in very limited atmospheric mixing conditions.

SUPERVISOR:

The ICS title for individuals responsible for command of a Division or Group.

SUPPLY UNIT:

Functional unit within the Support Branch of the Logistics Section responsible for ordering equipment and supplies required for incident operations

SUPPORT BRANCH:

The Support Branch is a Branch within the Logistics Section responsible for providing personnel, equipment, and supplies to support incident operations. This includes the Supply, Facilities, and Ground Support Units.

SUPPORTING MATERIALS:

Supporting materials refers to the several attachments that may be included with an Incident Action Plan, e.g., communications plan, map, safety plan, traffic plan, and medical plan.

SUPPORT RESOURCES:

The Support Resources are Non-tactical resources under the supervision of the Logistics, Planning, Finance/ Administration Sections, or the Command Staff.

SUPPRESSANT:

A suppressant is an agent, such as water or foam, used to extinguish the flaming and glowing phases of combustion when direction applied to burning fuels.

SUPPRESSION:

Suppression is all the work of extinguishing or containing a fire, beginning with its discovery.

SURFACE FIRE:

A Surface Fire is a fire that burns surface litter, other loose debris of the forest floor, and small vegetation.

SURFACE FUELS:

Surface Fuels are loose surface litter on the soil surface, normally consisting of fallen leaves or needles, twigs, bark, cones, and small branches that have not yet decayed enough to lose their identity. This also includes grasses, forbs, low and medium shrubs, tree seedlings, heavier branchwood, downed logs, and stumps interspersed with or partially replacing the litter.

SWAMPER:

1. A worker who is used to walk ahead of the dozer to guide the operator and assists fallers and/or sawyers by clearing away brush, limbs and small trees. They carry fuel, oil and tools and watches for dangerous situations.
2. A worker on a dozer crew, who pulls winch line, helps maintain equipment, etc., to speed suppression work on a fire.

- T -

TACTICAL DIRECTION:

Direction given by the Operations Section Chief which includes the tactics appropriate for the selection strategy, the selection and assignment of resources, tactics implementation, and performance monitoring for each operational period.

TACTICS:

Tactics are the operational aspects of fire suppression. Determining exactly where and how to build a control line and what other suppression measures are necessary to extinguish the fire. To deploy and direct resources on an incident to accomplish the objectives designated by strategy.

TASK FORCE:

A combination of single resources assembled for a particular tactical need, with common communications and a leader.

TEAM:

See single Resource.

TECHNICAL SPECIALISTS:

Technical Specialists are the personnel with special skills that can be used anywhere within the ICS organization.

TEMPORARY FLIGHT RESTRICTIONS (TFR):

TFRs are temporary airspace restrictions for non-emergency aircraft in the incident area. TFRs are established and put into effect by the FAA in the vicinity of an incident to ensure aircraft safety, and are normally limited to a five-nautical-mile radius and 2000 feet in altitude.

TERRA TORCH:

A Terra Torch is a device for throwing a stream of flaming liquid, used to facilitate rapid ignition during burn out operations on a wildland fire or during a prescribed fire operation.

TEST FIRE:

A Test Fire is a controlled fire set within the planned burn unit to determine the characteristic of the prescribed fire, such as fire behavior, detection performance and control of measures.

THERMAL BELT:

Thermal Belt is an area of a mountain slope where a nighttime inversion layer ‘bathes’ it with warmer and drier air. Typically experiences the least variation in diurnal temperatures and has the highest average temperatures and lowest relative humidity

THINNING:

Thinning is a selectively cutting of trees to improve the remaining forest stand, by removing trees of poor vigor or by reducing tree density.

TIE-IN:

Tie-In is to connect a control line or airdrop with another line coming from the opposite direction or with a specified point (road, stream, etc.). "Tie-in tanker 78's drop with the road".

TIMELAG:

The time needed under specified conditions for a fuel particle to lose about 63 percent of the difference between its initial moisture content and its equilibrium moisture content. If conditions remain unchanged, a fuel will reach 95 percent of its equilibrium moisture content after four time lag periods.

TIME UNIT:

The Time Unit is a functional unit within the Finance/ Administration Section responsible for recording time for incident personnel and hired equipment.

TORCHING:

Torching is the ignition and flare-up of a tree or small group of trees, usually from bottom to top.

TRIGGER POINT:

Trigger Point is a pre-determined point or line on a map. When a fire hits the trigger point, actions such as evacuations take place.

TURN-THE-CORNER:

Turn -the- Corner means to contain a fire along a flank and begin containing it across the head. It refers to ground or air attack.

TWO-WAY RADIO:

Two-way Radio is the radio equipment with transmitters in mobile units on the same frequency as the base station, permitting conversation in two directions using the same frequency in turn.

TYPE:

Type refers to capability of a firefighting resource in comparison to another type. A Type 1 resource provides a greater overall capability due to power, size, capacity, etc., than would be found in a Type 2 resource. Resource typing provides manager with additional information in selecting the best resource for the task.

- U -

UNCONTROLLED FIRE:

An Uncontrolled fire is any fire which threatens to destroy life, property, or natural resources.

UNDERBURN:

An Underburn is a fire that consumes surface fuels but not trees or shrubs (see Surface Fuels).

UNDERCUT LINE:

An Undercut Line is a fire line below a fire on a slope. It should be trenched to catch rolling material. It can also be called underslung line.

UNIFIED AREA COMMAND:

A Unified Area Command is established when incidents under an Area Command are multijurisdictional. (See Area Command and Unified Command.)

UNIFIED COMMAND:

In ICS, Unified Command is a unified team effort which allows all agencies with responsibility for the incident, either geographical or functional, to manage an incident by establishing a common set of incident objectives and strategies. This is accomplished without losing or abdicating agency authority, responsibility, or accountability.

UNIT:

The Unit is the organizational element having functional responsibility for a specific incident planning, logistics, or finance/ administration activity.

UNITY OF COMMAND:

The concept by which each person within an organization reports to one and only one designated person.

-- V --

VALUES AT RISK:

Values at risk is the physical and non-physical elements of the environment that may be adversely affected by fire.

VECTORS:

Vectors are the directions of fire spread as related to rate of spread calculations (in degrees from upslope).

VENTILATION:

Ventilation is the air flow and supply through a structure.

VISCOSITY:

Viscosity is the thickness of a solution or suspension. It is the measure of the relative capability of a fluid to resist flow. Heavy syrup has a high viscosity; gasoline has a low viscosity.

VOLUNTEER FIRE DEPARTMENT (VFD):

The VFD is a fire department of which some or all members are unpaid.

- W -

WATER TENDER:

A Water Tender is a ground vehicle capable of transporting specified quantities of water.

WEATHER INFORMATION AND MANAGEMENT SYSTEM (WIMS):

WIMS is an interactive computer system designed to accommodate the weather information needs of all federal and state natural resource management agencies. It provides timely access to weather forecasts, current and historical weather data, the national Fire Danger Rating System (NFDRS), and the national Interagency Fire management Integrated Database (NIFMID).

WET LINE:

A Wet Line is a line of water, or water and chemical retardant, sprayed along the ground, that serves as a temporary control line from which to ignite or stop a low-intensity fire.

WET WATER:

Wet Water is water containing a wetting or foaming agent.

WETTING AGENT:

A Wetting Agent is an additive that reduces the surface tension of water (producing wet water) causing it to spread and penetrate more effectively.

WILDFIRE:

Wildfire is a fire occurring on wildland that is not meeting management objectives and thus requires a suppression response, i.e., any unwanted wildland fire.

WILDLAND FIRE:

A Wildland Fire is any non-structure fire, other than prescribed fire, that occurs in the wildland.

WILDLAND FIRE USE:

Wildland Fire Use in the management of naturally ignited wildland fires to accomplish specific pre-stated resource management objectives in pre-defined geographic areas outlined in the Fire Management plans.

WILDLAND FIRE IMPLEMENTATION PLAN (WFIP):

WFIP is a progressively developed assessment and operational management plan that documents the analysis and selection of strategies and describes the appropriate management response for a wildland fire being managed for resource benefits.

WILDLAND FIRE SITUATION ANALYSIS: (WFSA)

WFSA is a document approved by the line officer that outlines and evaluates alternative wildland fire suppression strategies against selected environmental, social, political, and economic criteria. It provides a record of decisions.

WILDLAND/URBAN INTERFACE AREA:

Wildland urban Interface is the line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

WIND VECTORS:

Wind Vectors are wind directions used to calculate fire behavior.

WING SPAN:

The Wing Span is the distance from wing tip to wing tip on a fixed-wing aircraft.