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Signatures Of Plan Concurrence

"With our signatures below we accept and implement this plan. All previous versions are superseded by this one. Specific modifications of this plan can be made by the Tri-County FireSafe Working Group without the senior officials' signatures."

Chairperson, Lewis & Clark County Commission

Chairperson, Broadwater County Commission

Chairperson, Jefferson County Commission

City of Helena, and for the Helena Fire Dept

City of East Helena, and for the East Helena Fire Dept

Lewis & Clark County Rural Fire Council

Jefferson County Rural Fire Council

Broadwater County Fire District

Montana Dept of Natural Resources & Conservation
Central Land Office

Bureau of Land Management

United States Forest Service

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Record Of Changes

Date	Page(s) Changed	Changed By:	Changes Made

References

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- Arno, Stephen F.; Parsons, David J.; Keane, Robert E. 2000. *Mixed-Severity Fire Regimes in the Northern Rocky Mountains: Consequences of Fire Exclusion and Options for the Future*.
- Broadwater County PDM Plan
- Jefferson County PDM Plan
- Lewis & Clark County PDM Plan
- Meagher County CWPP 2014
- Augusta Area Community Protection Plan *(in progress)*
- Lincoln Fire District Protection Plan
- Wolf Creek Fire Service Area Protection Plan
- The "South Hills Preplan" Suppression Response Plan
- The "Wildland-Urban Interface Communities-At-Risk Hazard Assessment", BLM, 2004
- The "Wildland-Urban Interface Communities-At-Risk Mitigation Plan", BLM, 2004
- Rothermel, Richard C. 1991. "*Predicting behavior and size of crown fires in the Northern Rocky Mountains*." Res. Pap. INT-438. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station.

1) Executive Summary

The incentive for communities to engage in comprehensive forest planning and project prioritization was given impetus with the enactment of the Healthy Forests Restoration Act (HFRA) in 2003. This legislation included the first meaningful statutory incentives for the US Forest Service and the Bureau of Land Management to give consideration to the priorities of local communities as they developed and implemented forest management and hazardous fuel reduction projects. It also provided communities with a tremendous opportunity to influence where and how federal agencies implemented fuel reduction projects on federal lands and how additional federal funds could be distributed for projects on nonfederal lands.

In order for a community to take full advantage of this new opportunity, it had to first prepare a Community Wildfire Protection Plan (CWPP). The minimum requirements for a CWPP as described in the HFRA were:

- A CWPP must be collaboratively developed by local and state government representatives, in consultation with federal agencies and other interested parties.
- A CWPP must identify and prioritize areas for hazardous fuel reduction treatments and recommend the types and methods of treatment that will protect one or more at risk communities and essential infrastructure.
- A CWPP must recommend measures that homeowners and communities can take to reduce the ignitability of structures throughout the area.

The HFRA also required that three categories of entities must mutually agree to the final contents of the CWPP:

- The local county and city governments
- The local fire departments; and
- The Department of Natural Resource Conservation

The first CWPP for Broadwater, Jefferson and Lewis and Clark counties was approved in 2005 and was designed to help the communities within these counties to clarify and refine priorities for the protection of life, property, and critical infrastructure in the wildland-urban interface.

Findings in the 2005 document were thus:

The people in Broadwater, Jefferson and Lewis and Clark counties live, work and play in an environment that is frequented by wildfire. Our statistics showed that from 1984-2004 over 450,000 acres burned as a result of wildfires. On average over 20,000 acres burned annually, resulting in a significant risk to life and property.

The Tri-County FireSafe Working Group (TCFWG) defined the wildland urban interface (WUI) boundary as the area within four miles from communities that possess a population density exceeding 250 people per square mile. Projects proposed in the WUI would become a priority for accomplishment.

The 2005 plan contained maps that displayed the combined risk of wildfire in the three counties. All lands within the counties were assigned a numerical value of risk based upon the existing fuel hazard, number of people in the immediate area, and past history of wildland fires starting in the

immediate area. These maps have been frequently consulted when evaluating the merits of proposed projects over the past 10 years. All proposed projects received a high, moderate, or low priority rating in an effort to help develop strategic plans for protecting the communities at risk.

It was believed that using the CWPP would help result in the counties successfully competing for money that would be used to implement projects on nonfederal land. This belief proved to be correct.

In 2014, the Tri-County FireSafe Working Group came together again to update and improve the 2005 CWPP while still meeting its original intent and goals. This document is the result of that effort.

2) Statement Of Purpose

This Community Wildfire Protection Plan has been developed to act as a compilation of the data that has been generated by many members of the TCFWG. Each county has met the requirements of the FEMA Pre-disaster Mitigation (PDM) plan process; the BLM has published a WUI Communities-At-Risk Mitigation Plan; the Forest Service has presented a series of projects throughout the planning area for fuels reduction; several communities have written their own plans; and TCFWG has numerous projects on privately owned non-industrial forest land and City of Helena Open Space lands. Much of the data found in this plan is extracted from the work done on those plans.

This plan, like its previous edition, will serve as a process for the collaborative working of fuel hazard assessment and prioritization of projects to address that hazard in a unified manner. It is believed that this approach will continue to provide a contiguity of projects and economy of scale where possible and the most economical methods of spending the fuel modification dollars and capitalize on the work already done by these individual entities. It continues to be viewed as a most likely approach for the federal, state, local agencies, and local communities to work collectively to the region's benefit.

3) Description Of The Tri-County FireSafe Working Group

The group membership includes individual citizens, local government, state and federal agencies, interested contractors, and fire suppression departments. Members are from the counties of Lewis & Clark, Jefferson, and Broadwater. This group was the recipient of the FEMA "EXEMPLARY PRACTICES" award in the year 2000 for its outstanding outreach program. In 2004 our program was featured in the FEMA publication *At Home in the Woods; Lessons Learned in the Wildland/Urban Interface.*

The group meets on a monthly basis. Since its initiation following the North Hill fire of 1984 this group has had the primary mission of fire prevention education. It undertook a project to map the fuel hazard risk in the interface areas of the counties it represents. When Lewis & Clark County received the Federal Emergency Management Agency "PROJECT IMPACT" grant program this committee was well suited to be the "fire" committee. The group found that with the money available for hazard mitigation in general, and with the generous match provided by numerous members and landowners it was able to step out of the role of talking about fire prevention and mitigation to a very proactive position of wildland fuel hazard reduction projects. The mapping project continues in the three counties, along with the education and awareness programs and fuel hazard reduction in the wildland urban interface.

With the FEMA Project Impact funding no longer available, the committee has been successful in receiving Hazard Mitigation grants through Montana Disaster and Emergency Services for fuel hazard reduction on City of Helena open space land, and private lands in the Wolf Creek, MT area. The group has been successful in obtaining National Fire Plan Grants in 2001, 2002 and 2004 to develop the program for individual defensible space projects, and develop projects for Non-Industrial Private Forest owners. The Bureau of Land Management is assisting the fuel hazard reduction program with Community Assistance Agreements entered into during the fall of 2003, 2008, and 2014.

The number, scope, and types of projects has continued to grow with available funding opportunities and experience levels of the parties involved. The program continues to provide defensible space around homes in the interface, but has undertaken subdivision-wide protection projects, and is expanding into projects with larger tract non-industrial private forest landowners.

The Tri-County FireSafe Working Group is continuing its work with the local and state Disaster and Emergency Services agencies through the FEMA Pre-Disaster Mitigation Program. The goal is to maintain the interagency flavor and relationships developed over the past years to provide wildland fire mitigation planning, population protection, and meaningful projects to sustain forest health and natural aesthetics in wildland/urban interface settings.

4) Plan Goals

Overall goals and objectives for mitigating the wildland fire hazard in our region are to:

- Develop a strategic plan that looks across jurisdictional boundaries.
- Propose and implement projects that will protect communities at risk from wildfire.
- Develop and propose protection measures for municipal watersheds.
- Take measures to insure that escape routes are made defensible for the public and public safety workers.
- Continue to support programs that educate the public about the things that people can do to provide defensible space around homes and how to use fire wise building materials and landscaping design.
- Continue the program to use grant money to provide assistance to homeowners to create defensible space and insure ingress and egress for fire suppression personnel.
- Encourage the federal and state agencies to continue creating fire defensible space around homes that border agency land if the home-owner has done work on their own land. (Jack Cohen's research on defensible space)
- Focus first on the wildland urban interface communities at risk.
- Attempt to stabilize the municipal watersheds of Helena and East Helena.
- Use state of the art fire modeling methods to determine the best places to spatially locate dispersed fuels treatments in the general forested areas outside of the wildland urban interface area.
- Propose to treat a minimum of approximately 20 percent of the general forested area. (Spatial Strategies for Landscape Fuel Treatments, Mark A. Finney).

Fuel, weather and physical setting determine fire behavior and in particular fire intensity. Fuels are the leg of the fire environment triangle (Countryman 1972) that land managers can change to achieve desired post-fire conditions. Treatments provide a window of opportunity for effective fire suppression and protecting high value areas (Pollet and Omi). Therefore, continuing to reduce fuel quantity, and changing the spatial arrangement both horizontally and vertically will be the continued focus of our efforts. We intend to do this by focusing on the following goals and objectives to:

1. **Define our local Wildland/Urban (WUI) boundaries.**
   By:
   - Utilizing the input from the local residents and individual local plans
   - Utilizing available GIS technology
   - Utilizing known fuel hazard and applying local fire behavior expectation
   - Utilizing local topographic features
   - Utilizing fire history of the area
   - Utilizing the known weather patterns of the area
   - Understanding the fire response and suppression capabilities in the area
2. **Reduce impacts to the community from wildland fires.**
   By:
   - Homeowner fuel reduction programs
   - Strategic fuel break placement
   - Land owner education
   - Controlled burns
   - Forest fuel reduction focusing resources on the highest priority areas

- Seek out every opportunity for financial support for projects
- Streamlined permitting process for fuel reduction
- Ingress and egress fuel reduction projects
- Fuel reduction in utility right-of-ways
- Encourage fire insurance incentives
- Provide local support to legislative efforts when appropriate
- Reduce long-term costs of fire suppression and fire mitigation

3. **Reduce hazardous fuels in the forest and rangeland areas.**

   By:
   - A strong project oriented program
   - Support of a strong, qualified, private contractor network to develop and complete projects
   - Cooperate with Federal and State partner agencies through contiguous project identification and completion
   - Maximize the opportunities of future ecosystem health
   - Encourage expansion of resources (public and private) to support mitigation work

4. **Continue to assess and address the current wildland urban interface (WUI) problems at all levels.**

   By:
   - County/City/Town/Fire District fire protection and mitigation plans
   - Coordination with federal and state land management agencies
   - Encouraging the need for water supply systems in existing subdivisions
   - Centralize fire history documentation
   - Support a statewide, consistent, fire risk assessment system
   - Recognize that this plan is dynamic and needs to be continually updated

5. **Offer education and awareness programs for developers and homeowners in WUI.**

   By:
   - Support wildland/urban interface fuel hazard mitigation subdivision regulations
   - Support water supply requirements
   - Promotion of fire-resistant building materials
   - Support emergency access regulations
   - Work with real estate professionals and developers concerning educating their customers on the wildland fuel hazard in their area
   - Sponsorship of programs such as *FIREWISE*
   - Work with the media to make the risk known to the public, and celebrate the project success
   - Break down jurisdictional boundaries for mitigation and awareness programs
   - Partnership with FireSafe Montana

6. **Work with local fire jurisdictions to address their WUI issues.**

   By:
   - Participation in fire department sponsored fire prevention programs
   - Support the development of response pre-planning
   - Support rural addressing programs

5) Description Of General Areas Of Plan Coverage

TCFWG planning covers all of the three member counties. The area includes the borders of 3 National Forests, 2 BLM field offices, areas on both sides of the continental divide, MT-DNRC Central and Southwest Land Offices areas and 27 different city and volunteer fire jurisdictions. It uses a natural topographical and watershed approach to looking at the wildland fire risk and the populations within its area of influence.

It also encompasses the Elkhorn Wildlife Management Unit, which is the only one of its kind in the Forest Service. The Elkhorn Wildlife Management Unit was established as a result of the Final Elkhorn Wilderness Study Report (1982). The wilderness study was made in compliance with Public Law 94-557. In addition to making the study, this law required that the land's present wilderness character and potential for inclusion into the National Wilderness Preservation System be maintained for four years after the study is submitted to Congress, September 1986, or until Congress acts on the study's recommendation, whichever comes first. The Final Report (and FEIS) recommended no area be designated for wilderness but that a Wildlife Management Unit be established in the Helena and Deerlodge Forest Plans using the following criteria:

- Wildlife habitat will be managed to maintain viable populations of species associated with existing ecosystems, with emphasis on selected species that have seclusion as one of their habitat requirements.
- Vehicular access will be restricted as necessary to maintain wildlife habitat values and to provide seclusion for selected species, particularly within outlined mountain goat and moose habitat areas.
- Management controls over the use of motorized vehicles will be implemented, whenever necessary to protect the wildlife habitat and other natural resources. This will include the closure and restoration of roads that are under Forest Service control, or that can be placed under Forest Service control, which are not necessary to the use and management of the area.
- A trans-mountain road will not be considered.
- Land management activities for other resource values will be considered when they are compatible with management direction for wildlife.
- The Elkhorn Study has evaluated wilderness for the Study Area. Therefore, the Forest Plans did not consider a wilderness alternative for the Elkhorn Study Area.
- To the degree possible, the High Visual Resource Area around Elkhorn and Crow Peaks and the two areas proposed for wilderness area around Tizer Basin and Crazy Peak (in Alternative E of the Elkhorn FEIS) will be managed so as to maintain existing roadless and visual resource values and to minimize the impact of human activities. (See Final Elkhorn Wilderness Study Report and FEIS.)
- To the extent that manpower, funding, and legal limitations allow, interim management pending congressional action will include steps to remove structures and signs of human activity that are not of historical significance.

Developing management guidelines for the Elkhorn Mountains has involved the active participation of the Montana Department of Fish, Wildlife and Parks (MDFWP). In addition to developing

management guidelines, both agencies have also initiated a cooperative Elkhorn Wildlife Monitoring Program (1982).
Furthermore, Community Protection Plans have been developed by the Beaverhead-Deer Lodge National Forest to the south and the Lewis & Clark National Forest to the north which will also cover portions of our three counties. Our plan is intended to make any transitions with plans in other adjacent areas as seamless as possible.

The population of Jefferson County is 11,406, with approximately 4,500 located in the area north of the Boulder Hill to the northern county line. Basin, Boulder*[1], Clancy, Elkhorn, Jefferson City, Montana City, Whitehall and Wickes are directly covered by this plan. Land ownership is split: 45% Private; National Forest 43%; BLM 9%; and State 3%.

The population of Broadwater County is 5,612. Land ownership of the 1,193 square miles in the county is split: 60.4% private; 23.5% National Forest; 8.1% BLM; and 3 % state. The county encompasses portions of the Elkhorn Mountains on the west and the Big Belt Mountains on the north.

This plan directly covers the communities of Townsend*, Toston, Radersburg, Winston, and the Canyon Ferry Lake area. The growth potential in parts of the county is considered high, particularly in the western portions near the border with Lewis & Clark County. The areas around Canyon Ferry Lake that lay in Broadwater County are attractive for recreational users including full and part time residential development. The county identifies the National Forest to be at the greatest risk from crown fire in its adopted PDM plan. That plan indicates the impact on the population as moderate, with a moderate to high probability of occurrence, with a high magnitude or severe impact on the community if a major wildfire happens. Critical infrastructure does exist, ie. power transmission lines.

The population of Lewis & Clark County is 63,395. Here we again see a geographic split in population with those living in the various areas of the county; Augusta (309), Baxendale, Canyon Cr*, Canyon Ferry, Craig* (403), East Helena (1984), Helena*(28,190), Helena Valley (22,587), Lakeside, Lincoln*(1,013), Marysville*(80), Nelson, Wolf Creek(510), York (180), and Unionville (275). Land ownership is split: 44% National Forest; 42% private; 17.2% state; and 3.2% BLM.

According to the Montana Statewide Pre-Disaster Mitigation Plan, Lewis & Clark County ranks among the highest counties in the state for Class II /III condition class land. Of the total 2,232,434 acres, 641,980 acres (28.76%) are in Condition Class II, and 356,573 acres (15.97%) are in Condition Class III. A total of 998,453 acres (45%) in these two condition classes, considered highly vulnerable to future wildland fire.

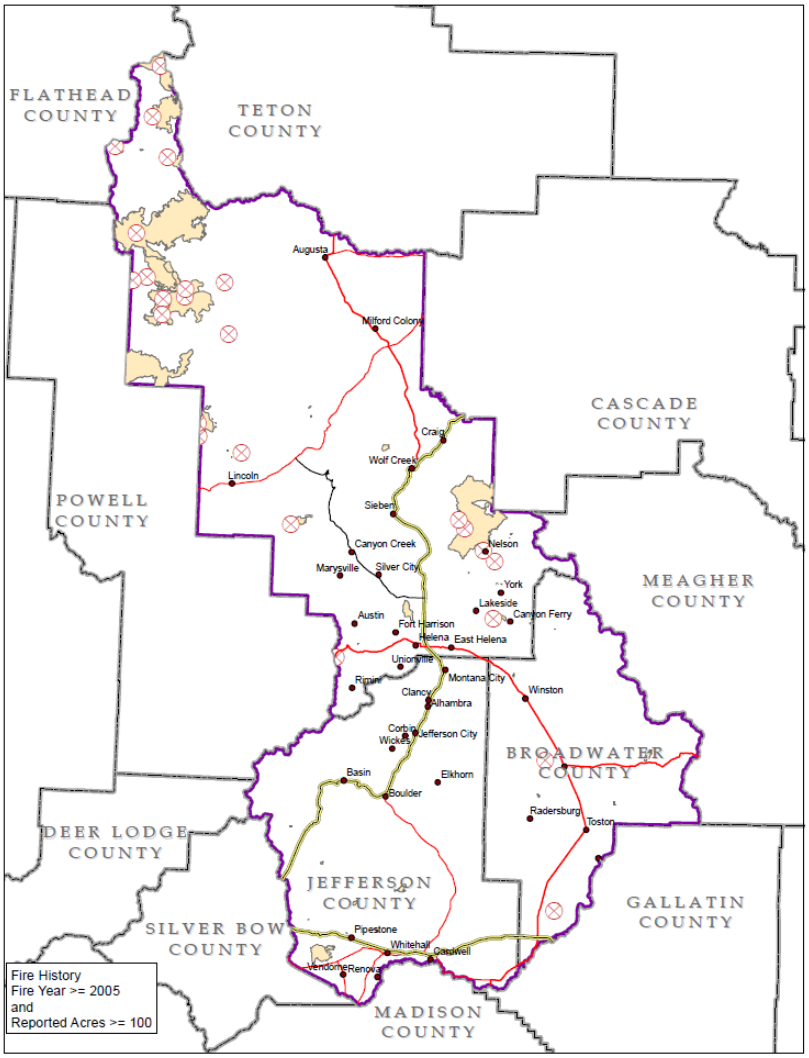
Lewis & Clark County alone has 309,948 acres that are mapped and risk rated at the “High” level. There are 1,363 homes found in these same acres. There is an estimated 155,796 acres risk rated in the “High to Severe” level, with 1,750 homes located in that ranking. A population estimate of 2 occupants per home would calculate to a minimum of 6,226 people living in these two risk rated areas. (numbers from 2013 GIS mapping data, growth in the interface is ongoing). Additional information can be found in the County 2014 Growth Policy Update

The identified communities within this boundary vary widely in population, elevation, infrastructure, transportation systems, fire protection organization, density of development, type of

[1] * Indicates a ***Community-at-Risk*** as identified in the Federal Register.

development, and the wildland fuel hazard. There are however, similarities in topography, recreational use, fuel types, and fire history.

6) Fire History



Fire history maps of Broadwater, Jefferson, and Lewis & Clark Counties allow fire managers to quickly see where past fires have occurred. While these maps give important information on the fuel based on how long ago a fire burned, they are not always accurate indicators of the intensity of the burn or the fuel remaining today.

Fire has been the major influence on vegetation patterns, composition, structure, function, age and development of both individual stands and the larger landscape (Arno 2000).

Since 1984, 87 fires over 100 acres have occurred within the tri-county area and approximately 50 percent have been caused by humans. Although many fires had no accompanying written information and therefore were not included in fire occurrence maps, this data does give a glimpse of the fire suppression history in the area. Fires that escaped detection would not be included. Fire occurrence data (see Appendix B) was digitized as point source data from historical maps that portrayed fires by year, size, and cause for 1920 to 1969. For the period from 1970 to 2014, fire occurrence information was developed from Kansas City fire database (KCFast). Records from this period have detailed information including acreage, cost, and physical location.

7) Community Collaborative Efforts Information

Planning sessions were held through the auspices of Tri-County Fire Working Group with representatives of the agencies and individual members represented. These include the regular monthly meetings of the Tri-County Fire Working Group. Presentations of the Wildland/Urban Interface designation, maps, and the plan preparation discussion were made at:

- Whitehall VFD;
- Lewis & Clark County Rural Fire Council
- Rimini Community/ Upper Ten Mile Cr watershed protection group;
- Jefferson County Rural Fire Council;
- A joint L & C County/City of Helena Commission work session;
- The lower Ten Mile Cr watershed protection group;
- Basin Community;
- Lincoln Community Council;
- Boulder Community;
- Helena Open Lands Management Council;
- Broadwater County LEPC;
- Lewis & Clark County LEPC;
- Jefferson County LEPC;
- Augusta VFD;
- a joint meeting with HFD,
- City of Helena Parks and Recreation,
- HOLMAC forester,
- USFS representative, and private foresters.
- Presentations at "Fire On The Landscape" Lecture Series

8) Climatology

The Tri-County area is usually clear, sunny and dry. Low humidity levels make both summer and winter temperatures seem more comfortable than those temperatures would seem in other parts of the country. Because these Counties are on the "dry side" of the Continental Divide, there are generally more sunny days than west of the Divide. This weather phenomena is a two edged sword. Low humidity's and warm sunny days also provide the conditions for active wildland fires.

Dry winters accompanied by a wet spring season have been typical for the area and summer rainstorm systems tend to become drier in July and August. In most instances storm systems produce enough rain to extinguish any fires that are started by lightning. However, as the summer season progresses rain storms become drier resulting in more frequently started lightning fires.

A climate change study by the University of Montana paints a bleak future for the Northern Rockies forests and grasslands, with warmer temperatures and associated drought leaving the forests more susceptible to insects and fire. The Study predicts that over the course of the next century, annual temperatures are projected to warm 3.6 to 7.2 degrees. Winters will be shorter and summers will be longer with spring snowmelt occurring four to six weeks earlier and summer drought periods lasting six to eight weeks longer. As a result, wildland fuels will be subjected to longer periods of drying and insect attacks providing for more available fuels. More wildland fires are expected to exhibit more extreme fire behavior resulting in more dangerous and damaging fire.

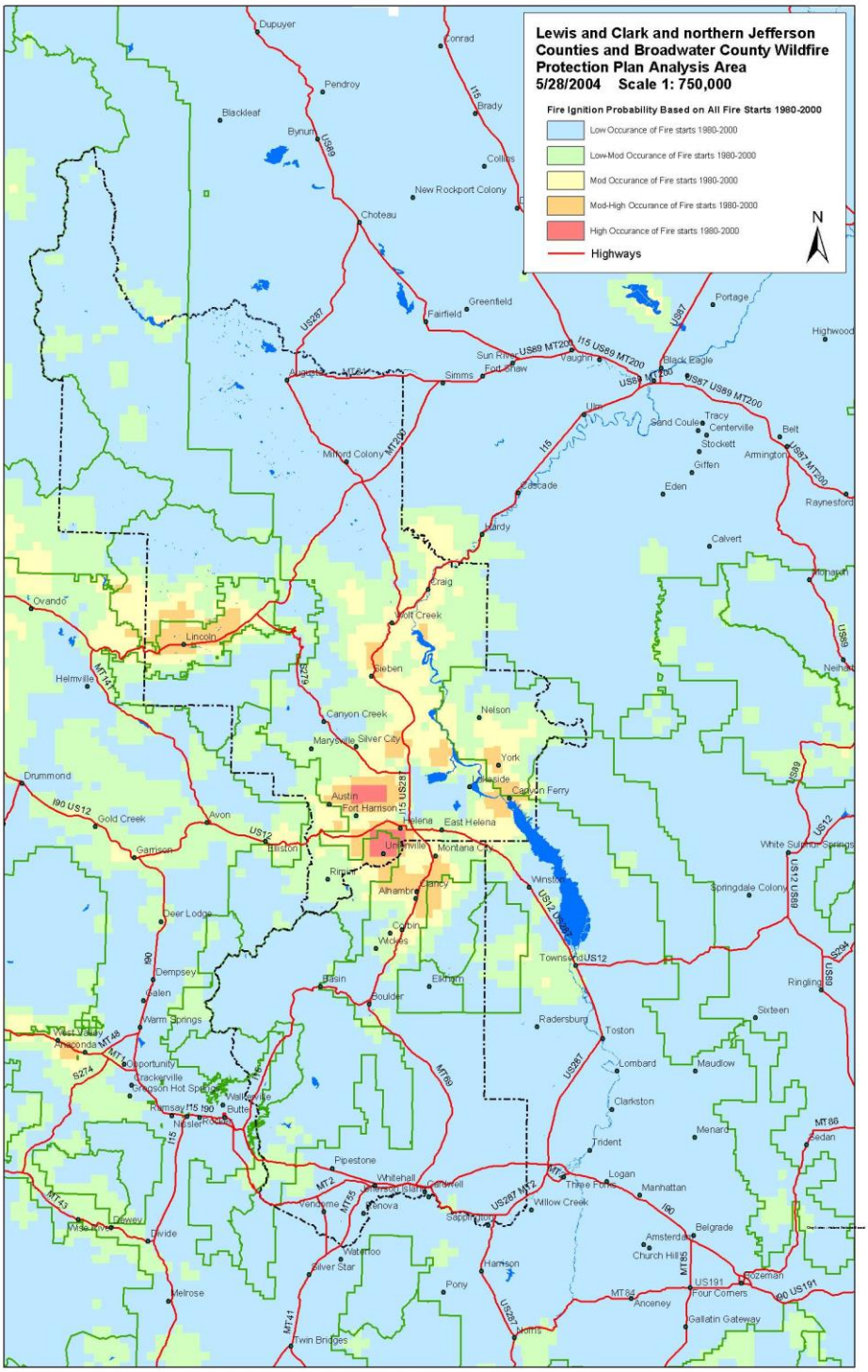
As for the annual seasonal snowfall, warming periods between snowfalls prevent heavy snow accumulations in the lower elevations. Snow depths rarely exceed five or six inches in and around the immediate town, while averaging approximately fifty inches in the surrounding mountainous areas. Since 1969, the average number of days per season with an inch or more of snow on the ground is 61 days.

The Tri-County area is covered by three Fire weather Zones; zone 114 on the north; zone 118 on the south; and zone 116 on the west. These zones are typified by frequent high wind events, thunderstorms, and low relative humidity. Lightning strikes, many of them from Dry Lightning storms, are common in the Tri-County area. Recent BLM lightning strike data shows over 13,000 lightning strikes during a 90 day period in a portion of Lewis & Clark County.

Area Climate Averages

	Helena	Townsend	Boulder
Average Annual Precipition	11.02	10.38	11.24
Average Daily High Temp. (July)	87.7°F	83.6°F	82.3°F
Average Daily Low Temp. (Jan.)	13.5°F	13.1°F	11.7°F

9) Probability Of Ignition Mapping



10) Wildland Fuel Hazard Identification And Mapping

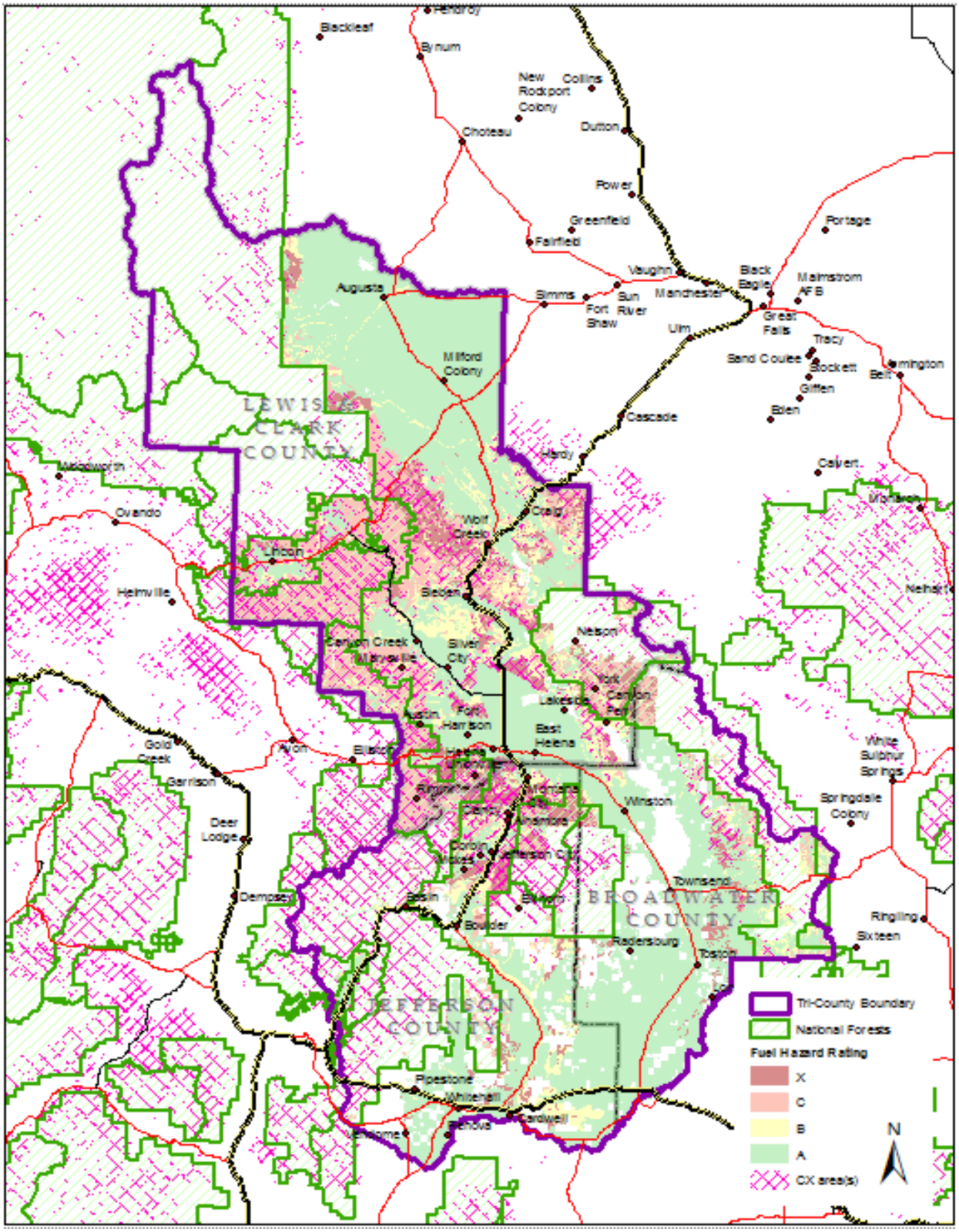


Figure 10.1: Wildland Fuels Hazard Rating Map

Fuel Hazard Classes.

Fuel Hazard Rating Maps prepared by Tri-County Fire Working Group for Broadwater, Jefferson, and Lewis & Clark Counties. Field work by Montana Prescribed Fire Services, Inc.

Vegetation as it relates to wildland fire has been classified into five primary "Fuel Hazard" groups considering steepness of slope as well as vegetation. Slope steepness simulates wind in its effect on fire spread. Changing from level ground to a 30% slope approximately doubles rate-of-spread in surface fires.

Group A: Group A fuels have potential for fast spreading fires when grass is cured such as early Spring before green-up and late summer and fall. These are areas of grass, weeds, and brush less than 2 feet high. The fire hazard can easily be mitigated in these fuels.

These areas are generally not a problem for development from a fire protection standpoint. Humans can usually avoid burning areas with ease and firefighters can work easily and efficiently under normal weather conditions. Heavy damages are still possible when items are within the burning area without adequate fuel treatments, clearances, or protection. This fuel type will accommodate the heaviest and widest range of developments with respect to wildfire hazards. *[Color Coded Green].*

Group B: These are medium density Conifer stands with primarily a grass and brush *understory*. The conifer *overstory* tends to reduce the density of the grass and brush. Minimal fuel reduction is needed to reduce this group to a less severe state.

Inexperienced people are usually afraid and can panic when these areas burn. Property, real and personal, can sustain heavy losses due to the greater burning intensities.

Due to the burning characteristics and resultant dangers for "B" rated fuels, it will be advantageous to coordinate and regulate development in these areas. Development can only exist if fuel modifications and treatments are completed prior to completion of the development. *[Color Coded Yellow]*

Group C: These are dense conifer stands and have potential for high intensity crown fires during periods of high fire danger with strong winds. These fuels can be reduced to a less severe state on slopes less than 30% but usually require some form of commercial harvest.

Experienced firefighters are most cautious in these fuels and are ever fearful of the crown fire potential. Rescue of persons entrapped by hot wildfires in these fuels are nearly impossible. Property, real and personal, can face complete destruction. Injuries can be serious and deaths may easily occur. The burning characteristics and resultant dangers in "C" fuels make it one in which close, coordinated, and regulated development is advantageous to all interests, both public and private. At best, development in these areas will only be marginal in safety and then only after modifications and treatments are completed prior to completion of the development itself. *[Color Coded Orange].*

Group X: This Group has potential for high intensity fire and extreme rates-of-spread. These are dense, flammable vegetation over two feet high including tall sagebrush and conifer reproduction (regeneration). Fuels can be readily reduced to a less severe state on slopes less than 30%.

Although very similar to "C" fuels when subjected to wildfire, the "X" type is delineated separately from "C" fuels because of its higher intensity burning characteristics, rapid rates of spread and its different requirements for mitigation. The dangers of intense, destructive wildfires are great*(est)* in "X" fuels. Property, real and personal, will face heavy damage and possibly complete destruction during wildfires. Injuries can be serious and deaths may easily occur due to entrapment.

The burning characteristics and resultant dangers make it one in which close, coordinated, and regulated development is imperative to all interests, both public and private. Fuel Hazard "X" lends itself to modification and can usually be readily reduced to a type "B" classification. *[Color Coded Red].*

Group CX: Since the initial CWPP was completed and approved in 2005, the three- county-area addressed by this plan, has been infested with Mountain Pine Beetle and Spruce Bud Worm in epidemic proportions. The result of this epidemic is hundreds of thousands of acresof dead trees with a receptive fuel bed of dead needles primed for easy ignition with unusually rapid rates of spread and burning intensity. The rate of heat release has been measured at two-times that of healthy green trees and the peak of heat release occurs much sooner than when green healthy trees burn. Fires in this fuel type have increased potential to go big quickly, even with moderate fire weather and light wind. In addition to this obvious hazard to firefighters and civilians, the dead trees present an additional hazard from blow-down.

Due to the potential for extreme fire behavior, this fuel type is mapped separately and requires even greater caution and regulation than that described in Group "C" and "X" above. *[Color Coded Purple with Cross-Hatch].*

Summary: Numerical comparison of fuel hazard classes is not possible because many different considerations are involved. Classes "A" and "X" are most likely to have fires that spread rapidly because of the abundance of grass and small diameter surface fuels (fine fuels) that dry rapidly and are exposed to the wind. In Class "A" fuels, the threat to life is negligible but firefighters have sustained severe and debilitating burns without proper personal protective gear. Property damage occurs only where fuels are tolerated right up to structures.

Fires that occur in Class "X" fuels during dry, windy, conditions can burn with sufficient intensity to endanger life and ignite structures at some distance. Quite troublesome destructive fires have occurred in Class "X" fuels.

The usual fire in Class "B" fuels is a moderately spreading surface fire, depending upon the amount of fine fuels present. The medium density overstory tends to reduce the mid-flame wind speed at the surface, reducing the rate-of-spread from that exhibited by Class "A" and "X" fuels. Fires in Class "B" fuels are usually easily controlled.

Fires in Class "C" fuels are normally slow-spreading, of low intensity, and rather easily controlled. However, dry conditions coupled with wind or steep slopes over 30% can produce the type of inferno typified by the fires of 1988, 1990, and 2000 in our area. All of these fires contained large areas of "X" fuels intermingled with Class "C" fuels.

Fires in class CX fuels can exhibit extreme fire behavior even with only moderate fire weather. Fires in these fuels have shown unusually rapid rates-of –spread, with large numbers of spot fires and extreme burning intensity.

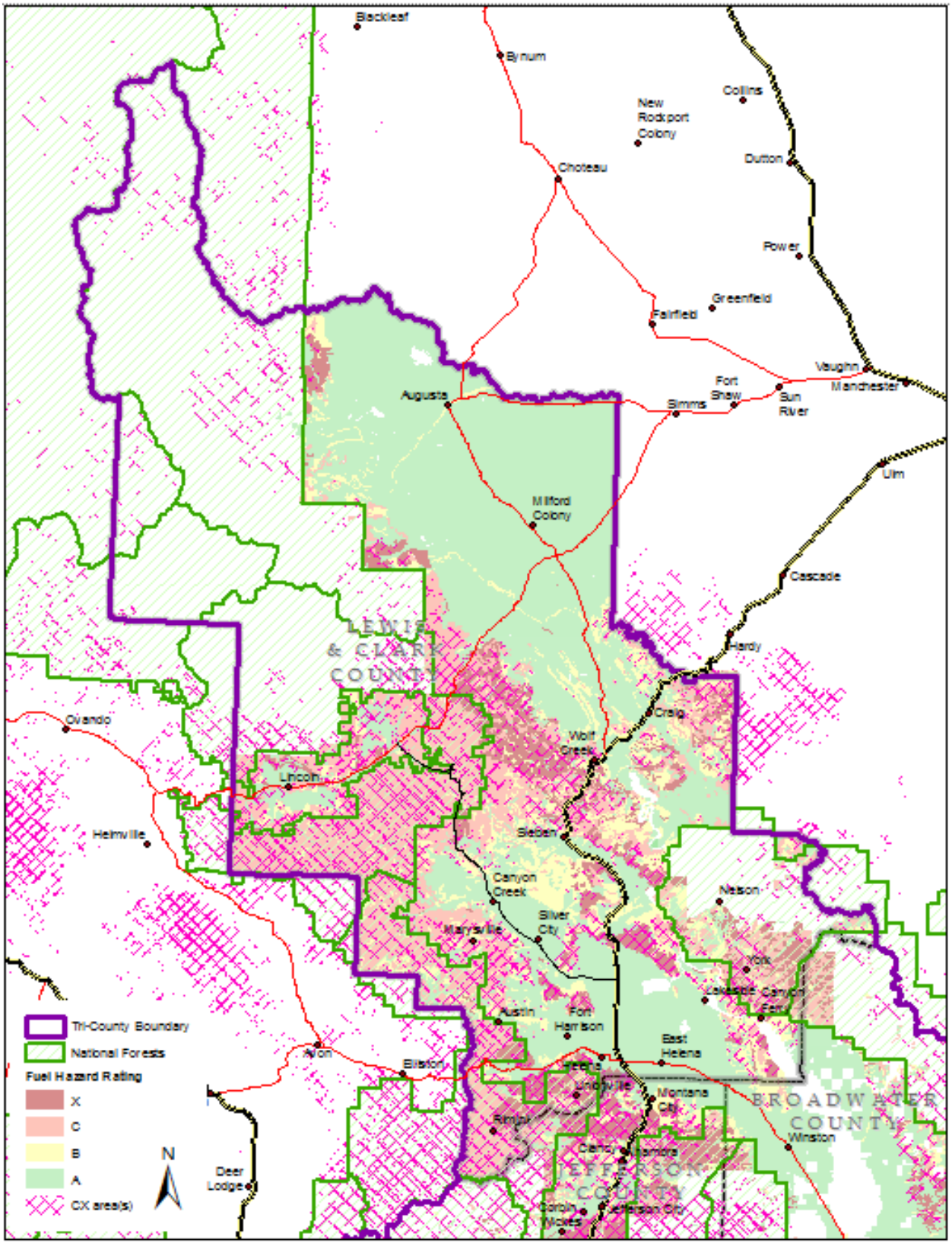


Figure 10.2: Wildland Fuel Hazard Rating Map – Lewis & Clark County

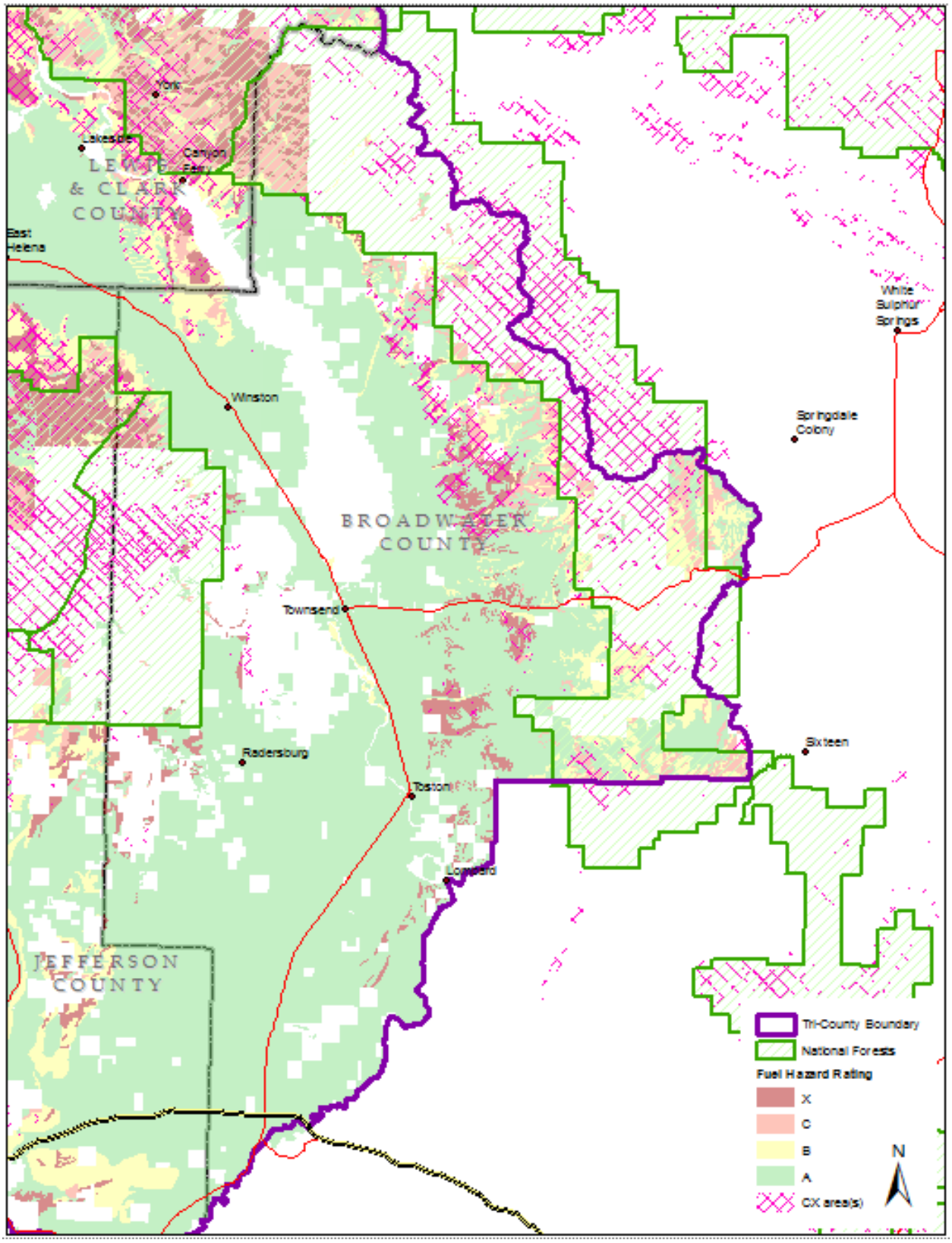


Figure 10.3: Wildland Fuel Hazard Rating Map – Broadwater County

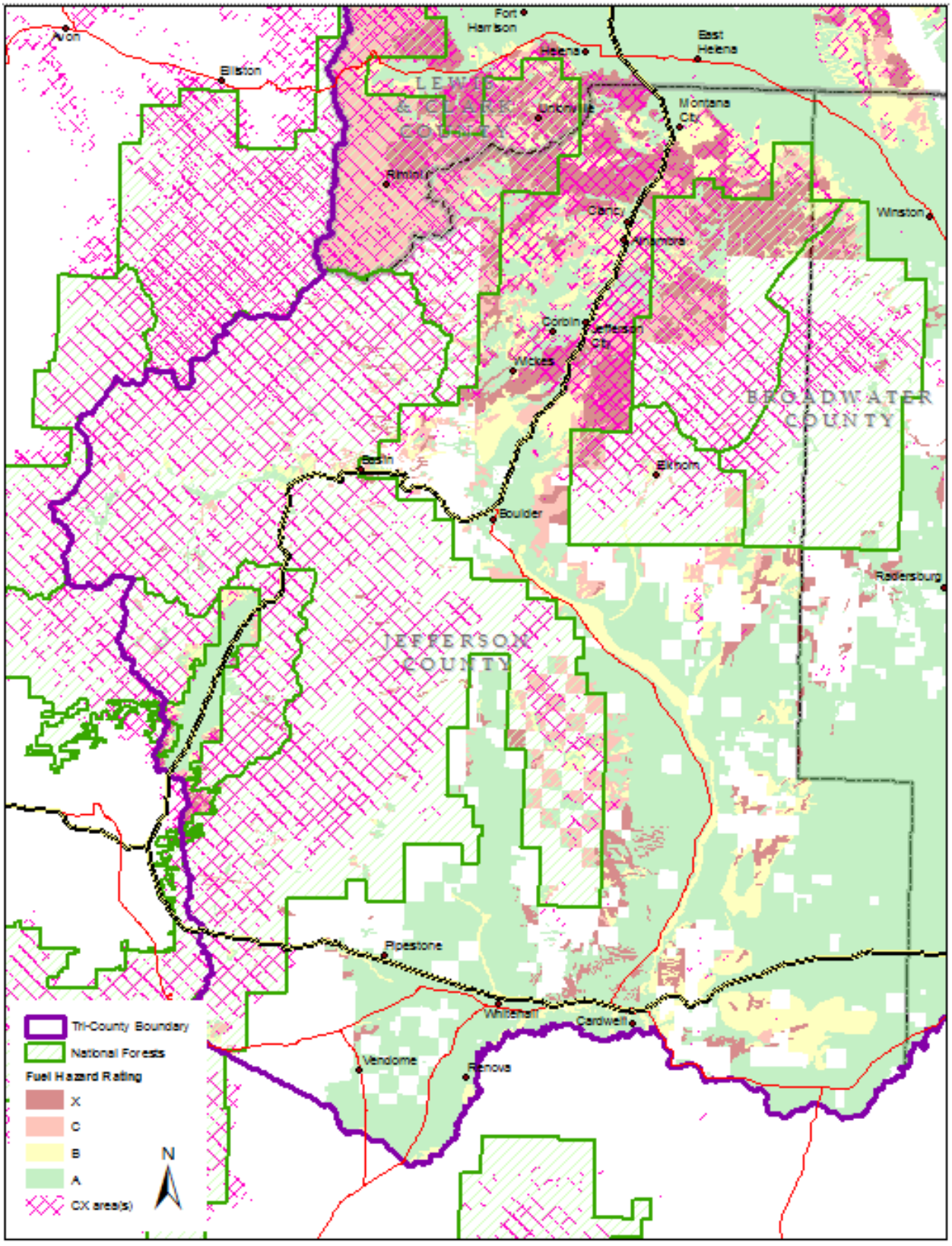


Figure 10.4: Wildland Fuel Hazard Rating Map – Jefferson County

11) Population Density Mapping

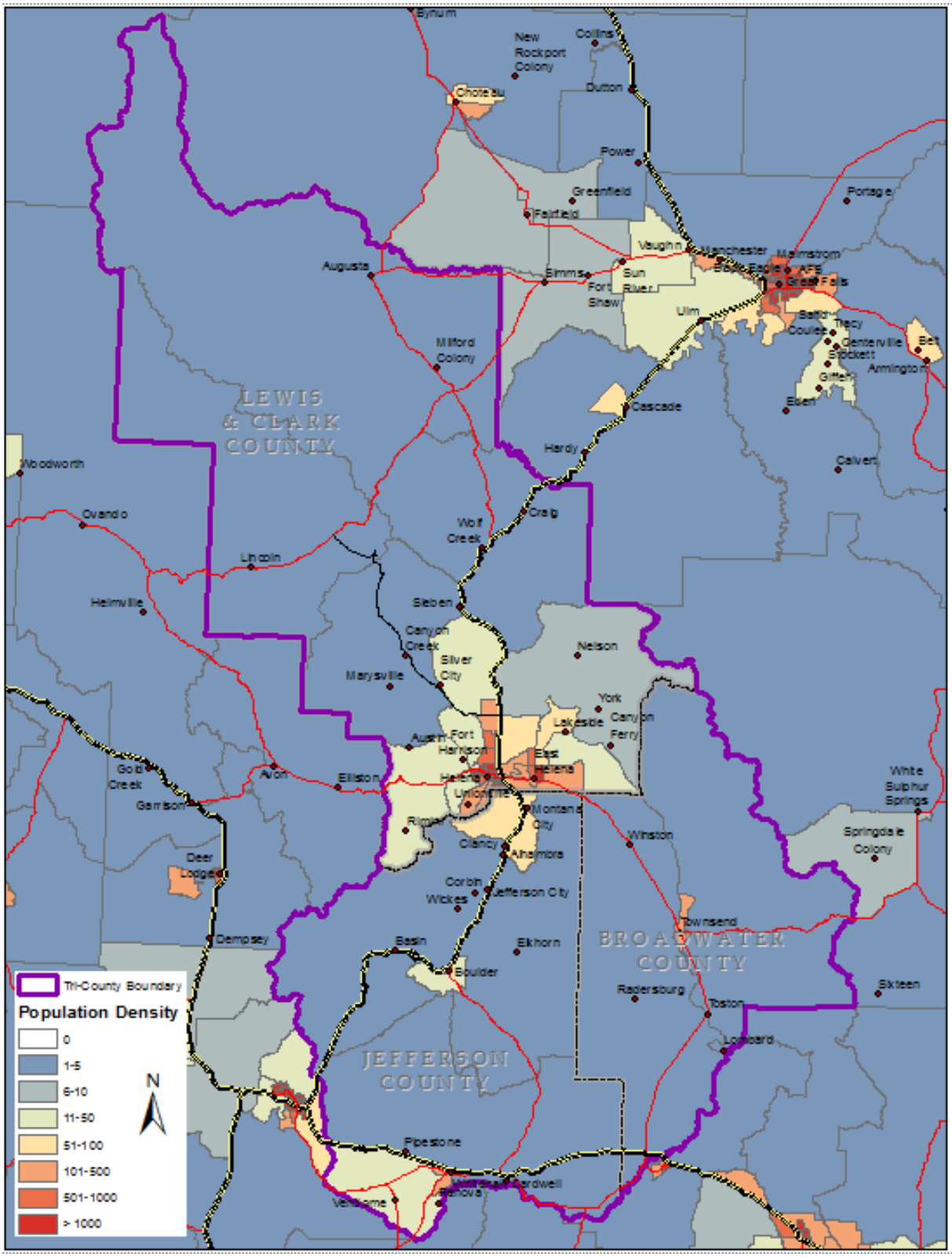


Figure 11.1: CWPP Area Population Density Map

12) Wildland/Urban Interface Definition And Mapping

Values At Risk.

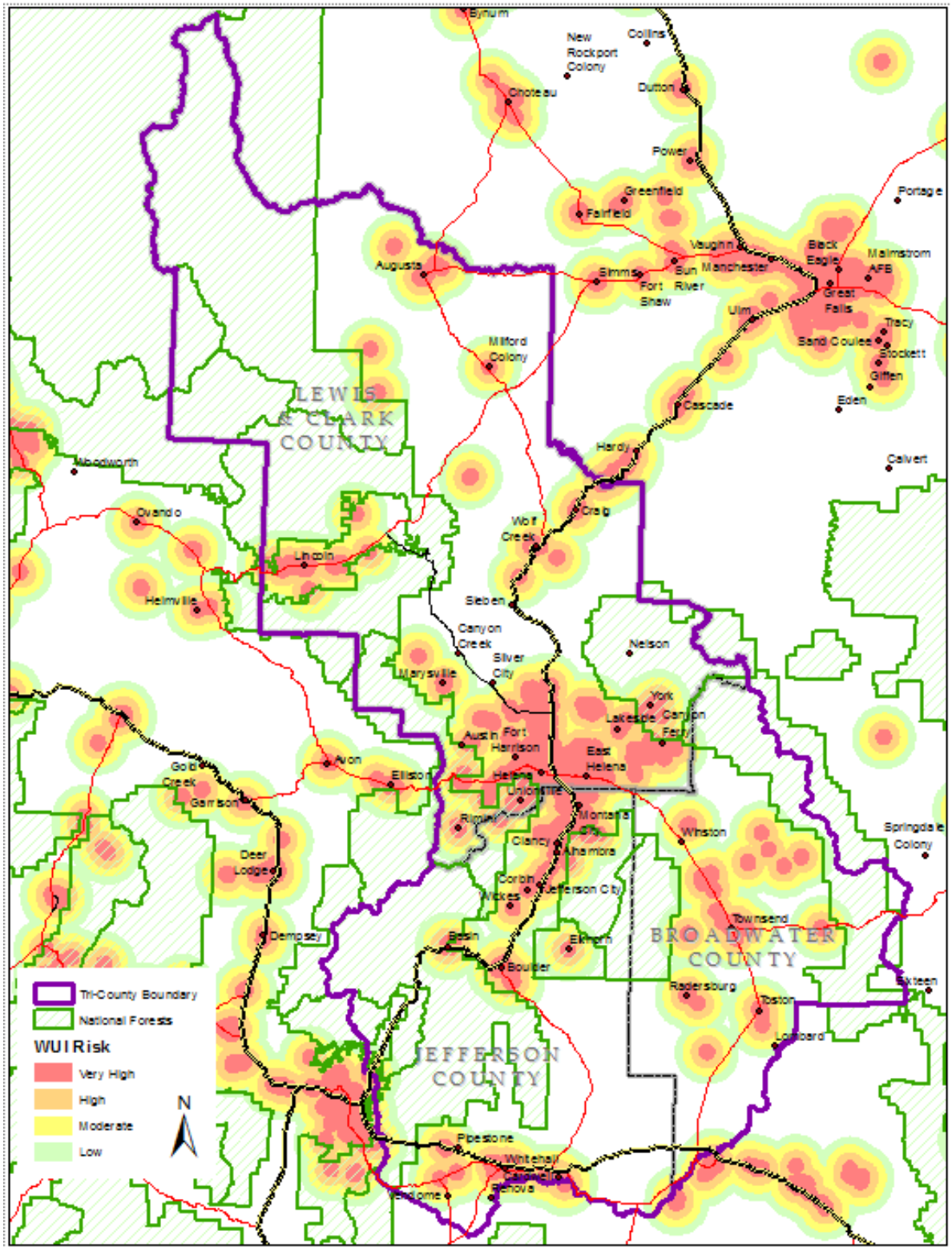


Figure 12.1: Wildland/Urban Interface Boundary Designation Map

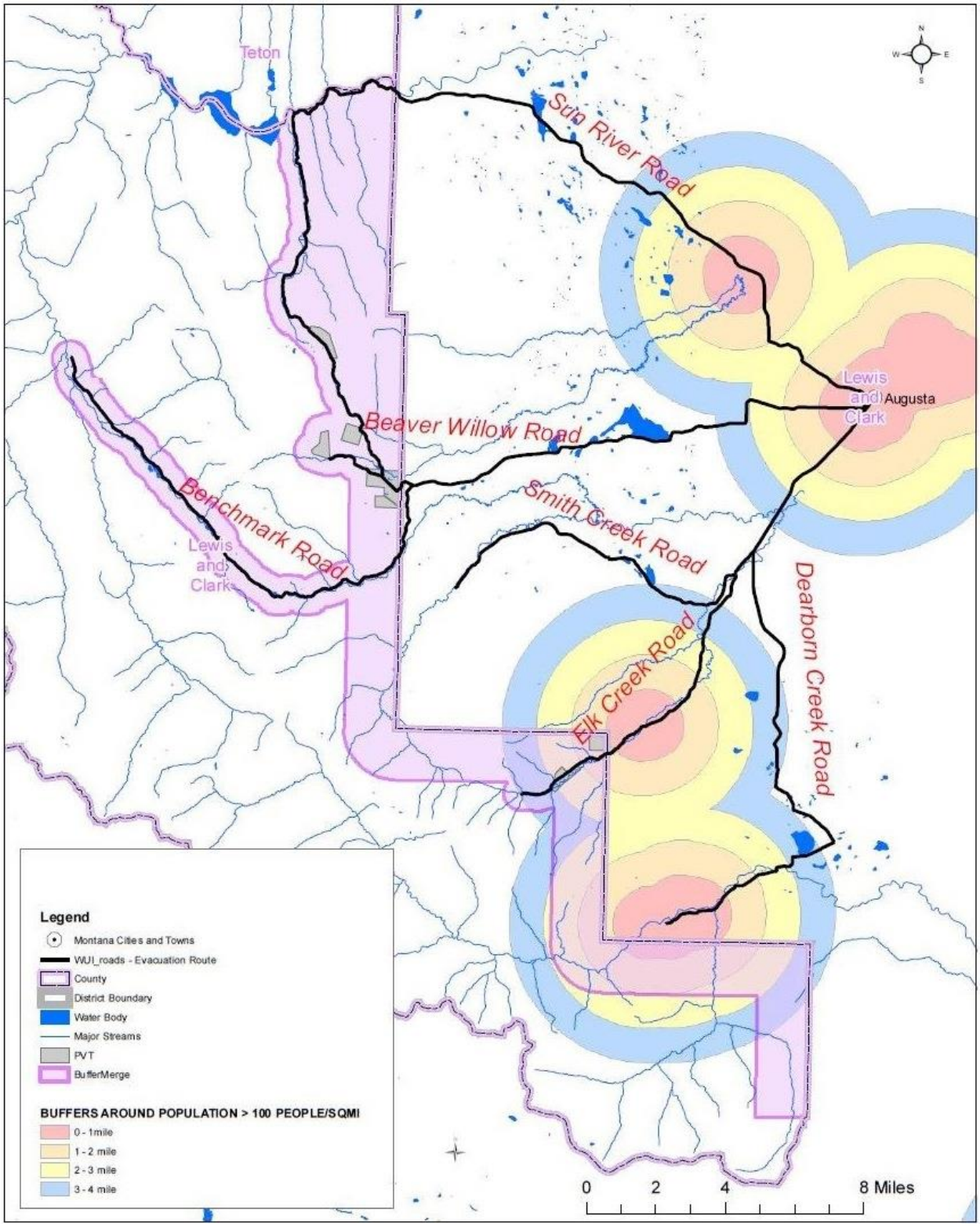


Figure 12.2: Augusta Wildland/Urban Interface Boundary Detail Map

Tricounty Community Wildfire Protection Plan Wildfire Fire Risk Analysis December 2004

A wildfire fire risk analysis was completed for the Lewis and Clark, Northern Jefferson, and Northern Broadwater counties (tri-county area). Three principle input layers were used to assess risk of wildfire damage to lands and structures in the tri-county area. The input layers were: fuel hazard risk, fire ignition probability, and wildland urban interface risk (based on proximity to interface communities). Each of the input layers had four hazard ratings: 1(low), 2 (moderate), 3 (high), and 4 (very high). A fire risk output layer was created by combining the three input layers with result values from 1 (low) to 12 (very high). This document summarizes how each of the three layers were created and how they were combined to create a fire risk analysis layer. The results of this analysis are intended for landscape level fuel reduction project priority comparisons within the tri-county area (approx 3 million acres). The input and output layers are 30m grids and are suitable for landscape level analysis at scales of 1:100,000 or greater.

Fuel Hazard Layer

A fuel hazard risk 30m grid for the tri-county area was developed by combining three input fuel hazard risk layers. The three input layers were: Lewis and Clark County fuel risk, Broadwater County fuel risk, and National Forest lands fuel risk. Each input layer had four fuel hazard risk classes: 1 (low), 2 (mod), 3 (high), and 4 (very high). An additional fuel hazard risk class for large water bodies was added: 0 (water). The two county fuel hazard risk layers were based on local fuel surveys and local fire department input. The Lewis and Clark County fuel hazard risk layer was developed in 2002 and primarily covered urban interface areas within the county. The Broadwater County fuel hazard risk layer was developed in 2003 for the Deep Creek Canyon area. The National Forest lands layer was developed following a fuel hazard risk mapping protocol developed by the USFS Region One National Fire Plan analysis group. Land cover type, tree canopy, aspect, and slope inputs were given fuel hazard weights and then summed to provide overall fuel hazard risk. The National Forest lands layer was developed in 2004 for all tri-county analysis areas not mapped in the two county layers. The final fuel hazard risk layer was created by combining data from Lewis and Clark County first, Broadwater County second, and all remaining areas from the National Forest layer. Each 30 meter cell has a fuel hazard risk of: 0 (water), 1 (low), 2 (mod), 3 (high), and 4 (very high).

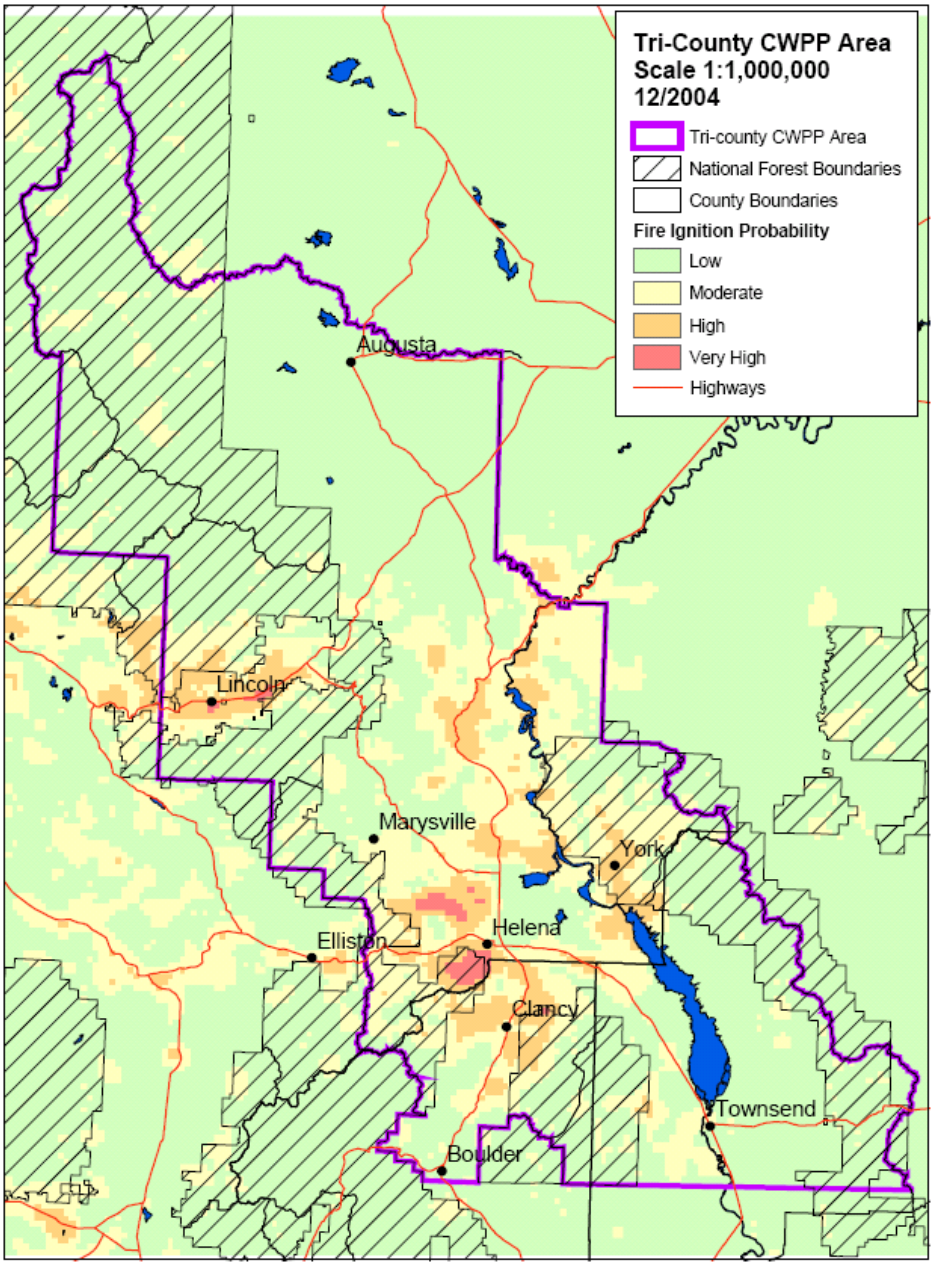


Figure 12.3: Fire Ignition Map

Fire Ignition Layer

The fire ignition probability 30m grid for the tri-county area was developed by the Wildlife Spatial Analysis Lab at the University of Montana for the USFS Region One Cohesive Strategy Team. The layer was based on an analysis of natural and human caused fire starts from 1981 through 2000. Fire start densities per 1 km cell were calculated using a point interpolate function based on the fire start data. A fire ignition probability layer was then created based on a natural breaks analysis of the fire start densities. Four fire ignition probability classes were mapped: 1 (low), 2 (mod), 3 (high), and 4 (very high). This layer was based on a fire start point coverage assembled from multiple sources but some data gaps are possible during the 20 year period covered. Each 30 meter cell has a fire ignition probability of: 1 (low), 2 (mod), 3 (high), and 4 (very high).

Wildland Urban Interface (WUI) Risk

The wildland urban interface risk 30m grid for the tri-county area was developed by combining two input wildland urban interface layers. The two input layers were: Tri-county wildland urban interface zones and USFS Region One Healthy Forest Restoration Act (R1HFRA) wildland urban interface. The tri-county WUI zone layer was developed based on recommendations from the tri-county fire planning group. Wildland interface zones up to four miles from interface communities (defined in the Federal Register notice of January 4, 2001 as areas where population density >= 250 people per square mile), were identified by the tri-county fire planning group as important areas for reducing fuel hazards. A wildland urban interface zone mapping procedure was created based on buffering interface communities by four miles. First, pixels with population density >= 250 were selected from a 30m population density grid (Wildlife Spatial Analysis Lab at The University of Montana). The selected pixels were converted to a polygon coverage and the polygons were buffered by four miles using one mile zones. Each one mile buffer zone in the four mile area was assigned a WUI risk class of: 4 (very high) for the nearest, 3 (high) for the next, 2 (mod) for the next, and 1 (low) for the farthest. An additional WUI risk class of: 0 was assigned to areas outside of the WUI zones.

Additional WUI areas were added from the R1HFRA WUI layer. The R1HFRA WUI layer was created based on WUI mapping methods outlined in the Healthy Forest Restoration Act using communities at risk, population density, and topography modeling. First all Communities at Risk (identified in the January 4, 2001 Federal Register), point locations were buffered by ½ mile. Second all pixels with population density >= 28 people per square mile were selected from a 30m population density grid, converted to a polygon coverage, and buffered by ½ mile. Third, all major roads in Montana were buffered by ½ mile. All three buffered layers were then combined together to form initial WUI areas. The combined initial WUI areas were then buffered by an additional 1 mile for a total buffer distance of 1.5 miles (1/2 mile initial buffer + 1 mile buffer) to form an intermediate WUI area. The intermediate WUI area was then intersected with areas of sustained steep slopes (slopes > 25% that were at least 5 acres in size). Finally, the 1.5 mile buffered areas were reduced back to the sustained steep slope areas or to the ½ mile initial buffer. The final result were WUI areas extending the first ½ mile from communities at risk, areas of population density > 28 people per square mile, or major roads, and then extending up to an additional mile where there were sustained steep slopes.

In particular, the R1HFRA WUI layer identified corridor routes along major roads not identified by the Tri-county WUI layer. The additional R1HFRA WUI areas were assigned WUI risk values of: 1 (low) because they were more than 4 miles from interface communities. Each 30m cell in the final wildland urban interface risk grid has a WUI risk of: 0 (outside WUI zone), 1 (low), 2 (mod), 3 (high), and 4 (very high).

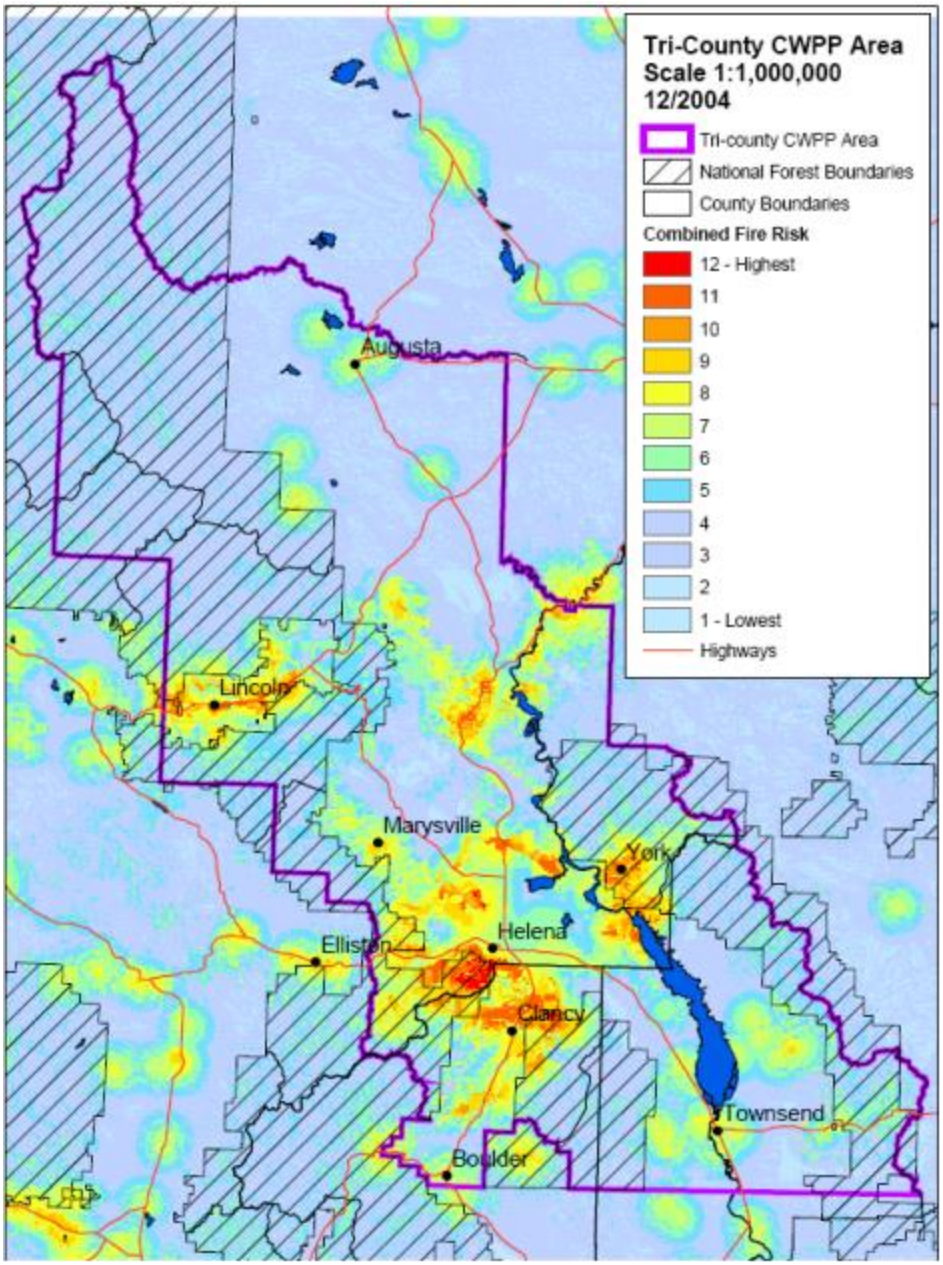


Figure 12.4: Combined Fire Risk Map

FIRE RISK

The fire risk layer for the tri-county area was created by combining the three 30m input grids described above. A combined risk value was assigned by adding the fuel hazard risk, fire ignition probability risk, and WUI risk values from each 30m input grid. Each 30m cell has a combined fire risk value from 1 (lowest) to 12 (highest).

13) Definition Of The Tri-County Wildland/Urban Interface Boundary

The Healthy Forest Restoration Act defines the wildland urban interface as:

A) an area within or adjacent to an at-risk community that is identified in recommendations to the Secretary of Agriculture in a community wildfire protection plan; or

B) in the case of any area for which a community wildfire protection plan is not in effect-

i) an area extending ½ mile from the boundary of an at-risk community

ii) an area within 1.5 miles of the boundary of an at-risk community including any land that

I) Has a sustained steep slope that creates the potential for wildfire behavior endangering the at-risk community.

II) Has a geographic feature that aids in creating an effective fire break, such as a road or ridge top; or

III) Is in condition class 3 as documented by the Secretary in the project-specific environmental analysis; and

IV) An area that is adjacent to an evacuation route for an at-risk community that the Secretary determines, in cooperation with the at-risk community, requires hazardous fuel reduction to provide safer evacuation from the at- risk community.

In developing our **localized WUI**, the following was taken in to account:

In the development stage of a plan dealing with the impacts to communities by wildfire, crown fires are often the focus of attention. Since the focus of attention is generally centered around crown fires and their effects on surrounding communities, for the sake of consistency, crown fire models will be used to determine the appropriate Wildland Urban Interface (WUI) area. It is important to state not all fires will become crown fires and in most cases only affect the surface structure of the forest.

Crown fire data available to determine a WUI area is based upon data which is taken from Rothermel's "Predicting Behavior and Size of Crown Fires in the Northern Rocky Mountains (1991)." Of the crown runs studied most ranged from 2 to 5 hours in duration. Distance covered varied from 2 to 7 miles and forward rate of spread ranged from .51 to 3.0 miles per hour. Average forward rate of spread was 1.13 miles per hour. The 20 foot wind speed varied from 10 to 45 miles per hour. With this data available the following two methodologies are offered:

Number One:

- The crown runs studied by Rothermel had a duration time of two to five hours. To calculate an average rate of spread between the different fires, all seven of the times were added together then divided by the total number of fires analyzed. Resulting in the following calculation:

$$\frac{(5+2+4+3+3+.83+4+2.5)}{7 \text{ fires}} = 3.5 \text{ hours.}$$

- The forward rate of spread was also reached through the same process as previously stated. The sum of the seven fires observed rate of spread per hour was divided by the total number of fires analyzed, once again that being seven.

$$\frac{(1.4+3.0+.52+.92+1.04+1.56+.55+0.55)}{7 \text{ fires}} = 1.4 \text{ miles per hour}$$

- Therefore using these calculations in the following formula:
  (3.5 hours avg duration of crown fire X 1.4 mph spread rate)= 4.9 miles

Number two:

- Similarly the distance covered by the different fires was established using the same type of methodology. To calculate the miles of travel by the seven different fires their distance was added together then divided by the total number of fires analyzed, that being seven.

$$\frac{(7+6+2+2.8+3.12+1.3+2.2+1.29)}{7 \text{fires}} = 3.7 \text{ miles.}$$

The conclusion reached, after analyzing Rothermel's findings, and our calculations from actual fires, was that a half to one and a half of mile area, as prescribed by the Healthy Forest Restoration Act, is not adequate to substantially affect the forward progression of a crown fire. In most of those cases studied the forward rates of spread, when duration and distance are taken into account, exceed the prescribed allowable limit and would have resulted in negative impacts to the community and its infrastructure. Therefore, to have a substantial effect on fire behavior the area of vegetation manipulation has to be expanded from at least 3.7 to 4.9 miles. It would be reasonable to expand the WUI area from half to one and a half miles to **four miles**. This conclusion is easily deduced from Rothermel's averaged duration times and distance covered by the seven different fires he studied. Furthermore, when looking at the averaged rates of spread, calculated in miles per hour, if left to the prescribed WUI distance of half to one and half miles, the time period for responding emergency resources would be approximately one hour. By expanding the boundary to four miles, the allowable time would also be subsequently lengthened providing a significant increase in the time for those emergency resources to formulate a safe plan of attack. The increase time period would also allow for greater amounts of time for those living in the WUI area to be systematically evacuated in a reasonable fashion.

14) Critical Infrastructure

This plan is not meant to provide a listing of specific sites nor the locations of such areas considered as critical to this area or to a broader public area. We are however making the reader aware that we are cognizant of the need to protect designated areas of certain particular interest and projects may be geared toward the protection of various community infrastructure. Examples include: Transportation corridors; Power line corridors; City of Helena water supply/Ten Mile Cr flume system; Residential Development infrastructure on the South side of the City of Helena; Communications system components. We are working through the county DES coordinators for key contacts with those entities who own or are responsible for such infrastructure to develop mitigation plans and actions for protection from wildland fire.

15) Response Agencies, Organization And Capabilities

See the appropriate County Emergency Operations and Pre-Disaster Mitigation Plans for more information…

16) Methods Of Reduction Of Area Fuel Hazard

Techniques Available To Manage Vegetation For Fire Protection

Within the fire environment of fuels, weather and topography, the fuel component is the only one which can be modified in the attempt to reduce or eliminate the wildland fire threat. Changing the fuel characteristics can effectively reduce the fire hazard or the fire intensities to a point where the fire threat is manageable. Fuel treatment options range from elimination of all fuels to create a firebreak to reducing the fuel's quantity. These options will be effective in breaking up the continuous fuels and isolating fuels or your home or development.

1. Hand Clearing - The most common method for the homeowner. Debris must be removed from the site or piled for later burning under safe conditions with a burning permit. Common tools include rakes, axes, shovels, chain saws, pruning saws and the power-string trimmer.

2. Mechanical - A quick method to reduce or remove large amounts of flammable vegetation. Tools and machinery include tractors, mowers and chippers.

3. Grazing - A simple and often overlooked method. Grazing can be a useful method to reduce some grasses and shrubs thereby reducing fuels. Cattle, sheep, goats and other grazers can be employed depending on terrain and vegetation type.

4. Irrigation - During prolonged dry weather, homeowners should irrigate their landscape and surrounding vegetation to increase its live and dead fuel moisture content.

5. Chemical - The application of herbicides either to kill existing plants or to prevent the growth of undesirable vegetation.

6. Thinning - Thinning involves removing a portion of the trees in a given area while leaving others. Various spacing of leave trees can be used depending on objectives. Spacing will usually vary from 10 feet to 20 feet between leave tree crowns.

7. Pruning - Pruning is usually done at the same time as thinning. After the trees to be removed are thinned out, the remaining trees are pruned. Pruning can be used to reduce fuels by removing the lower

portion of tree crowns. Both dead and live lower branches are removed during the pruning operation. This removes unwanted ladder fuels that can carry fire from the ground to the tree tops. Pruned trees should retain a minimum of 30% live crown after pruning. That means that at least 30% of the total tree height is composed of live branches.

8. Logging - Selective logging under carefully prescribed conditions will reduce the fuels on a site, and in some locales provide a profit from the harvested trees. Depending on size class and stand conditions, different harvest methods should be used. Methods vary from removing all trees in a given area to removing only selected trees. A trained forester or silviculturist should be consulted to determine the appropriate harvest method. Logging will leave tops and other debris that must be piled and burned, chipped, or taken care of in other ways such as removing from the site.

9. Piling - Piling of residues created by thinning, pruning and/or logging is one way to dispose of the fuel that results from these operations. Piling can be done either by hand, or by machine if there is enough room to operate. Normally, unusable boles, limbs, etc., from thinning and pruning operations, can be bucked up into pieces small enough to hand pile. Unusable logging residue normally requires machine piling. Piles must be kept away from any live vegetation, if the piles are to be burned after they dry out. Small piles can be covered with inexpensive plastic or other material so that the piles can be burned safely during wet weather.

10. Chipping - Another method to reduce the slash is to chip the excess material. This operation leaves small, easily disposed, chips. There are several advantages to chipping. Chipping eliminates the need to burn which can be troublesome due to the chance for escaped fire and smoke dispersion problems. Chipping is normally less expensive than hauling the debris from the site. And, scattering the chips over the site can inhibit grass and shrub growth thus reducing the fine fuels that can carry fire when dry.

11. Prescribed Burning - Prescribed burning is the application of fire to natural vegetation over a broad area. This can be over several hundred acres or as small as a homeowners yard. Prescribed burning can be utilized to reduce the accumulation of flammable debris but must be accomplished under controlled conditions of weather and fuel moisture and must be carried out in compliance with local policies and regulations. Landowners should consult with a fire or fuels management specialist before planning a large prescribed burn.

Note: Combinations of all of the above treatments can be used effectively depending on vegetation, terrain, and desired objectives.

Recommended treatment options. Treatments should be proposed on a landscape scale. There are two basic strategies. These strategies involve fundamentally different ideas on the role of the individual treatment units.

A. **Fuel breaks**. Fuel breaks are intended to reinforce defensible locations and thus reduce fire size by facilitating suppression. Fuel breaks facilitate suppression by indirect tactics. Fuel breaks have little effect on fire behavior or severity if the fire does not reach the fuel break or jumps (spots) over it. Fuel breaks may lead to larger wildfire sizes and larger areas burned severely if extensive burnout operations are used as intended along fuel breaks (burnout operations can be more intense and uniform than wildfires and may include areas that would not have burned). Fuel breaks are good strategies to use in the urban interface or intermix where suppression activities are assured.

B. **Dispersed treatments.** Dispersed treatments rely on the unit size and spatial placement of the treatment units as parts of a pattern to reduce spread rate and intensities. Dispersed treatments facilitate all suppression tactics (direct, indirect, and parallel attacks) by slowing overall fire growth and allowing units to be connected by fire-lines at the time the fires occur. Extensive coverage by a dispersed treatment pattern can change fire behavior irrespective of suppression actions. (Finney) Strategically placed dispersed treatment patterns are recommended for the general landscape because of their spatial flexibility in the context of uncertain fire locations, variable land ownership, restrictions on treatments, and suppression responses. With respect to protecting a wildland urban inter-mix, dispersed treatments slow the progress of fire toward the inter-mix, whereas fuel breaks provide defensible space for crews immediately adjacent to developed areas. Densities and total coverage of dispersed treatment units can be decreased with distance from higher-value areas. A treatment pattern including partial overlapping units is recommended.

The main features of the partially overlapping treatment pattern are:

- The size of the treatment units is unimportant, only the relative dimensions of the pattern affect spread rate through the pattern.
- The separation between units in the heading direction must be smaller than the fires
- Spread rate in the treatment area must be slower than in the untreated areas.

Recommended treatment options in the dry forest type (Ponderosa pine and Douglas fir)

There are at least three ways to reduce tree densities an accomplish fuel treatment: wildfire, prescribed fire, and mechanical thinning.

A. Reliance on wildfires is impractical. Letting natural fires play their historical role may have unwanted effects in forests that have undergone major stand structural changes over the past years of fire exclusion. In ponderosa pine forests choked with dense small-diameter trees or encroached by shade tolerant trees, allowing fires to burn may no longer be a strategic option. Fires would burn with uncharacteristically high fire intensities, killing all trees including the high value “old growth”. Non- native species can easily invade the site. High intensity wildfires which denude large areas, can have unwanted effects associated with runoff.

B. Restoring the dry type forest with prescribed burning is likely to be effective in stands that have moderate or low tree densities, little encroachment or ladder fuels, moderate to steep slopes which preclude mechanical treatment, and expertise in personnel to plan and implement prescribed burns.

C. Mechanical tree removal works best on forests that are too densely packed to burn safely, that have nearby markets for small-diameter trees, and areas where expertise and personnel are not available for prescribed burning programs, or where risk of fire escape or smoke management issues preclude burning. Mechanical tree removal may be accomplished with the use different types of equipment. Severing and hand piling is an acceptable option although it is very labor intensive. By itself mechanical thinning with machinery does little to beneficially affect surface fuels with the exception of possible compacting or crushing.

Post treatment Environment:
Thinning and prescribed fires can modify under story microclimate that was previously buffered by over story vegetation. Thinned stands (with more open tree canopies) allow incoming solar radiation to penetrate to the forest floor, which then increases surface temperatures, decreases fine fuel moisture and decreases relative humidity compared to un-thinned stands—conditions that can increase surface fire intensity. An increase in surface fire intensity may increase the likelihood that over story tree crowns may ignite. Therefore, it is important that the gap between the surface and crown fuels be maintained through either prescribed fire or pruning. Changing crown structure, while ignoring surface fuels, will only affect the likelihood of active crown fires—it will not necessarily reduce the likelihood of surface fires severe enough to damage soils or intense enough to ignite tree crowns. **It must be emphasized that all fuel strata need to be managed to minimize the unwanted consequences of wildfires. Mechanical treatments accompanied with prescribed fire can be a good approach.**

17) Prioritized Fuel Reduction Projects

Each member of TCFWG has a listing of potential project ideas by location within their area. One key are of concern is the threat of a severe fire in municipal watersheds. Rural Fire chiefs provide specific locations for population protection, strategically placed fuel breaks, safe zone creation, and access and egress routes. This has resulted in the creation of several FIREWISE communities throughout the tri-county area and development by local departments of population protection plans specific to their jurisdictions.

Additionally, agency partners are continuously being asked to provide any project ideas they may have for inclusion in the list of ongoing projects. Once the potential projects are identified, TCFWG collaboratively prioritizes the list and coordinates the progress of ongoing projects. The Western Montana BLM District, for example, has identified future treatment to occur in the Marysville, Clancy, North Hills / Ward Ranch and Scratch Gravel Hills Assessment areas that were identified in the Wildland-Urban Interface Communities-At-Risk Hazard Assessment of 2004. BLM is also looking for opportunities to treat BLM administered lands that are identified by the Wildland Interface Boundary Designation Map, 12.1 in this document.

It is important for the program to have geospatial data or locational data on where fuel hazard reduction projects have been accomplished thru the numerous grant programs that have existed in the area. Tri-County FireSafe Working Group encourages its partners to maintain the locational information and encourages further that the data be mapped. An incoming Incident Management Team could be saved hours of planning/preparation work for population and firefighter protection if they could be handed a map showing where past work has been done. It will also be important to know where projects have been accomplished in order to strive for contiguity with other private, state or federal projects in the future.

This plan provides the ability for annual review of project submittals by any entity. The prioritization process will remain the same and will be performed by a committee of the TCFWG.

Project ideas received from any source are screened to identify in the prioritization process the following:

- location within or adjacent to the identified WUI;
- population impacts and affected population numbers;
- project size; cost/benefit factors for the values at risk; and points are assigned for location distance within the WUI map layer.

This provides us with a hazard factor and a loss potential.

HIGH - Look at the Fuel Hazard rating map, potential project location and where they are the same. High ignition probability.

MEDIUM - Look at the ratings on the map, "C" locations and use the same criteria of population, etc.

LOW - Low fuel hazard, or high fuel hazard with not much at risk.

Not all projects for consideration are going to be on the ground. TCFWG also focus on Education and Awareness and Fire Prevention projects. Part of community protection is in the prevention of fire in the first place. FIREWISE presentations, "Open House" at the local fire stations, and presentations of the TCFWG programs and community involvement appearance requests continue to be a high priority even though the impact may be hard to measure.

Appendix A: List Of Acronyms

Acronym	Meaning
BLM	Bureau of Land Management
CWPP	Community Wildfire Protection Plan
DES	Disaster And Emergency Services
DNRC	Dept. of Natural Resources & Conservation (Montana)
EOP	Emergency Operations Plan
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
HFRA	Healthy Forest Restoration Act
HOLMAC	Helena Open Lands Management Advisory Committee
LEPC	Local Emergency Planning Committee
MOU	Memorandum of Understanding
MT-DNRC	Montana Department of Natural Resources & Conservation
NRCS	Natural Resource Conservation Service
PDM	Pre-Disaster Mitigation
TCFWG	Tri-County Fire Working Group
USDA	US Department of Agriculture
USFA	US Fire Administration
USFS	US Forest Service
USGS	United States Geological Survey
VFD	Volunteer Fire Department
WUI	Wildland Urban Interface

Appendix B: Compilation Of Fires In The Tri-County Area, 1984-2013

In 1984 there were 4 fires that were 100+ acres in the tri-county area. The total acres burned in those were 27,945 acres. There was 1 natural and 3 human caused fire.

NAME	SIZE IN ACRES	COUNTY	CAUSE
Lime Stone	120	Broadwater	Human
Little Sheep Cr.	275	Lewis & Clark	Human
Timber Hill	600	Lewis & Clark	Lightning
North Hill	26,950	Lewis & Clark	Human

In 1985 there were 3 fires that were 100 + acres in the tri-county area. The total acres burned in those fires were 600 acres. Of those 2 were Lightning and 1 human.

NAME	SIZE IN ACRES	COUNTY	CAUSE
Lime Stone	120	Broadwater	Human
Indian Cr.	120	Broadwater	Lightning
Baking Powder	160	Lewis & Clark	Lightning

In 1986 there were no fires over 100 acres in the tri-county area.

In 1987 there was 1 fire complex over 100 acres. They were all caused by lightning and burned 175 acres.

NAME	SIZE IN ACRES	COUNTY	CAUSE
Broadwater Co. Complex	175	Broadwater	Lightning

In 1988 there were 5 fires in the tri-county area. Four were human caused and the other one I didn't find any information. They burned for a total 93,747 of that 47,700 was the Canyon Creek fire that burned in the Scapegoat Wilderness.

NAME	SIZE IN ACRES	COUNTY	CAUSE
Warm Springs	46,900	Jefferson	Human
Squaw Gulch	129	Lewis & Clark	Human
Holter Lake	468	Lewis & Clark	Human
Roberts Mt.	550	Lewis & Clark	Lightning
Canyon Creek	45,700	Lewis & Clark	Lightning

In 1989 there was one fire that burned 2,400 acres.

NAME	SIZE IN ACRES	COUNTY	CAUSE
Indian Creek	2,400	Broadwater	Human

In 1990, 1991, 1992, 1993 and 1994 there was one fire a year that went over 100 acres. All were man caused.

YEAR	NAME	SIZE IN ACRES	COUNTY	CAUSE
1990	Beartooth Complex	32,968	Lewis & Clark	Human
1991	Holter Lake	125	Lewis & Clark	Human
1992	Black Butte	1,466	Broadwater	Human
1993	Lyons Creek	135	Lewis & Clark	Human
1994	Missouri River	246	Broadwater	Human

In 1995 there were 2 fires that were 100+ acres in the tri-county area. The total acres burned in those were 298 acres. Both were human caused fires.

NAME	*SIZE IN ACRES*	*COUNTY*	*CAUSE*
Foster Gulch	100	Lewis & Clark	Human
Sentinel Ranch	198	Lewis & Clark	Human

In 1996 there were 6 fires that were 100+ acres in the tri-county area. The total acres burned in those were 2,950 acres. There were 5 natural caused fires and 1 without a listed cause.

NAME	*SIZE IN ACRES*	*COUNTY*	*CAUSE*
Angus	2,100	Broadwater	Lightning
Cavern Fire	135	Jefferson	Human
Ext. 216	110	Lewis & Clark	Lightning
Timber Man	110	Lewis & Clark	Lightning
Ostrich	175	Lewis & Clark	Lightning
Electric Mt.	320	Lewis & Clark	Lightning

In 1997 and 1998 there was 1 fire each year that burned 100+ acres in the tri-county area. The total acres burned in those were 2,050 acres.

YEAR	*NAME*	*SIZE IN ACRES*	*COUNTY*	*CAUSE*
1997	Willow Creek	1,940	Lewis & Clark	Human
1998	Copper Creek	110	Lewis & Clark	Human

In 1999 there were 3 fires that were 100+ acres in the tri-county area. The total acres burned in those were 650 acres. All 3 were human caused fire.

NAME	*SIZE IN ACRES*	*COUNTY*	*CAUSE*
Claymore	230	Broadwater	Human
Little Hellgate	200	Lewis & Clark	Human
Hauser Dam	220	Lewis & Clark	Human

In 2000 there were 7 fires that were 100+ acres in the tri-county area. The total acres burned in those were 139,390 acres. All 7 were human caused fire.

NAME	*SIZE IN ACRES*	*COUNTY*	*CAUSE*
Toston-Maudlow	81,220	Broadwater	Human
Boulder Hill	2,482	Jefferson	Human
High Ore Rd.	9,978	Jefferson	Human
Reef	100	Lewis & Clark	Human
Wolf Creek	359	Lewis & Clark	Human
Bucksnort	15,251	Lewis & Clark	Human
Cave Gulch	30,000	Lewis & Clark	Human

In 2001 and 2002 there were no fires over 100 acres in the tri-county area.

In 2003 there were 5 fires that were 100+ acres in the tri-county area. The total acres burned in those were 39,043 acres. There was 1 human and 4 natural caused fires.

NAME	*SIZE IN ACRES*	*COUNTY*	*CAUSE*
Slim Sam	137	Broadwater	Lightning
Flat Creek #2	377	Lewis & Clark	Lightning
Talon	500	Lewis & Clark	Lightning
Jimtown	1,001	Lewis & Clark	Human
Snowbank	37,405	Lewis & Clark	Lightning

In 2004 there were no fires over 100 acres in the tri-county area.

In 2005 there were 2 fires that were 100+ acres in the tri-county area. The total acres burned were 5,902. There was 1 human and 1 natural caused fire.

NAME	*SIZE IN ACRES*	*COUNTY*	*CAUSE*
518	169	Jefferson	Railroad
Hazard Lake	5,733	Lewis & Clark	Lightning

In 2006 there were 4 fires that were 100+ acres in the tri-county area. The total acres burned in those were 3,032 acres.

NAME	*SIZE IN ACRES*	*COUNTY*	*CAUSE*
Judeman	176	Lewis & Clark	Equipment
Keep Cool	262	Lewis & Clark	Lightning
Ford Creek	323	Lewis & Clark	Lightning
Cigarette Rock	2,271	Lewis & Clark	Lightning

In 2007 there were 8 fires that were 100+ acres in the tri-county area. The total acres burned in those were 183,057 acres.

NAME	*SIZE IN ACRES*	*COUNTY*	*CAUSE*
Goodwin	183	Jefferson	Lightning
Little Wolf Creek	548	Lewis & Clark	Lightning
Fort Harrison	732	Lewis & Clark	Human
Novak	1,527	Lewis & Clark	Lightning
Conger Creek	24,598	Lewis & Clark	Lightning
Meriwether	42,876	Lewis & Clark	Lightning
Ahorn	52,551	Lewis & Clark	Lightning
Fool Creek	60,042	Lewis & Clark	Lightning

In 2008 there was 1 fire that was 100+ acres in the tri-county area. The total acres burned in that fire were 683.

NAME	*SIZE IN ACRES*	*COUNTY*	*CAUSE*
Bear Gulch	683	Broadwater	Human

In 2009 there were 5 fires that were 100+ acres in the tri-county area. The total acres burned in those were 5,400 acres.

NAME	*SIZE IN ACRES*	*COUNTY*	*CAUSE*
Copper Creek	109	Lewis & Clark	
Noble	130	Lewis & Clark	Human
MacDonald Pass	170	Lewis & Clark	Human
Rescue Gulch	582	Lewis & Clark	Lightning
Indian Trails	4,409	Lewis & Clark	Undetermined

In 2010 there were 4 fires that were 100+ acres in the tri-county area. The total acres burned in those were 3,249 acres.

NAME	*SIZE IN ACRES*	*COUNTY*	*CAUSE*
North Lyon Creek	104	Lewis & Clark	Human
North Fork	309	Lewis & Clark	Lightning
Lakeside	896	Lewis & Clark	Power Line
Davis	1,940	Lewis & Clark	Human

In 2011 there were 4 fires that were 100+ acres in the tri-county area. The total acres burned in those were 1,409 acres.

NAME	*SIZE IN ACRES*	*COUNTY*	*CAUSE*
Chevalier Ranch	105	Lewis & Clark	Undetermined
Upper Ayres	174	Lewis & Clark	Lightning
Bald Bear	497	Lewis & Clark	Lightning
Stadler Creek	633	Lewis & Clark	Lightning

In 2012 there were 11 fires that were 100+ acres in the tri-county area. The total acres burned in those were 50,219 acres.

NAME	*SIZE IN ACRES*	*COUNTY*	*CAUSE*
Indian Creek	294	Broadwater	Human
Antelope Lane	707	Jefferson	Lightning
19 Mile	3,789	Jefferson	Lightning
Wegner	121	Lewis & Clark	Lightning
Dalton Mountain	440	Lewis & Clark	Human
Black Beach	1,450	Lewis & Clark	Lightning
Corral	1,964	Lewis & Clark	Human
Bar Creek (Elbow)	3,000	Lewis & Clark	Lightning
East Fork	4,698	Lewis & Clark	Lightning
Rapid Creek (Elbow)	5,509	Lewis & Clark	Lightning
Elbow Pass	28,247	Lewis & Clark	Lightning

In 2013 there were 5 fires that were 100+ acres in the tri-county area. The total acres burned in those were 14,282 acres.

NAME	*SIZE IN ACRES*	*COUNTY*	*CAUSE*
Copper City	390	Broadwater	Human
Hunter Gulch	157	Lewis & Clark	Arson
Log Gulch	215	Lewis & Clark	Human
Sweats Complex	309	Lewis & Clark	Arson
Rock Creek	677	Lewis & Clark	Lightning
Red Shale	12,534	Lewis & Clark	Lightning

Appendix C: Fire Danger Pocket Cards

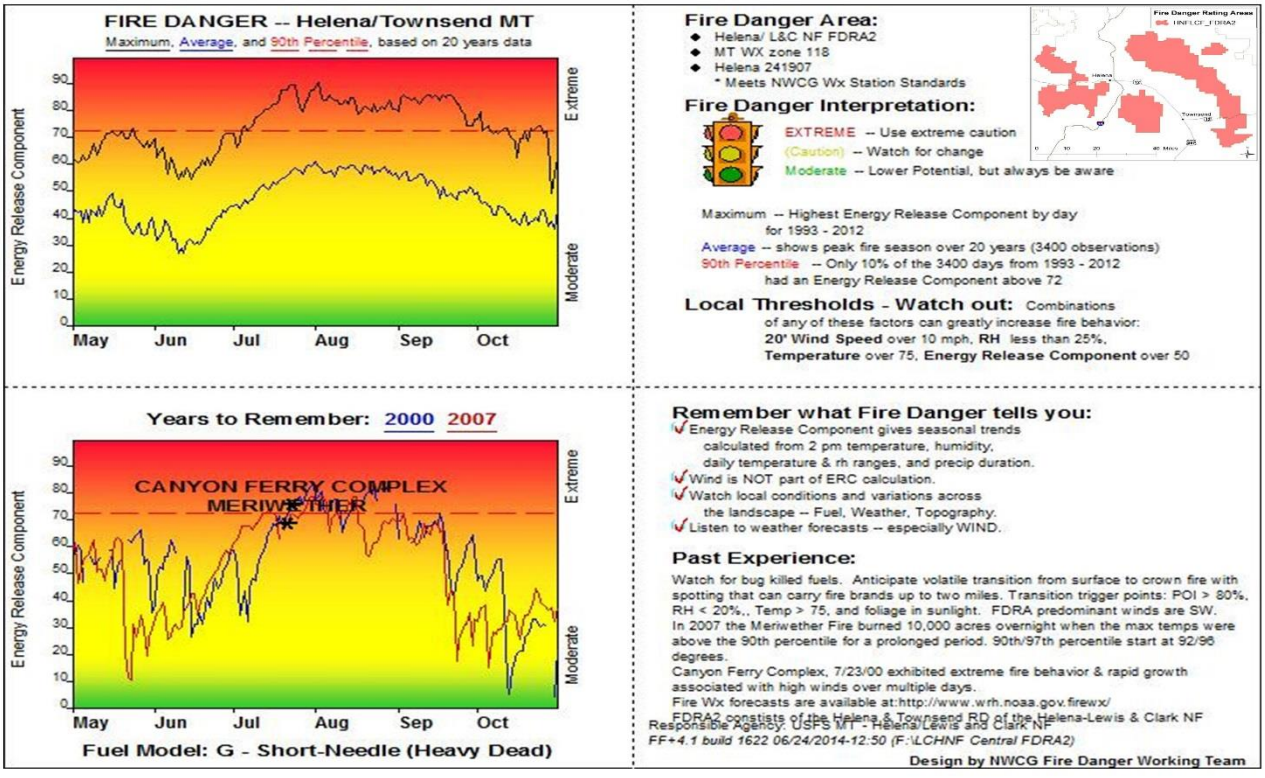
Energy Release Component (ERC)

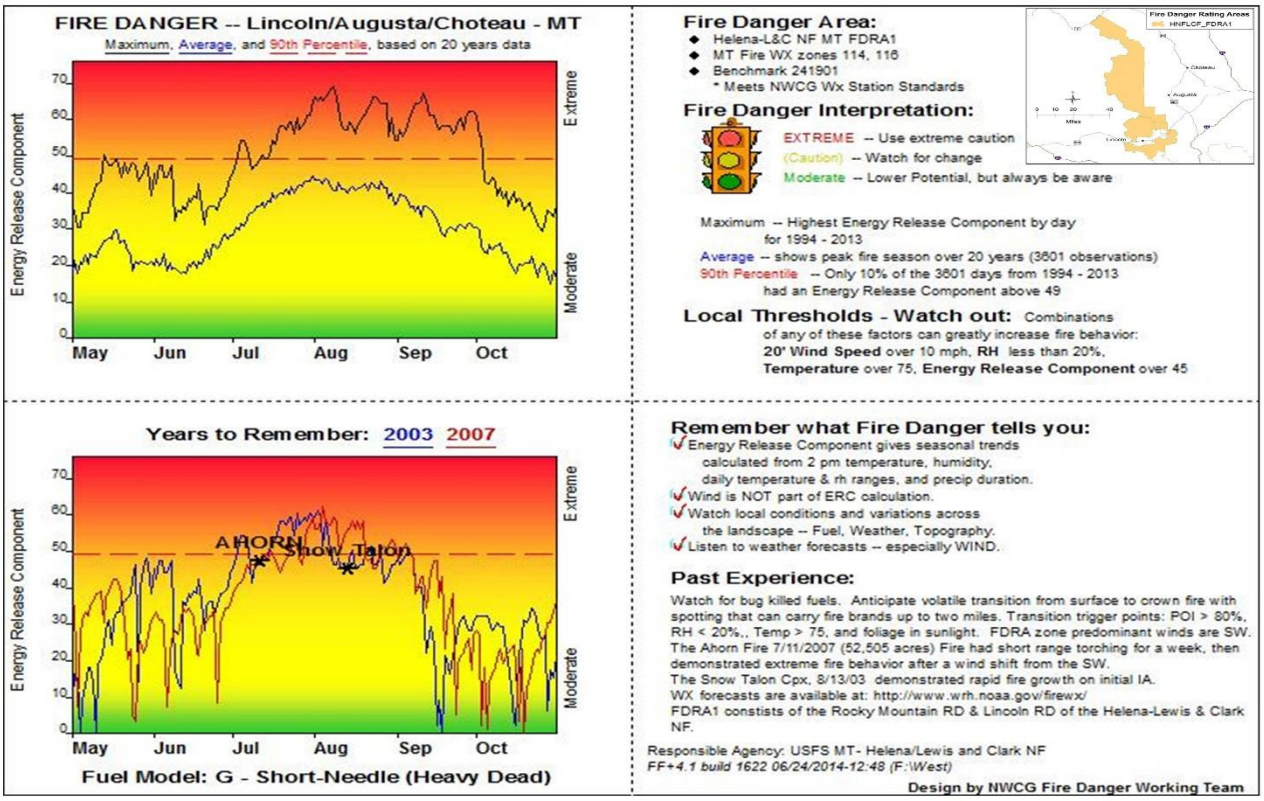
In timbered areas, tracking the dryness of large dead and downed fuel in relation to weather data is helpful in predicting fire danger. The National Fire Danger Rating System (NFDRS) uses weather and fuel moisture data to do this. An output (index) of NFDRS is Energy Release Component (ERC), which is a good way to track seasonal wildfire danger. The Energy Release Component (ERC) index is related to how hot a fire could burn. It is directly related to the 24-hour, potential worst case, total available energy (BTUs) per unit area (in square feet) within the flaming front at the head of a fire.

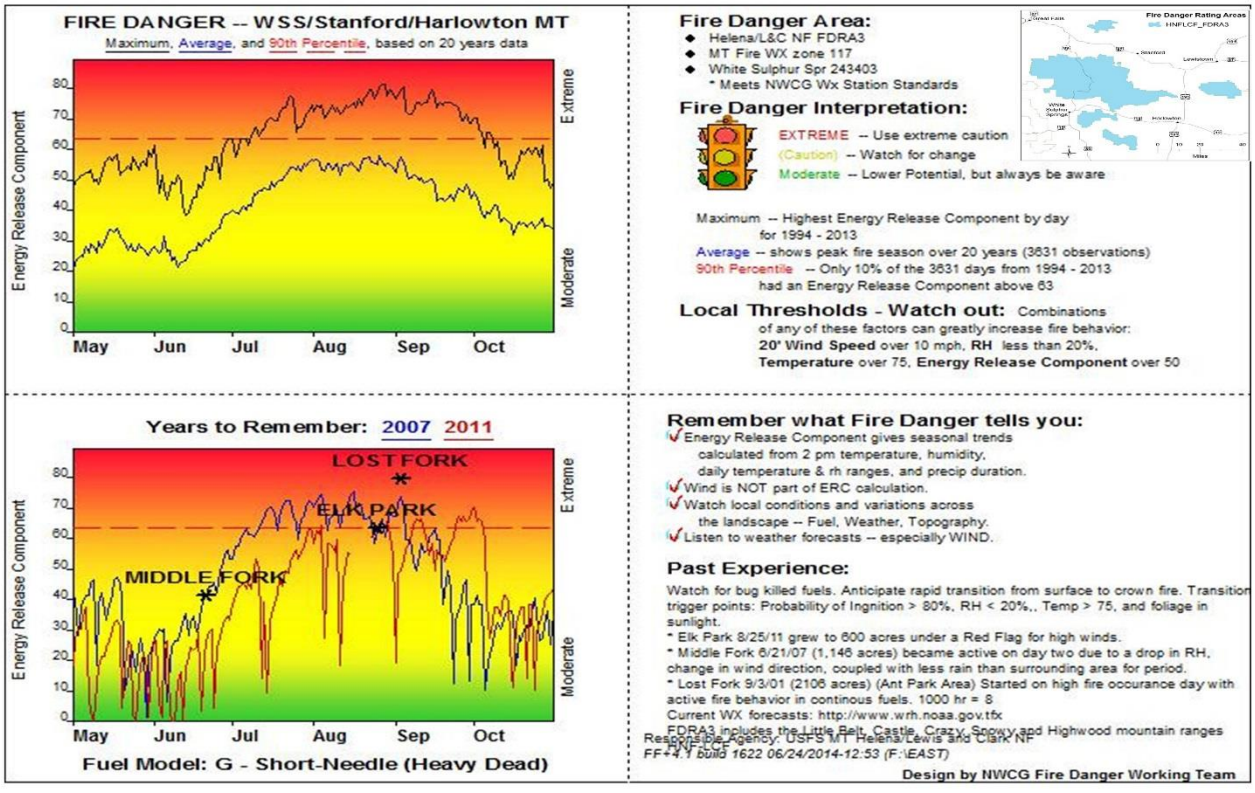
The ERC can serve as a good characterization of fire season, as it tracks seasonal fire danger trends well. The ERC is a function of the fuel model and live and dead fuel moistures. Fuel loading, woody fuel moistures, and larger fuel moistures all have an influence on the ERC, while the lighter fuel have less influence and wind speed has none. ERC has low variability, and is the best fire danger component for indicating the effects of intermediate to long-term drying on fire behavior (if it is a significant factor), although it is not intended for use as a drought index.

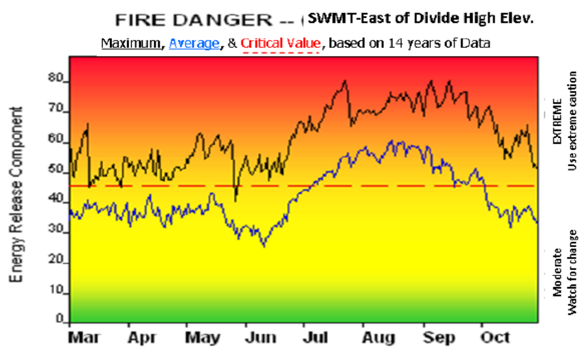
The below graphs displays the NFDRS Energy Release Component for the Helena weather station and surrounding areas for the past 20 years. The yearly time frame displayed is from May 15th to Oct 1st. The maximum, minimum and averages are graphed in addition the data for the years of 2000 and 2007.

When correlated to wildfire activity, the NFDRS Energy Release Component shows that most large fires happen when the ERC is high (if not the highest) for that date.

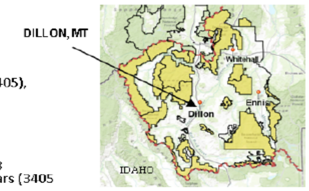



FIRE DANGER -- Lincoln/Augusta/Choteau - MT
Maximum, Average, and 90th Percentile, based on 20 years data
Energy Release Component
Extreme
Moderate
May Jun Jul Aug Sep Oct
Years to Remember: 2003 2007
AHORN
Snow Talon
Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
Helena-L&C NF MT FDRA1
MT Fire WX zones 114, 116
Benchmark 241901
* Meets NWCG Wx Station Standards
Fire Danger Interpretation:
EXTREME -- Use extreme caution
(Caution) -- Watch for change
Moderate -- Lower Potential, but always be aware
Maximum -- Highest Energy Release Component by day for 1994 - 2013
Average -- shows peak fire season over 20 years (3601 observations)
90th Percentile -- Only 10% of the 3601 days from 1994 - 2013 had an Energy Release Component above 49
Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
20' Wind Speed over 10 mph, RH less than 20%,
Temperature over 75, Energy Release Component over 45
Remember what Fire Danger tells you:
Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
Wind is NOT part of ERC calculation.
Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
Listen to weather forecasts -- especially WIND.
Past Experience:
Watch for bug killed fuels. Anticipate volatile transition from surface to crown fire with spotting that can carry fire brands up to two miles. Transition trigger points: POI > 80%, RH < 20%,, Temp > 75, and foliage in sunlight. FDRA zone predominant winds are SW.
The Ahorn Fire 7/11/2007 (52,505 acres) Fire had short range torching for a week, then demonstrated extreme fire behavior after a wind shift from the SW.
The Snow Talon Cpx, 8/13/03 demonstrated rapid fire growth on initial IA.
WX forecasts are available at: http://www.wrh.noaa.gov/firewx/
FDRA1 constists of the Rocky Mountain RD & Lincoln RD of the Helena-Lewis & Clark NF.
Responsible Agency: USFS MT- Helena/Lewis and Clark NF
FF+4.1 build 1622 06/24/2014-12:48 (F:\West)
Design by NWCG Fire Danger Working Team


FIRE DANGER -- WSS/Stanford/Harlowton MT
Maximum, Average, and 90th Percentile, based on 20 years data
Energy Release Component
Extreme
Moderate
May Jun Jul Aug Sep Oct
Years to Remember: 2007 2011
LOST FORK
ELK PARK
MIDDLE FORK
Fuel Model: G - Short-Needle (Heavy Dead)
Fire Danger Area:
Helena/L&C NF FDRA3
MT Fire WX zone 117
White Sulphur Spr 243403
* Meets NWCG Wx Station Standards
Fire Danger Interpretation:
EXTREME -- Use extreme caution
(Caution) -- Watch for change
Moderate -- Lower Potential, but always be aware
Maximum -- Highest Energy Release Component by day for 1994 - 2013
Average -- shows peak fire season over 20 years (3631 observations)
90th Percentile -- Only 10% of the 3631 days from 1994 - 2013 had an Energy Release Component above 63
Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
20' Wind Speed over 10 mph, RH less than 20%,
Temperature over 75, Energy Release Component over 50
Remember what Fire Danger tells you:
Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
Wind is NOT part of ERC calculation.
Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
Listen to weather forecasts -- especially WIND.
Past Experience:
Watch for bug killed fuels. Anticipate rapid transition from surface to crown fire. Transition trigger points: Probability of Ingnition > 80%, RH < 20%,, Temp > 75, and foliage in sunlight.
* Elk Park 8/25/11 grew to 600 acres under a Red Flag for high winds.
* Middle Fork 6/21/07 (1,146 acres) became active on day two due to a drop in RH, change in wind direction, coupled with less rain than surrounding area for period.
* Lost Fork 9/3/01 (2106 acres) (Ant Park Area) Started on high fire occurance day with active fire behavior in continous fuels. 1000 hr = 8
Current WX forecasts: http://www.wrh.noaa.gov.tfx
FDRA3 includes the Little Belt, Castle, Crazy, Snowy and Highwood mountain ranges
Responsible Agency: USFS MT Helena/Lewis and Clark NF
FF+4.1 build 1622 06/24/2014-12:53 (F:\EAST)
Design by NWCG Fire Danger Working Team



Fire Danger Area
- SWMT East of Divide High Elev. (Timbered & Mountainous)
- Fire Wx Zones MT 110/111
- RAWS: Yellowmule (244606), Wise Rvr (245405), Red Rocks (245410), French Creek(245415), Harkness (245416), Burnt Crk (245506), Steele Creek (245417)

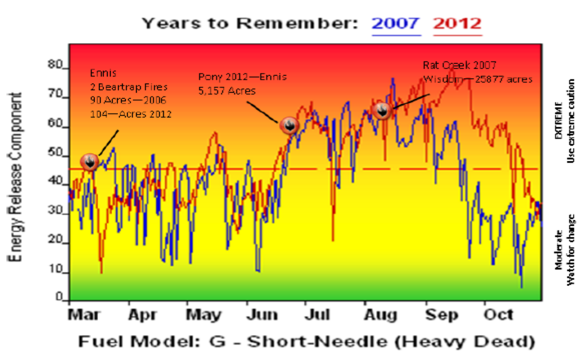


Fire Danger Interpretation
Maximum—Highest ERC by day for 2000-2013
Average— shows peak fire season over 14 years (3405 observations)
Critical Value– Fire activity increases rapidly above ERC >45 and increase of large fire potential with ERC > 57. 41% of the 3405 days from 2000-2013 had ERC above 45.

Energy Release Component (ERC)
Serves as a good characterization of local seasonal fire danger trends resulting from the area's fuel moisture conditions. The ERC is a relative index and should be compared to historic trends and thresholds on the pocket card. The ERC relies heavily on large and live fuels, has low variability, and is not affected by wind speed.

Local Thresholds—WATCH OUT: Combinations of any of these factors can greatly increase fire behavior.

20' wind speed over 15 mph
RH Less than 20%,
Temperature over 80°
1000 hr fuels <12%

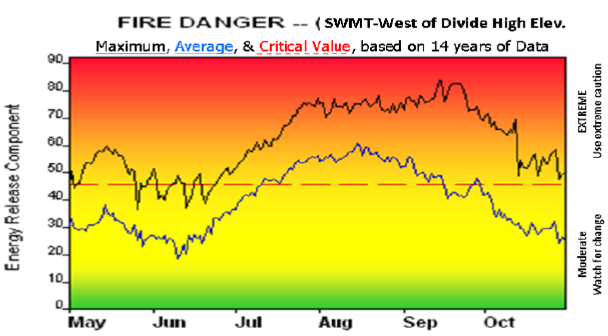


SWMT-East of Divide High Elev.

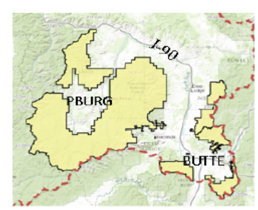
Remember what Fire Danger tells you:
☑Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precipitation duration.
☑Wind is NOT part of ERC calculation
☑Watch local conditions & variations across the landscape—Fuels, Weather & Topography
☑Listen to forecasts—especially WIND

Past Experience:
This area includes higher elevation mixed conifer timber fuel types. Fuel loading and dryness are the primary contributing factors in the area. Fire activity generally increases above an ERC of 45. Fire growth potential tends to increase after short drying periods (7 days) with a combination of ERC > 57, and 1000 hour fuel moisture < 12%. Surface fires can transition to crown fires rapidly under these conditions. Slope and wind alignment can increase spread by a factor of 15X. Pony Fire was an early season fire that transitioned to a crown fire rapidly on steep slopes. The Bear Trap fires were early spring fires that grew rapidly with steep slopes and alignment in combination with ERC near 48 and 1000 hr fuels < 12%. Rat Creek was typical of later season fires crowning with approaching cold front winds. Long range spotting common in sub-alpine fir. Fuels effected by mountain pine beetle may exhibit faster rates of spread (5X-10X), may have more receptive fuel bed to spotting and transition more quickly from a surface fire in both the red and gray stages. Surface fuel loads also increase within 5 to 10 yeas after MPB due to falling snags. Watch long duration fires during fall frontal passage.

Developed by the SWMT Interagency NFDRS Team *FF+ build 1321 05/05/2014*



Fire Danger Area
- SWMT West of Divide High Elev. (Timbered & Mountainous)
- Fire Wx Zones MT 110
- RAWS: Teepee Point(242910), Gird(242911), PBURG (243002)

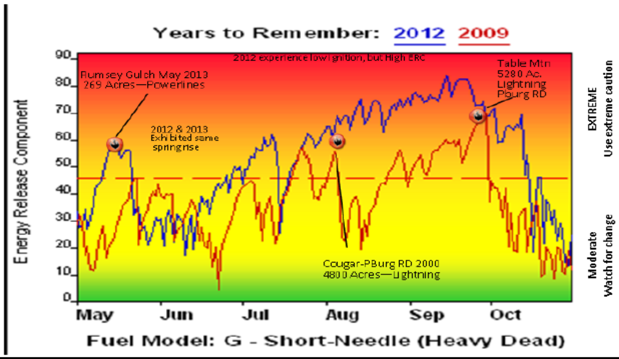


Fire Danger Interpretation
Maximum—Highest ERC by day for 2000-2013
Average— shows peak fire season over 14 years (2557 observations)
Critical Value– Fire activity increases rapidly above ERC >45. 38% of the 2972 days from 2000-2013 had ERC above 45.

Energy Release Component (ERC)
Serves as a good characterization of local seasonal fire danger trends resulting from the area's fuel moisture conditions. The ERC is a relative index and should be compared to historic trends and thresholds on the pocket card. The ERC relies heavily on large and live fuels, has low variability, and is not affected by wind speed.

Local Thresholds—WATCH OUT: Combinations of any of these factors can greatly increase fire behavior.

20' wind speed over 15 mph
RH Less than 20%,
Temperature over 80°
1000 hr fuels < 12%



SWMT-West of Divide High Elev.

Remember what Fire Danger tells you:
☑Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precipitation duration.
☑Wind is NOT part of ERC calculation
☑Watch local conditions & variations across the landscape—Fuels, Weather & Topography
☑Listen to forecasts—especially WIND

Past Experience:
This area includes higher elevation mixed conifer timber fuel types. Fuel loading and dryness are the primary contributing factors in the area. Fire activity generally increases above an ERC of 45. Fire growth potential tends to increase after short drying periods (7 days) with a combination of ERC > 54, and 1000 hour fuel moisture < 12%. Surface fires can transition to crown fires rapidly under these conditions. Slope and wind alignment can increase spread by a factor of 15X. Rumsey Fire occurred in the early season, rapid spread occured with ERC > 55, alignment and high winds from a powerline ignition. Table Mtn and Cougar rapidly grew in size with ERC > 55 and 1000 hr fuels < 12%. 2012 was a long period of High ERC values, but reduced ignition. Long range spotting common in sub-alpine fir. Fuels effected by mountain pine beetle may exhibit faster rates of spread (5X-10X), may have more receptive fuel bed to spotting and transition more quickly from a surface fire in both the red and gray stages. Surface fuel loads also increase within 5 to 10 yeas after MPB due to falling snags. Watch long duration fires during fall frontal passage.

Developed by the SWMT Interagency NFDRS Team *FF+ build 1321 05/05/2014*