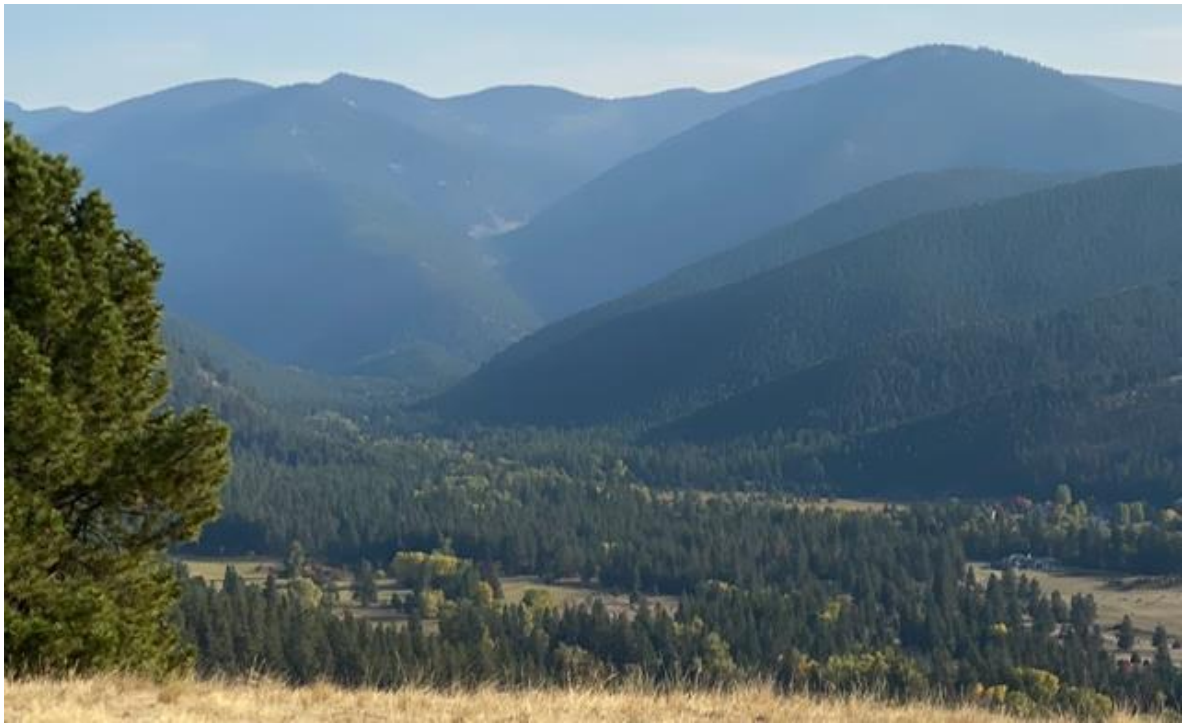
Grant Creek Community Wildfire Protection Plan
Missoula and Missoula County, Montana 2024



This document was prepared at no cost to Missoula County by Grant Creek residents who volunteered their time and resources.

About the Friends of Grant Creek

Friends of Grant Creek, Inc. (FOGC) was organized in 1987 as a volunteer, non-profit organization to conduct educational efforts to support and promote the interests of the residents and landowners of the Grant Creek Valley. Membership is open to anyone who is dedicated to the purposes of the organization and is a resident or non-resident landowner within the Grant Creek watershed north of I-90. The Grant Creek Wildfire Risk Task Force (GCWRTF) are all volunteers and operate under the direction of the FOGC Board of Directors.

Author Information and GCWRTF members:
Michael Cole…….USDA Forest Service, retired – Project Leader, co-author
Richard Lasko……USDA Forest Service, retired – co-author, GIS and fire behavior analysis
John Langstaff…..Missoula City Fire Department Captain, retired
Tim Hunt…….Middle Grant Creek Wildfire Preparedness Coordinator, retired
RT Cox……President, FOGC, attorney, retired

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List of Acronyms

BI – Burning Index
BOD – Board of Directors
BPA – Bonneville Power Administration
BTU – British Thermal Unit (a measure of heat)
CWPP – Community Wildfire Protection Plan
DNRC – Department of Natural Resources (Montana)
ERC – Energy Release Component
FDNY – Fire Department of New York (city)
FAA – Federal Aviation Administration
FEMA – Federal Emergency Management Agency
FOGC – Friends of Grant Creek
FS – Forest Service
FWP – Fish, Wildlife and Parks (Montana)
GC – Grant Creek
GCWRTF – Grant Creek Wildfire Risk Task Force
GIS – Geographic Information System
HFRA – Healthy Forests Restoration Act
HIZ – Home Ignition Zone
HOA – Home Owners Association
I-90 – Interstate 90
LRC – Lolo Restoration Committee
MAP – Management Action Point
MCFPA – Missoula County Fire Protection Association
MFD – Missoula Fire Department (city)
NFDRS – National Fire Danger Rating System
NFPA – National Fire Protection Association
NWE – Northwestern Energy
NWF – National Wildlife Federation
OEM – Office of Emergency Management
POD – Potential Operational Delineation
RC&D – Resource Conservation and Development
ROS – Rate of Spread
RFD – Rural Fire District
SC – Spread Component
SDI – Suppression Difficulty Index
STEX – Sand Table Exercise
UAV – Unmanned Aerial Vehicle
US – United States
USDA – United States Department of Agriculture
USFA – United States Fire Administration
WAM – Wildfire Adapted Missoula
WUI – Wildland Urban Interface

Executive Summary

Purpose and Goals

Purpose of the Grant Creek CWPP

This Community Wildfire Protection Plan (CWPP) has been developed by local stakeholders who are invested in mitigating wildland fire threats in their communities. ***The 2024 Grant Creek CWPP*** integrates information from a variety of sources to present a comprehensive picture of wildland fire risk that will enable fire and emergency management agencies, residents, landowners, organizations and their partners to act in a coordinated fashion to improve public safety and increase community resilience to wildland fire in the Grant Creek drainage.

The CWPP and the ancillary data that was gathered to develop the plan will also provide information to support Incident Management Teams responding to wildfires in Grant Creek. When implemented, this incident support should also include mapping and data associated with fuel treatment areas (both those effectively treated and planned for treatment).

The 2024 Grant Creek CWPP is tiered to the 2018 Missoula County CWPP, and will serve as a site-specific supplement to the direction provided by that document or any of its future revisions.

The Grant Creek CWPP will respond to public comments received by the City of Missoula during deliberation for a large scale, multi-family apartment complex development within the Missoula city limits near the entrance to the Grant Creek valley. These comments can be summarized into four major issues related to wildfire:

1) Increasing wildfire threat in the Grant Creek Wildland Urban Interface (WUI) as evidenced by the increasing number and complexity of large wildfires in Missoula County.

2) Increasing high-intensity wildfire risk due to the buildup of hazardous fuels on public and private lands adjoining homes and subdivisions in the WUI.

3) Evacuation of residents and recreational visitors during wildfire emergencies. Existing design limitations of the Grant Creek Road and the lack of alternative evacuation routes affects both emergency response (ingress) and evacuation traffic (egress) during an evacuation.

4) Increasing wildfire risk exposure from future development as a result of more homes, people and human ignition potential in the WUI in both city and county administered lands.

Goals of the Grant Creek CWPP

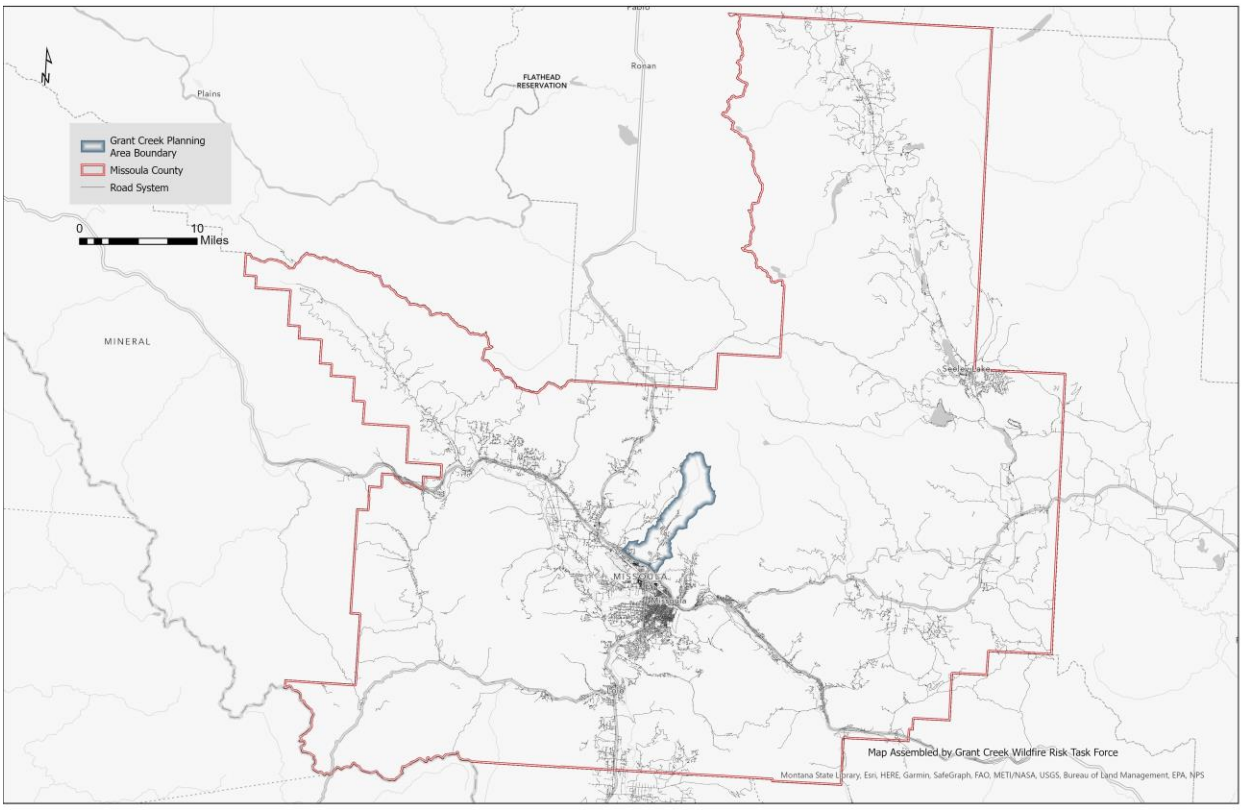
The Grant Creek CWPP will support attainment of the following goals:

- Protect lives and property from the negative impacts of wildland fire;
- Create a shared wildfire safety responsibility among residents, property owners, visitors, conservation groups and federal, state, and local agencies to mitigate wildland fire threats by increasing individual knowledge and improving situational awareness;
- Motivate landowners and homeowners to protect not only themselves but their neighbors through an ongoing program of community-wide risk reduction efforts;
- Identify homeowner-scaled hazardous fuels projects that homeowners can accomplish;
- Broaden public support of, and provide guidance for, larger, long-term landscape scale wildfire hazard reduction projects within Grant Creek;
- Assist local agencies to develop a site-specific evacuation plan for Grant Creek;
- Sustain a livable community in Grant Creek by maintaining a healthy, resilient environment where quality of life is not significantly or adversely affected by wildfire;
- Provide information to support grants to fund wildfire hazard reduction projects;
- Assess the merits of Grant Creek becoming a Firewise Community; and
- The watershed has many similarities to other areas of wildfire risk in Missoula County, and this plan may serve to stimulate interest in developing other site-specific plans.

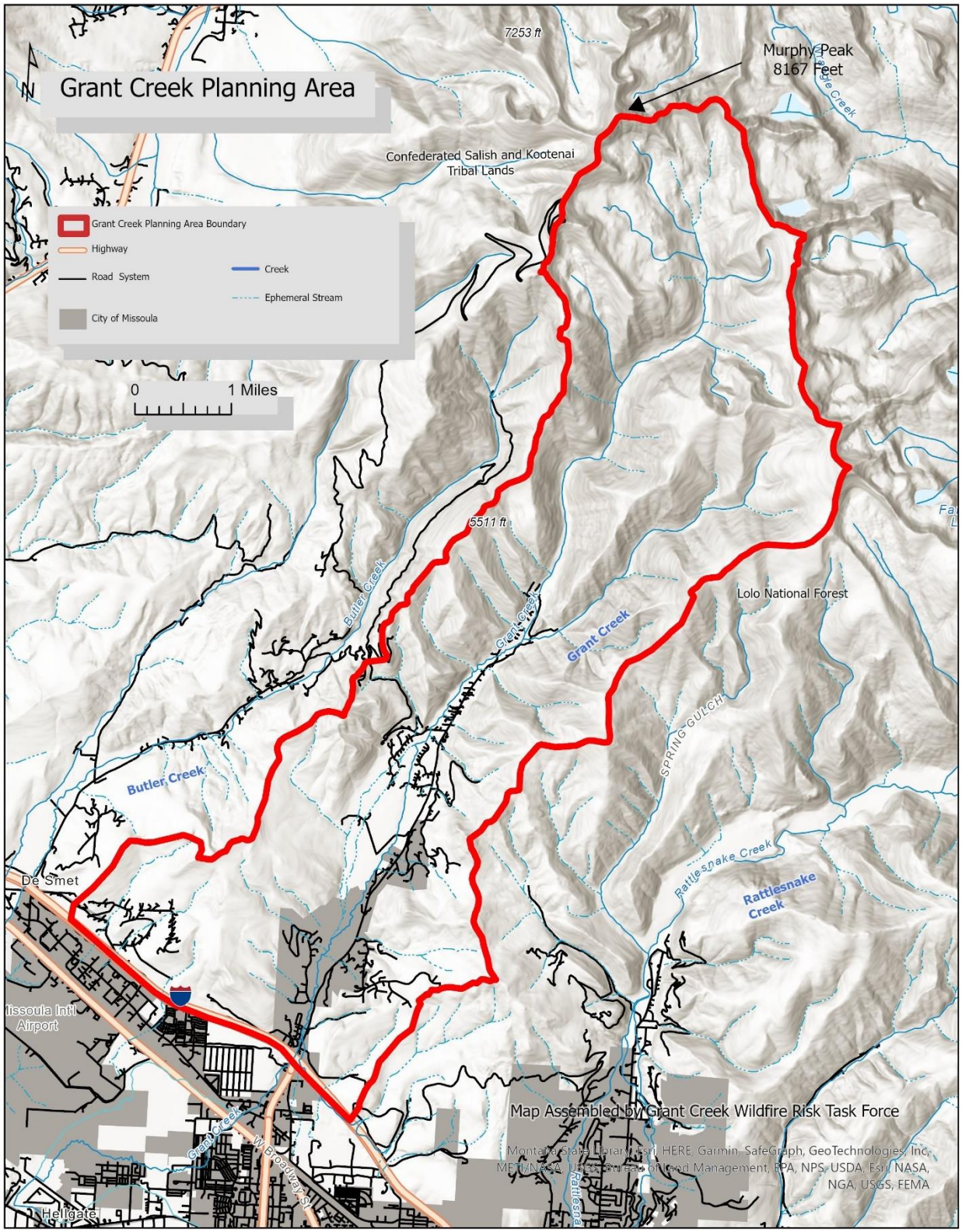
Planning Area Description

The Grant Creek Planning area is located on the northwest side of Missoula, Montana and encompasses the northeast to southwest oriented Grant Creek watershed north of U.S. Interstate 90 (I-90), including the Gooden Lane/Keil Loop residential area two miles west of the Grant Creek/Reserve Street I-90 exit (Maps 1 and 2). The planning area, which is 17,699 acres in size, is bordered on the west by the Butler Creek watershed divide, on the north by the Upper Finley Creek watershed divide, on the east by the Rattlesnake watershed divide and on the south by I-90.

It is located within both Missoula City and Missoula County jurisdictions, and includes National Forest System lands administered by the Lolo National Forest. The Grant Creek watershed is primarily accessed from Exit 101 on I-90 via the Grant Creek Road. Exit 99 on I-90 accesses the Gooden Lane/Keil Loop area which does not have a road connection to the rest of the drainage.



Map 1 – Grant Creek planning area location in Missoula County



Map 2 - Grant Creek Planning Area

Wildfire Hazard and Risk Assessment

Although there are more recent measures of wildfire hazard, the Grant Creek CWPP wildfire hazard assessment is based on the Missoula County 2018 Relative Wildfire Hazard Assessment in order to maintain consistency with the county's analysis. The Grant Creek CWPP examines wildfire hazard and risk in the Grant Creek setting and describes how residents in Grant Creek may be affected by a wildfire based on where they live. It describes the history of wildfire-related assessments applicable to Grant Creek based on the best available information, research and science, and includes maps where applicable to improve situational awareness for residents and emergency services.

Action Plan and Implementation

This document contains an Action Plan (Appendix A). Its purpose is to serve as a roadmap of actions to direct the focus of agencies, residents and landowners in their efforts to mitigate wildfire hazard and risk within the Grant Creek WUI. The action plan is designed to identify projects of various complexity to reduce risk related to the physical wildfire environment (fuels) as well as risk associated with human-caused ignitions. Potential actions range in size from those that can be completed by a single homeowner to landscape-level wildfire risk reduction. The list of actions is organized as follows: 1) categories; 2) specific actions under each category described in a short narrative; 3) responsibility for completion; 4) priority for completion compared with other action items - High, Medium, Low; 5) a time frame for completion; 6) associated documents and; 7) notes.

Communication Plan

This document contains a Communication Plan (Appendix H). Its purpose is to inform fire and emergency management agencies, residents, landowners, organizations and their partners about the variety of communication methods available in Grant Creek. This plan will assist in distribution of wildfire-related information year-round in order to enhance situational awareness, wildfire preparedness and timeliness of fire information in the event of a wildfire.

Planning Summary

During a meeting in 2019, the City of Missoula's Grant Creek Neighborhood Council, at the request of the Wildfire Preparedness Coordinator of Missoula County's Office of Emergency Management (OEM), asked for volunteers living in the Grant Creek neighborhood to establish a Wildfire Preparedness Subcommittee due to increasing wildfire risk in the Grant Creek area. The three individuals who volunteered were, by coincidence, from lower, middle and upper Grant Creek, representing different WUI environments. They were tasked with providing information to residents on the importance of creating defensible space around homes and the availability of free home ignition zone inspections by local fire personnel through their coordination with the County Wildfire Preparedness Coordinator. This is an ongoing, collaborative process.

On December 18, 2020 the Board of Directors (BOD) of the Friends of Grant Creek (FOGC), a non-profit organization made up of Grant Creek residents concerned about land development and wildfire issues, asked several members of the Grant Creek community (including the three original members of the Wildfire Preparedness Subcommittee) if they would be willing to gather information about issues concerning wildfire hazards and risk in Grant Creek and develop a CWPP specific to Grant Creek in order to make the local community more prepared in the event of a wildfire. This request was set in motion as a result of significant local opposition to a rezone proposal for a large apartment complex development in Grant Creek where residents did not believe that wildfire-related issues were adequately addressed. As a result, five community members, three with extensive experience in wildland and structural firefighting, agreed to work on a volunteer basis towards completion of a draft Grant Creek CWPP. This group became known as the Grant Creek Wildfire Risk Task Force (GCWRTF).

This document focuses on the four wildfire-related issues previously identified specific to Grant Creek and the concerns of its residents and landowners ***based on written public comment*** received by the City of Missoula during the rezone proposal.[1,2] Throughout development of this CWPP, the GCWRTF has coordinated their inventory, mapping and planning efforts with local Grant Creek residents and land owners as well as city, county, state and federal agencies involved with both fire and emergency response in Grant Creek. This ongoing coordination provided information, advice and review in order to prepare a timely, relevant, and scientifically-based CWPP.

Compliance With the Missoula County CWPP

The 2024 Grant Creek CWPP is tiered to the 2018 Missoula County CWPP and serves as a site specific supplement to the direction provided by that document or any of its future revisions.[3]

The Missoula County CWPP provides a broad overview of the local environment, wildfire risk assessment and the cohesive strategy needed among multiple government agencies and the general population to implement a county-wide program of wildfire risk reduction. It covers a county-wide area of approximately 2,600 square miles. It ties collaborative wildfire risk reduction efforts in the county to the Healthy Forest Restorations Act of 2003 (HFRA) which was the framework for development of CWPPs nationwide.[4]

HFRA requires that **all** CWPPs must meet three minimum requirements:

1. Show collaboration between local and state agencies, in consultation with federal agencies and other interested parties;
2. Identify and prioritize fuel treatments to reduce hazardous fuel areas;
3. Recommend strategies to reduce the ignitability of structures.

The Missoula County CWPP supports and encourages more localized CWPPs like the Grant Creek plan that provide additional detail to address unique concerns. Although the Grant Creek planning area covers only 1% of Missoula County, ***Grant Creek residents are faced with their own set of challenges and are interested in a plan that focuses on their specific location and addresses concerns specific to their wildfire risk environment and personal safety***. A localized CWPP provides the opportunity to address a range of topics based on their relevance to the affected population. While not legally-binding, CWPPs serve as effective documents to help local communities such as Grant Creek become more prepared for future wildfire events and bring people together to achieve locally-relevant objectives.

How to Read This Plan

The CWPP is organized into six different sections based on the interest and focus of the reader.

Collaboration – pages 15-19
Identifies interested city, county, state and federal government agencies and provides information on collaboration efforts with Grant Creek stakeholders during development of the CWPP.

The Natural and Human Environment - pages 19-38
Describes Grant Creek's physical, cultural and natural resource environments and the human environment of access and development, infrastructure, land ownership and governance.

The Wildfire Environment - pages 39-71
Describes the past, present and future of the Grant Creek wildfire environment including wildfire history, fuels, weather and potential fire behavior. This section describes local agency fire protection responsibilities and capabilities. Wildfire risk assessments developed by county, state and federal agencies are also included.

Fuels Mitigation - pages 72-82
Presents different types of fuels mitigation at different scales from preparation of the Home Ignition Zone (HIZ) of an individual residence to large projects requiring grant funding. It identifies the four different wildfire risk exposure levels in Grant Creek depending on where a person lives and recommended hazard reduction projects in each area.

Evacuation Planning – pages 82-84
Discusses what needs to be incorporated in a written evacuation plan specific to the needs of Grant Creek residents, information already available and what information needs to be obtained to continually update the plan.

CWPP Monitoring and Evaluation – pages 84-85
Describes Grant Creek residents' reliance on the Missoula County CWPP to assure that stakeholders' responsibilities are met for successful implementation of the Grant Creek CWPP over time.

For reference, endnotes and hyperlinks have been included to provide ease of access to the source information for the CWPP. All hyperlinks were active at the time this document was prepared.

Collaboration

Stakeholder roles are identified in the 2018 Missoula County CWPP. The diagram below identifies site-specific stakeholders in Grant Creek who must continue to maintain and develop relationships in order to implement an effective CWPP. The threat of wildfire in the Grant Creek planning area represents the connection between all stakeholders.

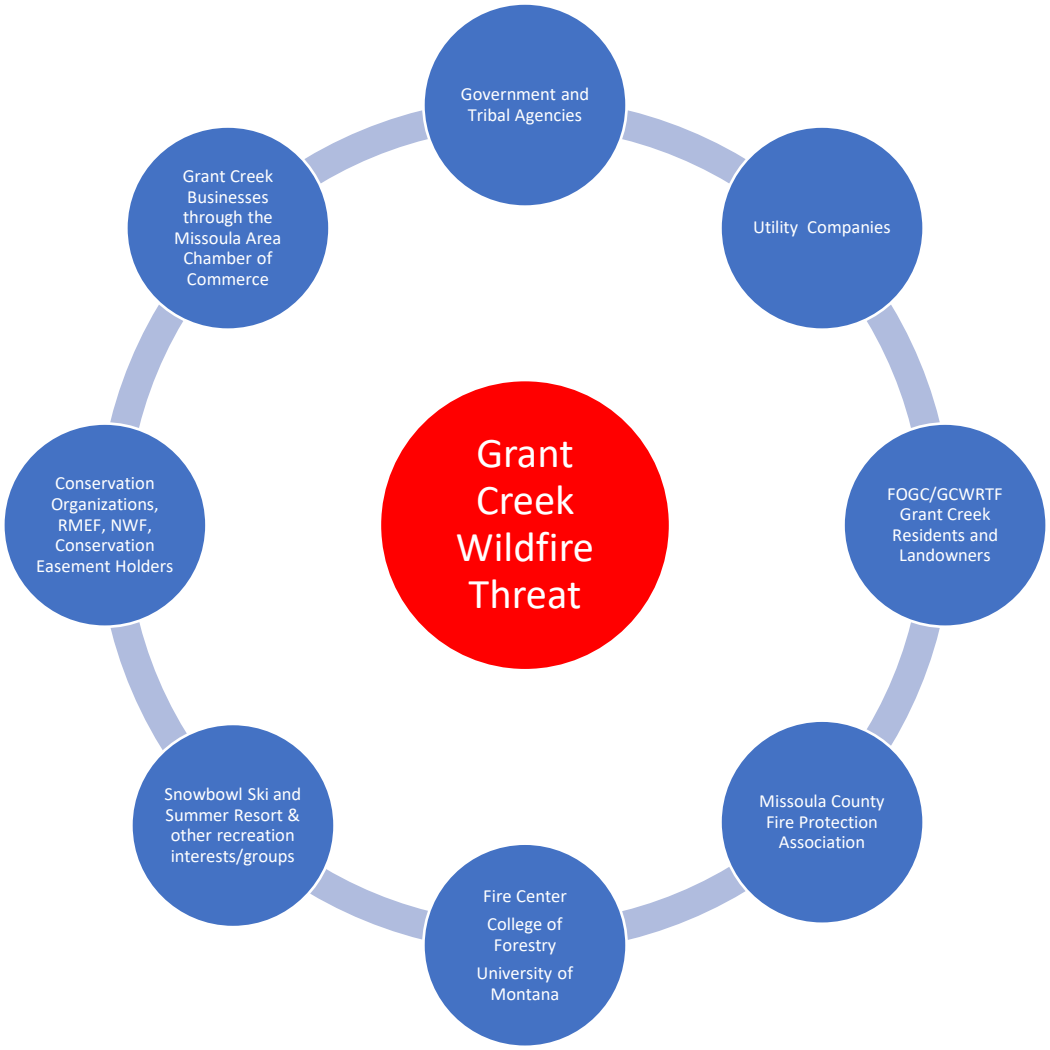


Figure 1 – Grant Creek Stakeholders

Government Agencies with Grant Creek Interests

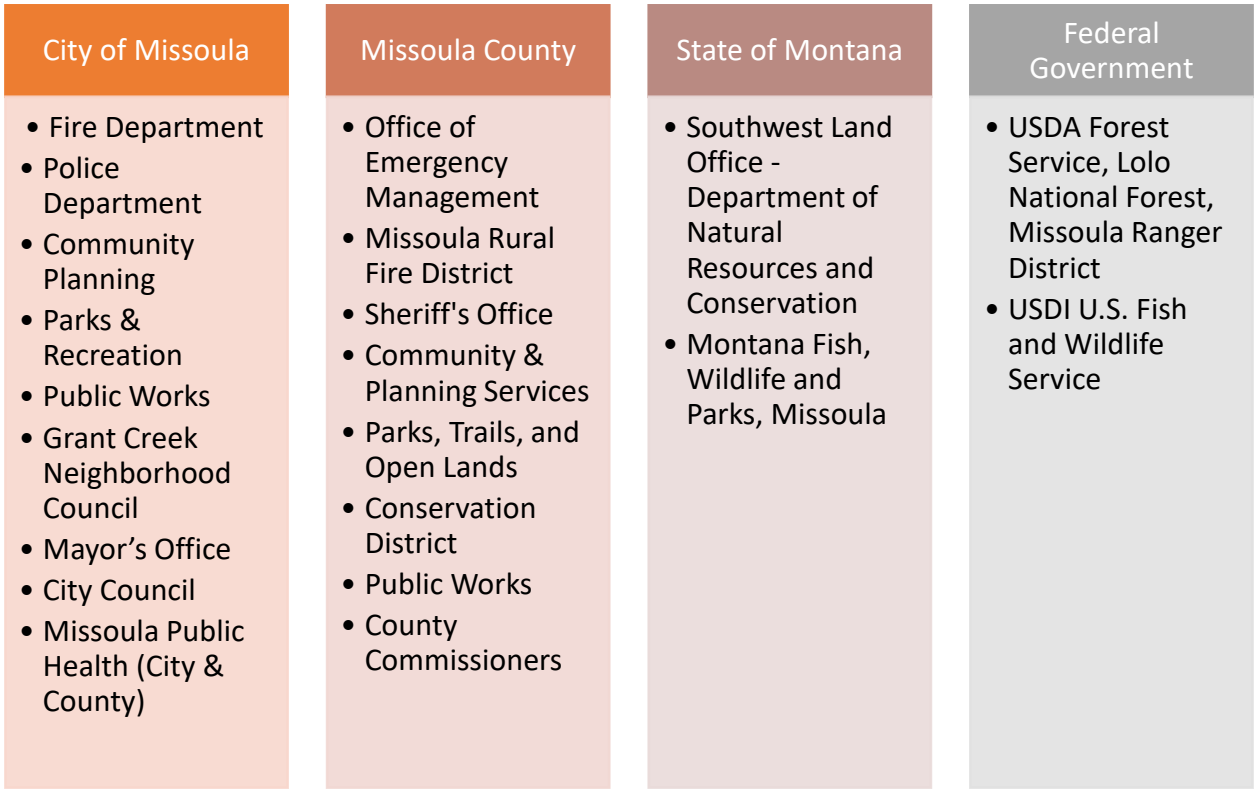


Figure 2 – Local Interested Government Agencies

Examples of Recent Collaborative Efforts in Grant Creek

From 2019 to 2022, the FOGC, GCWRTF and many individual residents of Grant Creek communicated directly with city, county, state and federal agencies including Office of Emergency Management, planning departments, engineering departments and elected officials on issues concerning traffic and wildfire hazards in Grant Creek associated with increasing development. This included numerous letters, meetings and public testimony concerning city and county development proposals, proposed zoning changes, hazardous fuels projects, road and traffic improvements and public recreation projects in Grant Creek. During this same time, the GCWRTF was making presentations to local residents at HOA meetings, FOGC general meetings and peer groups to keep them updated on increased wildfire risk issues in the Grant Creek based on current research, specific development issues, and local and national wildfire events, including changes in vegetation patterns and fire behavior brought about as a result of climate-influenced weather.

Beginning in 2021, the GCWRTF met with city, county, state and federal fire agencies in Missoula County to coordinate their efforts in producing a draft Community Wildfire Protection Plan for Grant Creek. Presentations concerning the need for a Grant Creek specific plan were made to all fire agencies, at annual meetings of the FOGC general membership, at the City of Missoula's Grant Creek Neighborhood Council and with peer groups. These efforts helped gain acceptance of the CWPP project proposal from residents and government agencies.

On May 15, 2021, for the first time ever, the City of Missoula's Office of Community Planning, Development and Innovation required a developer that was proposing a major apartment complex in Grant Creek to produce a Risk Analysis and Fire Protection & Emergency Plan focused on wildfire risk. This analysis would never have taken place without the active collaboration of the GCWRTF with other stakeholders throughout the city's planning process.

In the fall of 2021, the GCWRTF obtained permission from several large private landowners to conduct on-the-ground visual assessments of their properties within the Grant Creek drainage to look for evidence of past wildfire, existing wildfire hazards and overall forest health on both treated and untreated lands. On some of these assessments, the landowner or their representative was present during the visit. In conjunction with these private land assessments, the Task Force also conducted visual assessments of the adjoining Lolo National Forest including both treated and non-treated lands in the immediate vicinity of housing areas above Bench Creek, Ravine Gulch and the East Fork of Grant Creek.

On April 8, 2022, the Grant Creek Wildfire Risk Task Force (GCWRTF) collaborated with the MCFPA to conduct over 160 home inspections in upper and middle Grant Creek as part of the field exercise of the fire training course S-215, Fire Operations in the WUI. The course was sponsored by the Southwest Montana Wildland Fire Training Center. Instructors, the GCWRTF and 26 students representing the Missoula Fire Department, the Missoula County Rural Fire District, and USDA Forest Service attended. The GCWRTF worked with Garden City Compost to provide free single-trip yard waste dumping coupons (one per home) as an incentive for residents to participate in the Grant Creek Home Inspection Day.

Photo 1 - Grant Creek home ignition zone inspection pre-meeting with students. April 8, 2022. John Langstaff.

On May 3, 2022, the GCWRTF and the MCFPA's Community Preparedness Team partnered again to host a wildfire simulation and sand table exercise (STEX) at the University of Montana based on a Grant Creek wildfire scenario. Fire behavior analytics and simulation mapping were provided by the GCWRTF. Thirty attendees included representatives from local, county, state and federal agencies in Missoula County, and some infrastructure stakeholders that could play a role in addressing specific issues. The MCFPA prepared a *Lessons Learned Summary* of the exercise (Appendix B). The GCWRTF also prepared a letter to MCFPA with their thoughts on the exercise relative to the concerns of Grant Creek residents (Appendix C). MCFPA also produced a video of the exercise (released on October 13, 2023)[5] for use as a training tool for agencies, Grant Creek residents and the general public.

Photo 2- Grant Creek Wildfire Ready Backyards bus tour stop at Grant Creek Ranch. June 22, 2022. John Langstaff.

On June 22, 2022, The GCWRTF collaborated with the Lolo Restoration Committee (LRC) and the Missoula Area Chamber of Commerce on a Wildfire Ready Backyards bus tour of Grant Creek to discuss wildfire preparedness. At several stops with different types of wildfire risk, members of GCWRTF discussed increasing development, increasing forest density, wildfire history, hazard and risk and evacuation issues in Grant Creek. Other subject matter experts discussed grants available to reduce hazardous fuels, not only in Grant Creek, but elsewhere in Missoula County. The tour was attended by 44 individuals representing residents of Grant Creek and other Missoula County neighborhoods, LRC, Missoula Chamber of Commerce, government agencies, private contractors and university staff.

On September 10, 2022, the GCWRTF met with representatives from Lincoln Hills HOA (Rattlesnake) and Elk Creek HOA (Frenchtown) to discuss strategies for getting local residents more involved in Home Ignition Zone (HIZ) mitigation efforts.

Grant Creek encompasses a large number and variety of structures, housing densities, commercial development, ownerships, neighborhoods, infrastructure, special and government interests, terrain, habitats and wildfire hazards and risk. ***As a result, effective collaboration with stakeholders will need to continue in Grant Creek in a constant effort to create and maintain a fire-adapted community through wildfire hazard reduction, education and evacuation planning.***

The Grant Creek Setting

Natural Environment and Historical Context

Geography in Grant Creek varies dramatically from rolling foothills interspersed with several large meadows along the Grant Creek valley floor to high alpine peaks in the Rattlesnake Mountains. The major water feature throughout the area is Grant Creek, a tributary of the Clark Fork River and part of the Columbia River Basin. Elevations range from 3,340 feet above sea level near I-90 to 8,167 feet at Murphy Peak on the north boundary at the upper watershed divide, a distance of approximately 10 air miles. Slope and more rugged mountainous terrain begin to increase significantly about 4 miles north of I-90 where Grant Creek and its main tributaries become more confined to narrow valleys. Grant Creek is again confined to a narrow valley as it exits the south end of the drainage near I-90. The vegetative landscape transitions from southwest to northeast in the area as elevation increases, trending from 1) grasslands and shrubs to; 2) mixed open and forested slopes depending on aspect to; 3) steep, densely forested slopes and narrow valleys to; 4) rocky cirque basins and peaks.

Cultural and Historical Resources

Grant Creek was part of the aboriginal territory of the Séliš (‘Salish’ or ‘Flathead’) and QĺIispé (‘Kalispel’ or ‘Pend d’Oreille’). The valley’s primary water resource, translated to English, has always been known in the Salish language as “Little Wide Creek You Can Cross.” It was traversed by one of their most important east-west trails. The Missoula area was the single greatest digging ground for their primary food source, bitterroot (*Lewisia rediviva*), which can still be found in the grasslands of the Grant Creek watershed.[6]

Grant Creek’s ranching history dates to the 1850’s. Cattle ranching and associated haying supported by irrigation are still the primary agricultural uses. Two large ranches have property located in both Grant Creek and the adjoining Butler Creek drainage to the west, but only one of these is still headquartered in Grant Creek. Originally known as Knowlton Creek, the name of the creek changed when Captain Richard Grant, a former Hudson Bay Company trapper from Fort Hall (present day Idaho), settled there and raised cattle.[7] Grant’s original homestead is believed to have been located on property now owned by Grant Creek Ranch. Grant’s wife, Helene, and daughter, Julia, were QĺIispé and fluent speakers of the Salish language. It was Julia

who originated the English placename “Missoula” as an anglicized modification of the Salish name for the middle Clark Fork River.[8]

Photo 3 - View south to the Grant Creek Ranch headquarters (center right) and pastures. Grant Creek flows south through the forested riparian area in between the pastures. August, 2021. Fred Carlson, FDNY

Also of historic significance is the later acquisition of the ranch by John Rankin. His eldest daughter, Jeanette Pickering Rankin, was born there in 1880 (that house is no longer standing). She went on to become the first woman in American history to serve in Congress and was elected twice to the U.S. House of Representatives, once in 1916 and again in 1940.[9] This ranch and its significance to Montana history is located in the middle of the Grant Creek valley.

Natural Resources

In addition to riparian zones, grasslands and forests that will be described later in this document related directly to wildfire hazard and risk, there are other natural resources that may be directly impacted by wildfire.

Watershed, Fisheries and Wildlife

Grant Creek, a perennial mountain stream, is part of the Middle Clark Fork hydrologic subbasin**.** In 2021 a riparian assessment of Grant Creek was completed to determine overall health of the stream corridor. The creek above the Snowbowl Road bridge was not part of the study as it was considered “…relatively high-quality riparian and aquatic habitat…” in part due to its location within mostly National Forest System lands.[10] The major native species of fish in Grant Creek were identified as westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) and bull trout (*Salvelinus confluentus*).[11] The assessment also identified that the stream segment from the

Snowbowl Road bridge south to I-90 was in generally good health with a stable or improving trend.[12] Some locations in this stretch of the stream also have infrastructure in place for agricultural irrigation.

The Grant Creek drainage provides habitat for a variety of wildlife. Native species commonly seen are black bear (*Ursus americanus*), mountain lion (*Puma concolor*), elk (*Cervus elaphus*), white-tail deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), and bobcat (*Lynx rufus*). The Grant Creek area provides critical elk migration and breeding habitat. Sightings of Grizzly bear (*Ursus arctos horribilis*) have increased in the surrounding mountains in the upper drainage and this species may become a more frequent visitor. Bird species are also abundant and varied due to the variety of riparian, grassland and forest habitats ranging in elevation from 3,000 to 8,000 feet above sea level. Two non-native subspecies of wild turkey (Merriam's and Eastern) were most likely originally introduced into Montana by FWP. The turkeys commonly seen throughout the year in the lower elevations of Grant Creek are a hybrid of these two subspecies (*Meleagris gallopavo sp.*).[13]

Soils

A variety of soil types are present in Grant Creek. Grant Creek terrain varies from flat meadows to rolling grasslands to steep, heavily-forested mountainsides. As a result, different topography, vegetative cover, geologic processes and underlying geology determine both the depth, productivity and stability of these soils. A wildfire could have serious impacts to soil stability depending on slope, aspect, soil type, fire severity and amount of vegetation loss. Soils exposed to severe heat from wildfire can even become hydrophobic where a crust is formed within the soil layer, rainfall cannot penetrate the ground and water can only flow across the surface. Denuded and hydrophobic soils, especially on steeper slopes, would be more vulnerable to long-term erosion and could create conditions suitable for weather-induced debris flows following a wildfire event.[14] This could also affect water quality in Grant Creek.

Invasive Species

The primary non-native plant species found in Grant Creek include Spotted knapweed (*Centaurea stoebe*), Dalmatian toadflax (*Linaria dalmatica*), Houndstongue (*Cynoglossum officinale*), Leafy spurge (*Euphorbia virgata*), Sulfur cinquefoil (*Potentilla recta*) and Cheatgrass (*Bromus tectorum*). Supported by grant funding, residents, land owners and HOAs have been actively confronting this problem for a number of years through spraying and hand pulling of weeds on private property. Encroachment of these plants will increase following a wildfire which would provide a favorable seed bed for their growth and further expansion in the valley.

Forest Resources

Logging has occurred in Grant Creek over the past 150 years, both on public and private lands. In its early history a sawmill at the Grant Creek Ranch provided lumber to the new town of

Missoula and later a lumber mill owned by the railroad was located several miles up Ravine Gulch. However, steep terrain has always limited where logging was feasible. Timber removal has not kept up with natural increases in forest regeneration and its expansion into previously non-forested areas or regrowth of logged areas.

Air Quality

A wildfire in Grant Creek could produce significant air quality hazards not only to residents and businesses in Grant Creek but throughout the Missoula valley. Depending on a variety of weather factors, smoke would most likely move south out of the canyon and into Missoula due to down slope, down valley air movement which often occurs in the evening. A long duration wildfire would create a continual source of smoke, further impacting air quality in Missoula.

Summary

A large wildfire in Grant Creek could have significant, long-term impacts to Grant Creek's natural, cultural and historic resources depending on size, location, duration and fire severity. Infrastructure such as roads and bridges in Grant Creek could be adversely affected. Loss of ranching infrastructure (buildings, fencing, equipment, etc.), cattle and feed (hay) would be the primary impacts to agriculture from a wildfire. In addition, moving cattle out of the area prior to or during a wildfire could create significant logistical issues.

A major wildfire could also have downstream impacts from I-90 south to the Clark Fork River where Grant Creek is already identified as an impaired stream by several state and local agencies. The stream is confined to an 800-foot-long concrete box culvert under the I-90 intersection.[15] This could become seriously compromised in the event of a debris flow in the aftermath of a large wildfire.

Access

Primary Ingress/Egress

Grant Creek Road, proceeding north from Exit 101 on Interstate 90, is the main arterial road and only reliable travel route into and out of the area (Map 3). It is a one-way in, one-way out paved, two-lane, narrow road without shoulders, severely limiting ingress and egress in the event of a wildfire. This road also serves as the main access route for major commercial, recreational and multi-family rental developments within the Missoula city limits immediately north of I-90. The Grant Creek Road provides the only year-round public access via the connecting Snowbowl Road to the Snowbowl Ski and Summer Resort's commercial developments located approximately 10 miles north of I-90 in upper Butler Creek, the next drainage west of Grant Creek in Missoula County.

Pavement ends on Grant Creek Road approximately 0.3 miles north of its junction with Bench Road in upper Grant Creek and is gravel-surfaced beyond that point to road end. Pavement ends on Snowbowl Road about 0.3 miles west of Grant Creek Road near a turnaround at the entrance to Keegan Trail subdivision and is gravel-surfaced from there to the resort.

In 2022, the City of Missoula engineering department identified the section of Grant Creek Road between I-90 and Expo Parkway as a "Crash Cluster" due to the increasing number of traffic accidents that have occurred in this section of the road. Information on reported traffic accidents on Grant Creek Road from 2019-2022 can be found in Appendix D.[16]

All bridges located within Grant Creek meet or exceed weight limits for the passage of emergency and fire response equipment. Locked gates can be found on private roads but would need to be breached for emergency response.[17]

Photo 4 – A multi-vehicle accident on Grant Creek Road at the first intersection north of I-90. August 3, 2021. Kevin Davis.

Other Ingress/Egress Routes with Known Limitations

In 2021, the GCWRTF did a detailed, on-the-ground, review of road systems on public and private land in Grant Creek. Using a two-wheel drive vehicle as the minimum standard of travel by residents in the event of a wildfire evacuation, only two potential routes were identified.

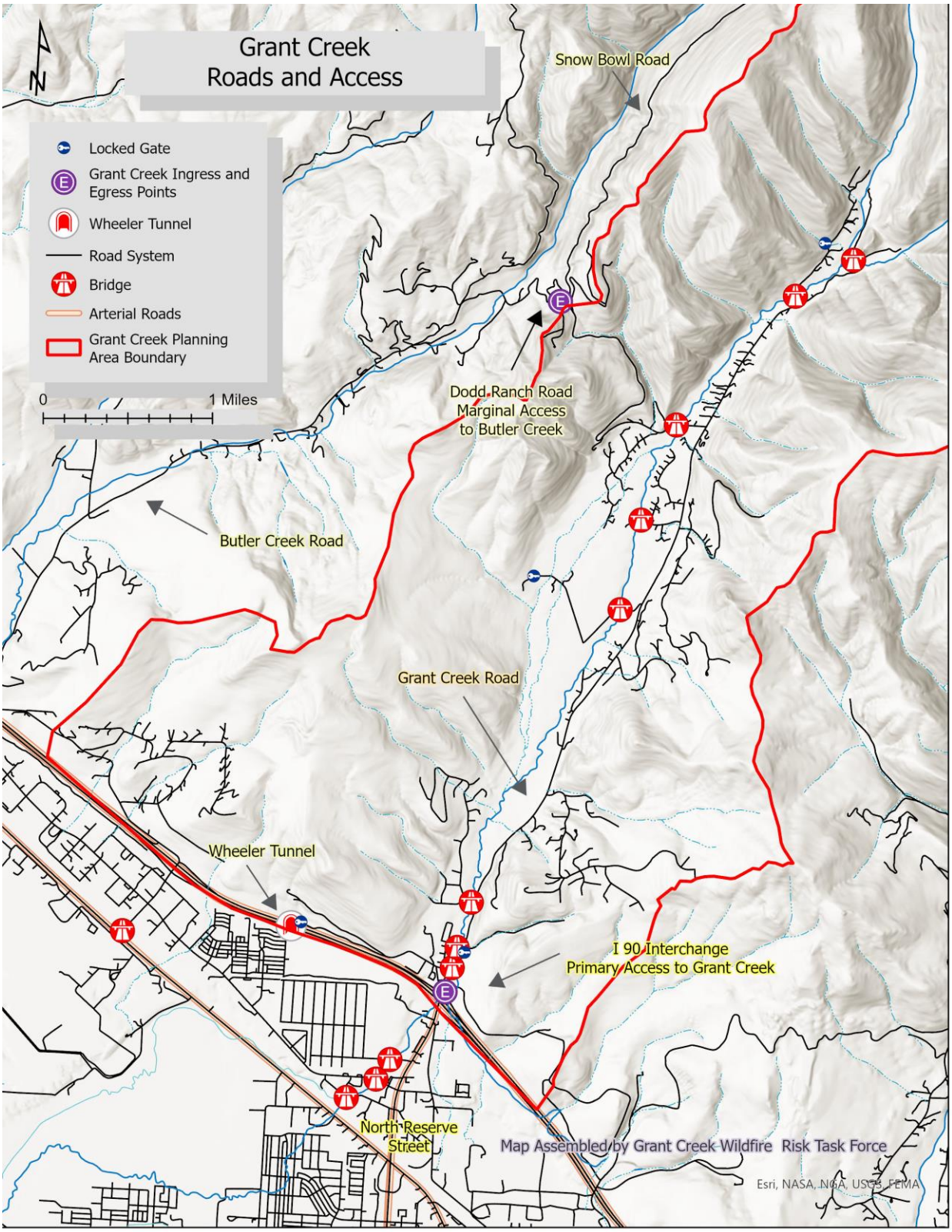
The **Dodd Ranch Road** is a steep, narrow, winding, one-lane, privately-owned gravel road, branching off the Snowbowl Road at the watershed divide between Butler Creek and Grant Creek, providing access downhill to the Butler Creek Road.

The narrow, low height **Wheeler Tunnel** under I-90 connects Grant Creek via Expo Parkway/Old Indian Trail West Road on the north to Wilke Street on the south by a dirt road that is currently in private ownership with a locked gate at the tunnel's north entrance.

Under existing conditions, both of these routes provide very limited opportunities for ingress/egress of vehicles and equipment during a wildfire emergency in Grant Creek.

Photo 5 – South end of the Wheeler Tunnel under I-90 where it exits onto Wilke Street. June 2021. GCWRTF.

Traffic congestion on the Grant Creek Road, including within the city limits, has increased significantly in the 40+ years of major housing and commercial development in Grant Creek and the adjoining I-90 intersection. As a result, Grant Creek residents have become increasingly concerned about the buildup of hazardous fuels, the traffic bottleneck that has developed and evacuation in the event of a wildfire.



Map 3 – Grant Creek Roads and Access

Existing and Future Development

Commercial Development

Hotels, restaurants, traveler/visitor services and a canine daycare center are located in Grant Creek immediately north of and adjacent to I-90, with multi-family private residences and rental apartments located within a short walking distance. Existing zoning allows additional commercial development in this area on three vacant lots. The area near Gooden Lane, Keil Loop at the Airway Blvd exit has one commercial business, a bank.

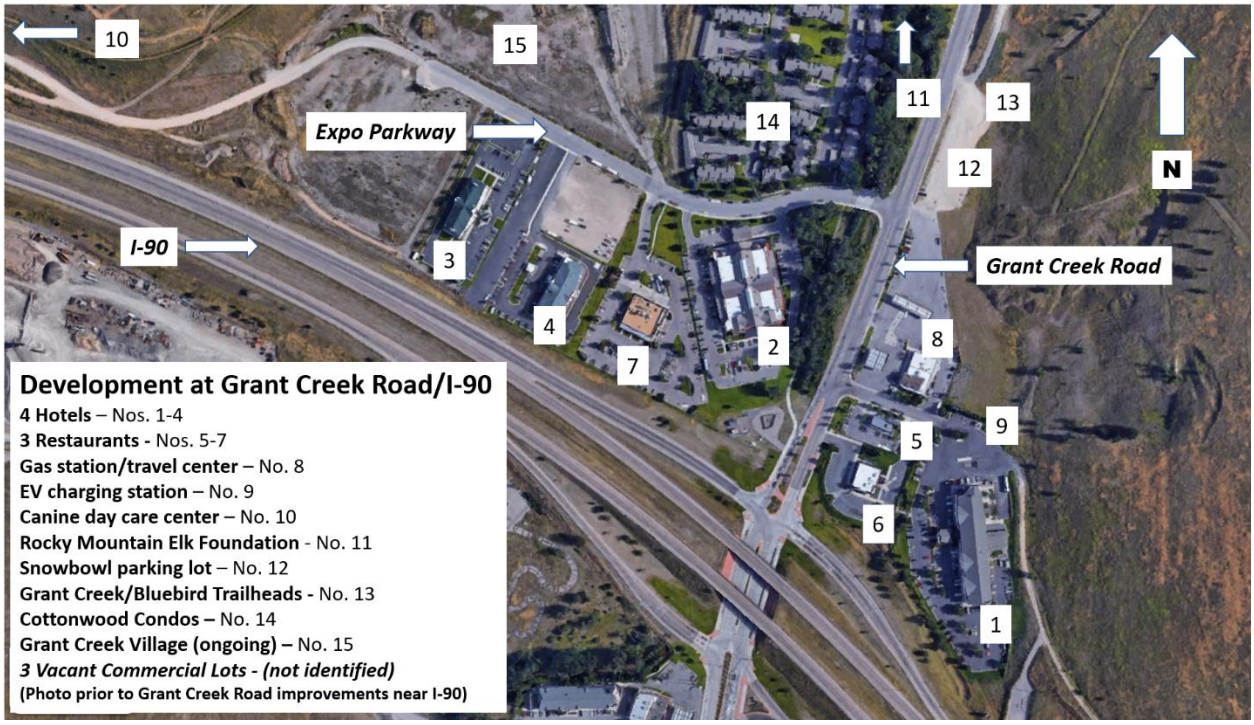


Photo 6 – Development near Grant Creek Road/I-90 Intersection – Google Earth base map photo.

Recreational Development

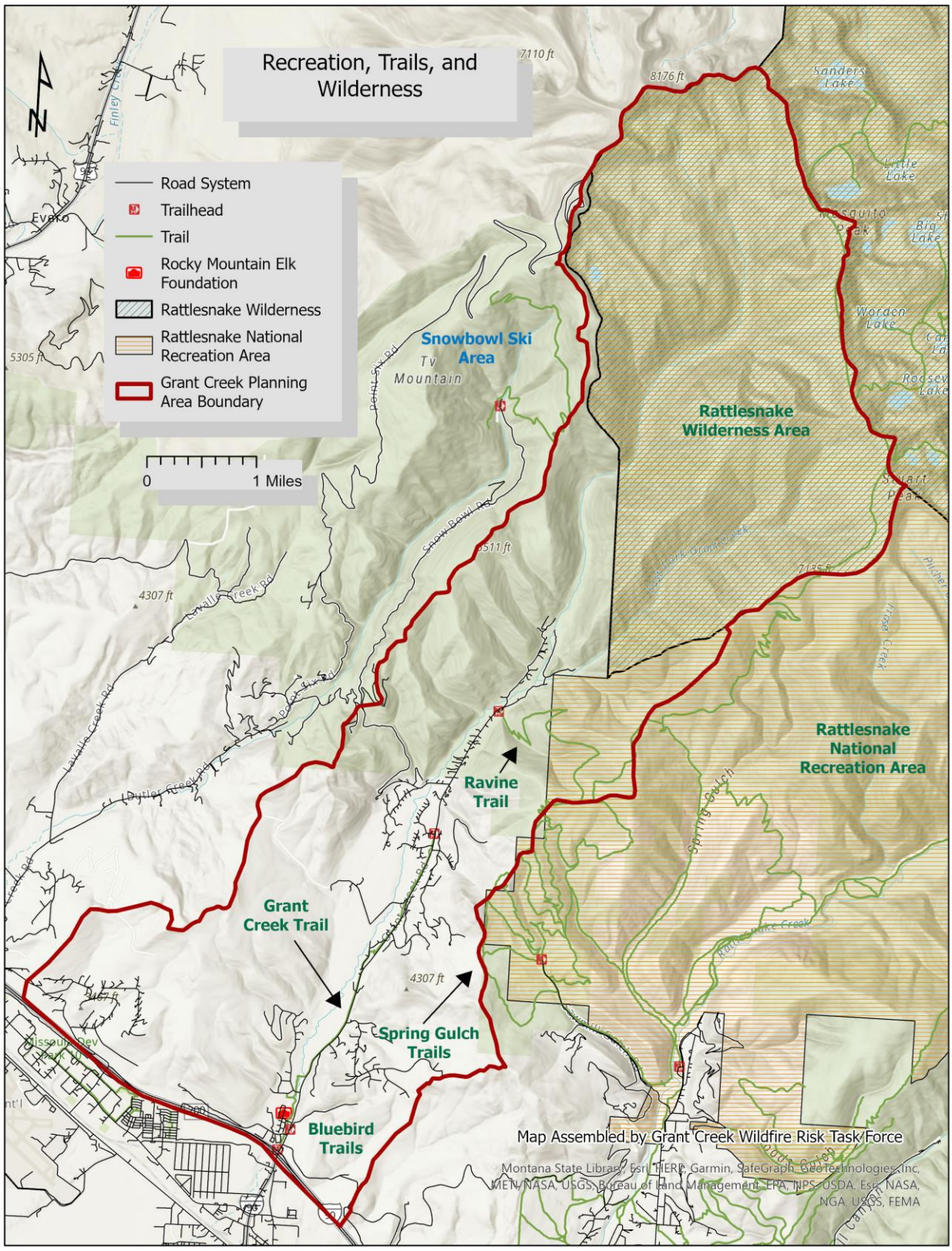
Several visitor and recreational developments are located close to the commercial area near I-90 including the Rocky Mountain Elk Foundation (RMEF) Headquarters/Visitor Center and the City of Missoula's Blue Bird Preserve/Grant Creek Trailheads. These trailheads are located in the Snowbowl Ski and Summer Resort shuttle bus parking lot.

Grant Creek Road also provides access to a heavily-used Forest Service trailhead in Grant Creek near residential areas, the Ravine Trail. This is the only trail that accesses the Lolo National Forest and the Rattlesnake National Recreation Area and Wilderness from the Grant Creek valley. The trailhead parking lot is small and considered substandard for the volume of use it

receives from hikers and mountain bikers. As a result, trail users park their vehicles on the road and in private driveways nearby when the lot is full, blocking in some residents, and creating significant obstructions to ingress and egress. This would be a significant problem in the event of a wildfire resulting in evacuations of residents living on Bench Road and the East Fork of Grant Creek.

Photo 7 - Ravine Trailhead and parking issues. Left photo – substandard parking lot (center of photo) at the Ravine Trailhead. October, 2021. Chris Cole. Right photo - Grant Creek Road looking north to the Ravine Trail parking lot. The pickup truck at the top of the road belongs to the owner of the property adjoining the south side of the parking lot who had to back up on a blind curve to make the turn into their driveway. October 23, 2020. John Langstaff.

The Snowbowl Resort area boundary in upper Butler and La Valle Creeks includes a total of 2,323 acres and is accessed on the Snowbowl Road through Grant Creek via the Grant Creek Road. Of this total acreage, 80 acres are privately owned by the resort and 2,243 acres are Lolo National Forest lands administered under a Special Use Permit. Snowbowl is in the process of expanding their outdoor activities during the summer months which would disperse recreationists throughout their permitted acreage during wildfire season.



Map 4 – Recreation, Trails and Wilderness

Residential Development

Multiple single-family homes, many in subdivisions, are accessed by Grant Creek Road, the majority located between ½ and 5 miles north of I-90. As of May, 2023, there were approximately 635 postal addresses in the Grant Creek Valley, the majority made up of single-family homes. There were also 106 postal addresses for rental apartments near I-90 as a result of recently completed construction (Photo 8). The 2023 population of Grant Creek, based on existing postal addresses including apartments (741) is estimated at 1,712 residents.

There are over 100 undeveloped, zoned building lots for new single-family dwellings in Grant Creek. Construction is underway for townhomes and 4-story apartments adding an additional 594 rental units within a short walking distance of I-90. These developments have the potential to increase the population of Grant Creek to over 3,315 residents.[18]

Photo 8 - Phase 1, Grant Creek Village apartments. March 29, 2022. GCWRTF

Between the end of pavement and the Snowbowl Resort, there are also a number of isolated homes concentrated near the Grant Creek/Butler Creek watershed divide whose primary access is the Grant Creek Road.

In addition, an estimated 171 people live in approximately 74 homes in the Gooden Lane/Keil Loop area within the Grant Creek planning area accessed from the I-90 Airway Boulevard exit.

New development, increased population, associated vehicle traffic, restricted traffic flow at the I-90 intersection and the potential need for access by larger city firefighting apparatus, i.e., ladder trucks, are all factors that increase the complexity of response and evacuation in the event of a wildfire.

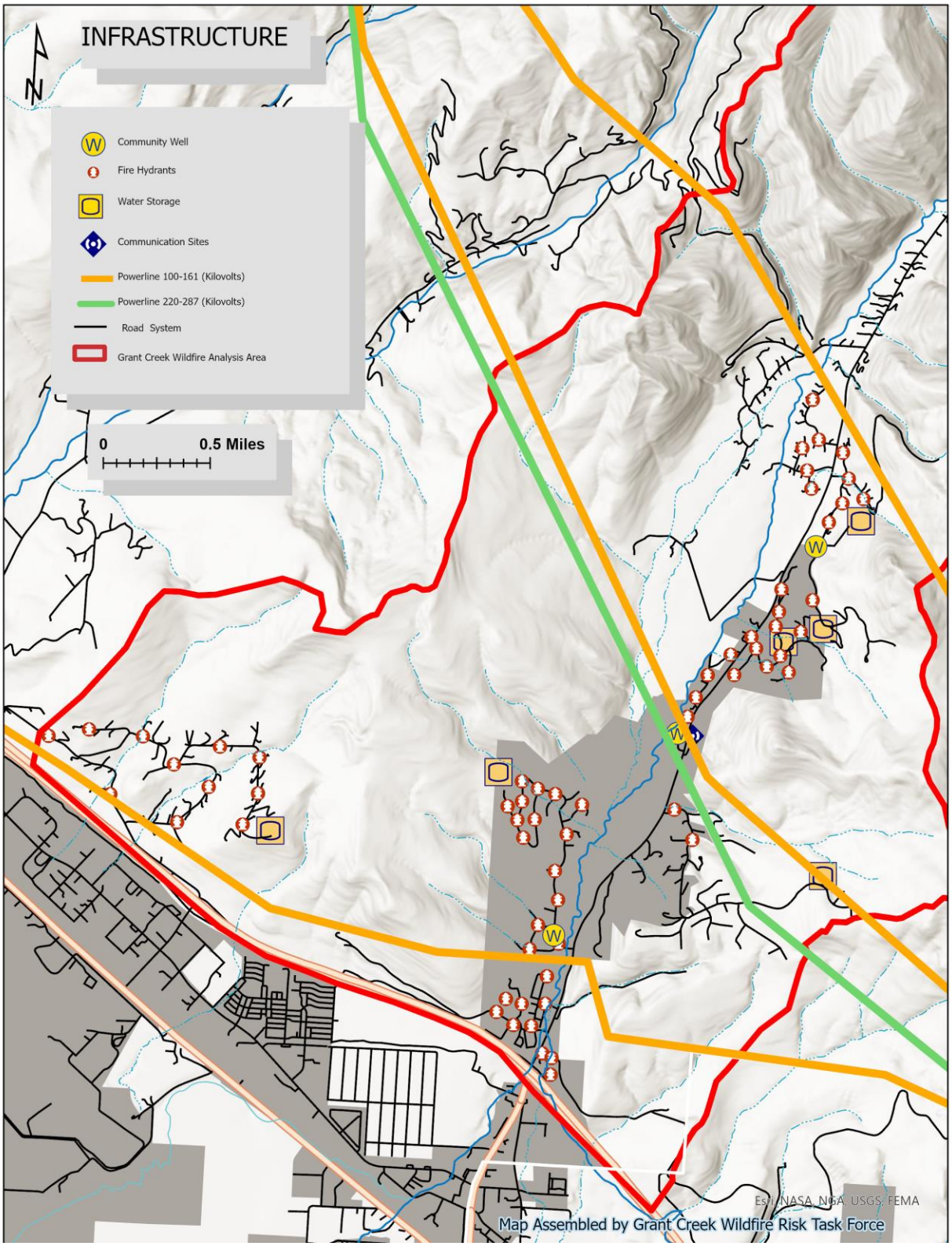
Infrastructure

There are four major above-ground high voltage power transmission lines that cross the valley from east to west, three owned by Northwestern Energy and one by the Bonneville Power Administration (Map 5). Northwestern Energy also distributes natural gas underground to commercial businesses and private residences throughout Grant Creek with above-ground structures associated with this distribution located in lower Grant Creek near the I-90 Grant Creek Road junction. A communication building owned by AT&T is located about 2 miles north of I-90 adjacent to the Grant Creek Road. Electronic transmission towers are located on the Northern watershed divide between Grant Creek and Butler Creek (not shown on Map 5).

Photo 9 – High voltage powerlines located in cured grasslands on the south side of the Prospect subdivision. September 24, 2022. GCWRTF.

The City of Missoula as well as some HOAs maintain buried and above ground large volume potable water storage tanks. The City of Missoula and Missoula County also maintain fire hydrant systems in portions of Grant Creek.

A 10-inch steel buried pipeline managed by Phillips 66 once transported petroleum products on a southeast to northwest trajectory under I-90 through commercial properties, the Grant Creek Village apartment complex, the HOA Common Areas of Prospect and Prospect Meadows subdivisions and agricultural land in lower Grant Creek before crossing west into the Butler Creek watershed (not shown on Map 5). Any surface route markers or structures could potentially be compromised by wildfire or suppression activities such as dozer/excavator constructed firelines.



Map 5 – Infrastructure

Land Ownership

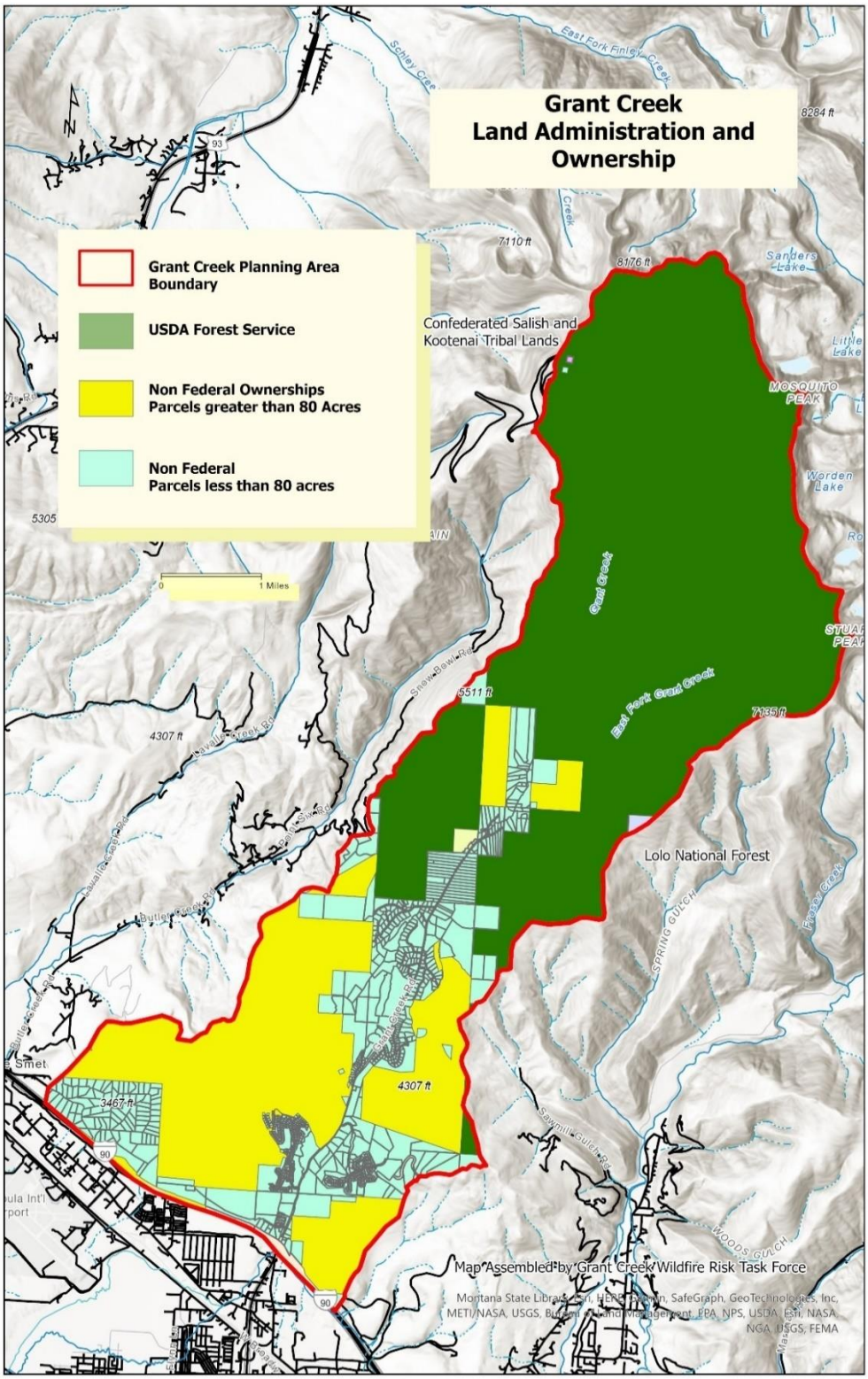
Although there have been ranches and individual homes in Grant Creek for well over 100 years, the first residential housing development and associated infrastructure started with 10-acre lots in Grant Creek Tracts in 1962.[19] This development trend has continued up to the present time where a majority of residents now own a single-family home in a subdivision or a small acreage. Most owners throughout Grant Creek are year-round residents (Map 6).

Commercial properties, including rental apartments, are primarily located near I-90 off of Grant Creek Road with one property located on Airway Boulevard.

Properties over 10 but under 80 acres are less densely populated with fewer homes. Two exceptions include a platted subdivision (currently undeveloped) off Glen Eagle Road owned by Missoula County as the result of a court settlement and one apartment complex near I-90.

There are a number of large, privately-owned land holdings over 80 acres in the lower half of the drainage, several which cross into adjoining watersheds in Butler and Rattlesnake Creeks (Map 6). The three largest owners are the National Wildlife Federation, Flynn Ranch and Grant Creek Ranch, the latter being one of the most active cattle operations (leased grazing) based in the Grant Creek valley. The City of Missoula owns a large acreage in lower Grant Creek that was purchased for open space.

Most of upper Grant Creek is publicly-owned, steep, heavily-forested with limited road access and is part of the Lolo National Forest.



Map 6 – Grant Creek Land Administration and Ownership

Governance

A narrow corridor of private residential and agricultural land from I-90 north along both sides of Grant Creek Road to, and including, the Grant Creek Hills subdivision is located within the Missoula City limits. All other private lands outside of this area, including homes in the area north of the I-90 Airway Boulevard exit, fall under the jurisdiction of Missoula County.

The majority of publicly-owned lands in the planning area are administered by the USDA Forest Service, Lolo National Forest. Montana state-owned lands in Grant Creek occupy less than 80 acres.

Fire protection responsibilities of city, county, state and federal government agencies are discussed later in this document.

Neighborhoods

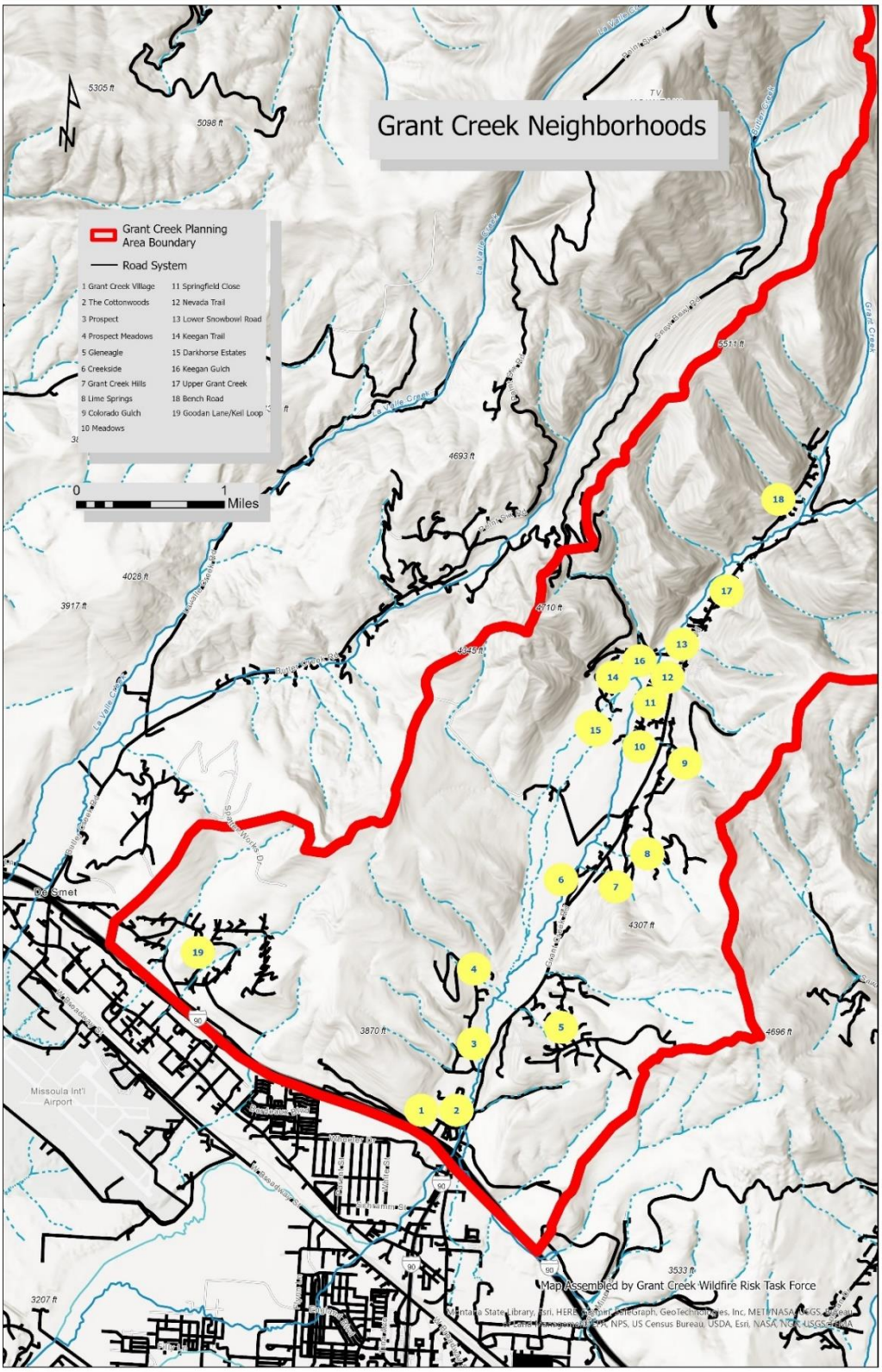
An inclusive review of the planning area identified all housing locations including isolated residences. Specific areas of Grant Creek both within and outside of the Missoula city limits have more concentrated areas of housing, including multi-family rental apartments and subdivisions. Many of these neighborhoods have become known by commonly identified names, often associated with local access roads and unrelated to their original subdivision plat. For instance, many of the residential areas in the middle of the Grant Creek planning area were originally part of the Grantland 1 through 10 subdivisions.

Some subdivisions are governed by a Home Owner Association (HOA) with officers elected by residents of a subdivision. The HOA includes covenants/property restrictions applicable to all homeowners in the subdivision filed with Missoula County. HOAs determine annual fees assessed to each homeowner to manage each subdivision's internal, non-public infrastructure and common areas. For instance, some subdivisions share water system infrastructure.

From I-90 north on Grant Creek Road, these neighborhoods are identified on map 7 by numbers that reference the approximate location of each neighborhood.

1) Grant Creek Village (rental apartments)
2) The Cottonwoods
3) Prospect
4) Prospect Meadows
5) Gleneagle
6) Creekside
7) Grant Creek Hills
8) Lime Springs
9) Colorado Gulch
10) Meadows (Rankin Road/Pickering Lane/Mellot Lane/Jacot Lane)
11) Springfield Close
12) Nevada Trail
13) Lower Snowbowl Road(from Grant Creek Road to Keegan Trail)

14) Keegan Trail
15) Darkhorse Estates
16) Keegan Gulch
17) Upper Grant Creek (including the East Fork of Grant Creek)
18) Bench Road
19) Goodan Lane/Keil Loop (Airway Boulevard exit off I-90)



Map 7 – Grant Creek Neighborhoods

Unique Conservation Lands

Charlotte Reed Marbut Nature Reserve – 32 acres

The Marbut family owned the Grant Creek Ranch from 1955 through the late 1970s. This nature reserve in Grant Creek adjoining a segment of the creek approximately ¼ mile upstream from Prospect Drive is managed for its conservation values in perpetuity in honor of the family's matriarch and is not open for public recreational access. It was known historically by the Marbut family as Beaver Meadow.[20] Administered by the City of Missoula.

Bluebird Preserve – 124 acres

This grassland area, administered by the City of Missoula, allows public recreational access from a trailhead in the Snowbowl shuttle parking lot near I-90. There are some access restrictions. The preserve contains one of only three known populations of Missoula phlox (*Phlox missoulensis*) located in the Missoula valley. It also contains a small acreage of relict, native rough fescue (*Festuca campestris*) and bluebunch wheatgrass (*Elymus spicatus*) habitat.[21]

National Wildlife Federation Lands – 704 acres (within the watershed)

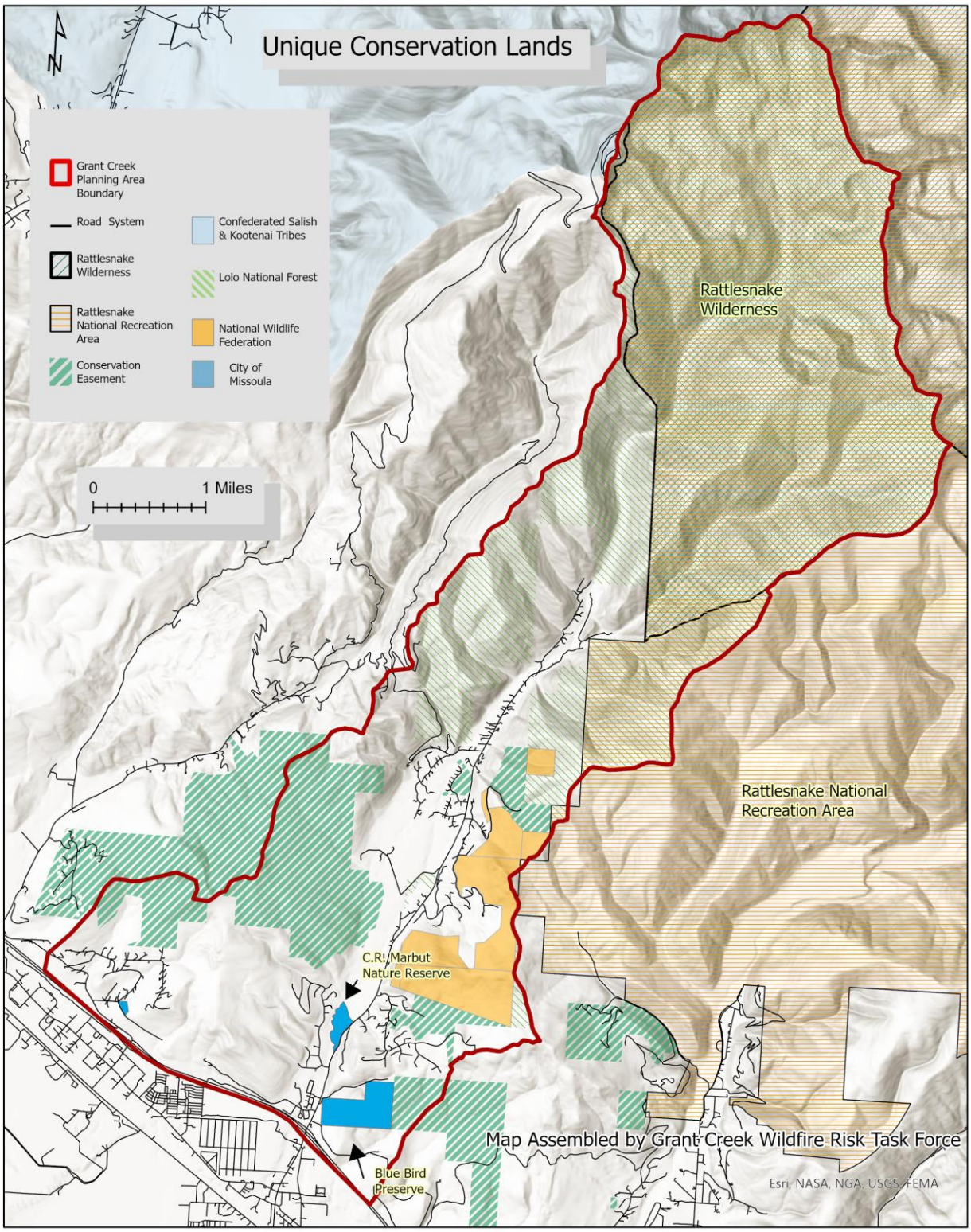
Properties owned by the NWF in Grant Creek are located on the east side of the valley and border both residential areas and National Forest System lands. The priorities for these NWF lands are wildlife-focused on the three pillars of the organization's common agenda for wildlife – 1) to protect, restore and connect wildlife habitat; 2) transform wildlife conservation and; 3) connect Americans with wildlife.[22] For the benefit of wildlife, some access restrictions apply.

Conservation Easements

A conservation easement is a voluntary legal agreement by which a landowner chooses to limit certain uses of the land in order to conserve some value it provides. Land placed into a conservation easement still belongs to the landowner who retains rights to sell the land or pass it to heirs. Most landowners continue to live on and manage the land for farming, ranching, timber, recreation and other uses. These agreements are tailored to meet the needs and long-term goals of the landowner.[23] There are a number of conservation easement agreements in Grant Creek, some that overlap into Butler Creek and Rattlesnake Creek due to landownership.

Rattlesnake National Recreation Area and Rattlesnake Wilderness

These lands were established by Congress in 1980 and are administered by the Lolo National Forest. Both areas allow public recreational access and use. However, the wilderness area is managed specifically to preserve and protect natural conditions and to protect wildlife habitats, clean water sources, and diverse ecosystems. As a result, motorized and mechanized equipment are not allowed in the wilderness area.



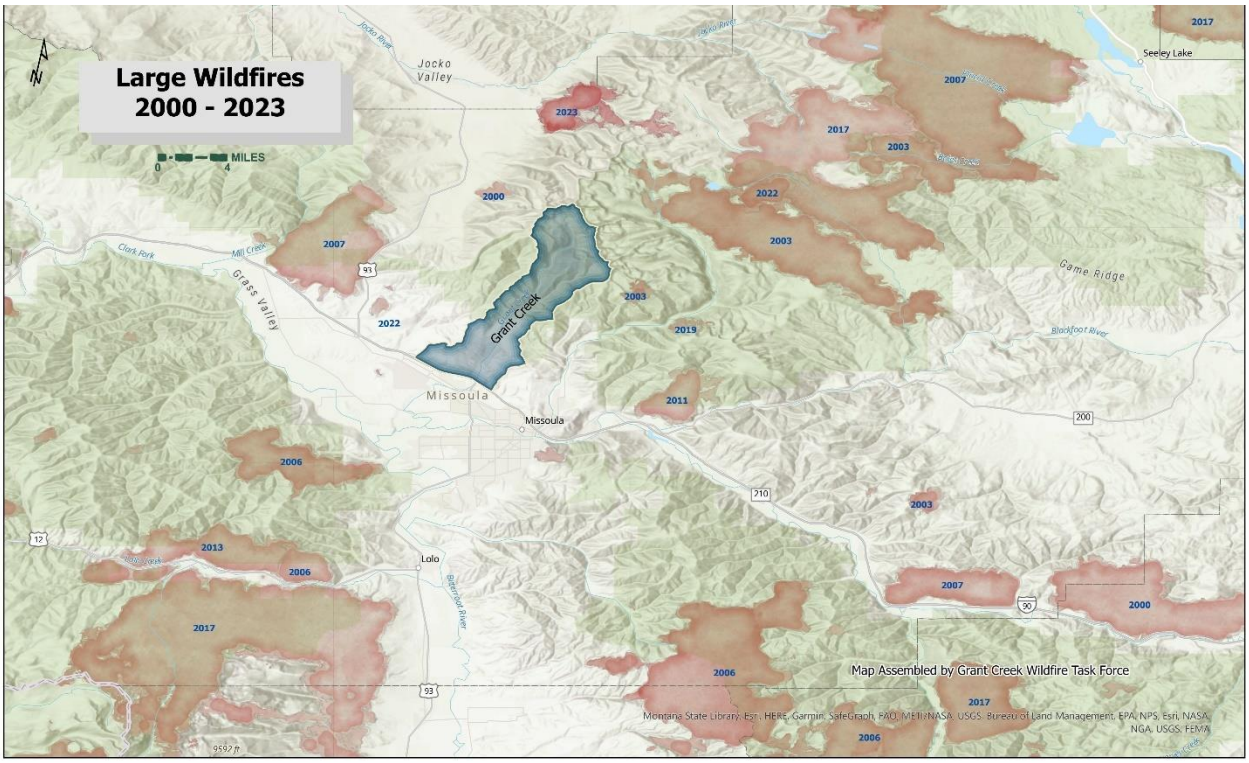
Map 8 - Unique Conservation Lands.

The Wildfire Environment

Wildland fire is an ecological process that has been a component of the environment in the Northern Rockies for thousands of years. Both lightning and humans are sources for wildfire ignitions in Grant Creek. Wildland fire interacts with insect infestations, forest diseases, and climate to define the composition and pattern of vegetation in Grant Creek and western Montana.[24] With changes in climate and vegetation, Grant Creek is expected to remain susceptible to wildfire events, with the expectation that they will occur more frequently.

Wildfire History

Montana experiences large landscape-scale wildfire events every year. Since the year 2000, large wildfires are occurring more frequently in Missoula County and have been burning closer to the city limits of Missoula and Grant Creek. Some of these individual wildfires encompassed areas larger in size than the entire Grant Creek drainage (Map 9). Climatic trends and increased human activity suggest that wildland fire will continue as a significant ecological element in Missoula County and western Montana.



Map 9 – Large Wildfires: 2000-2023.

Wildfire Ignitions in Grant Creek

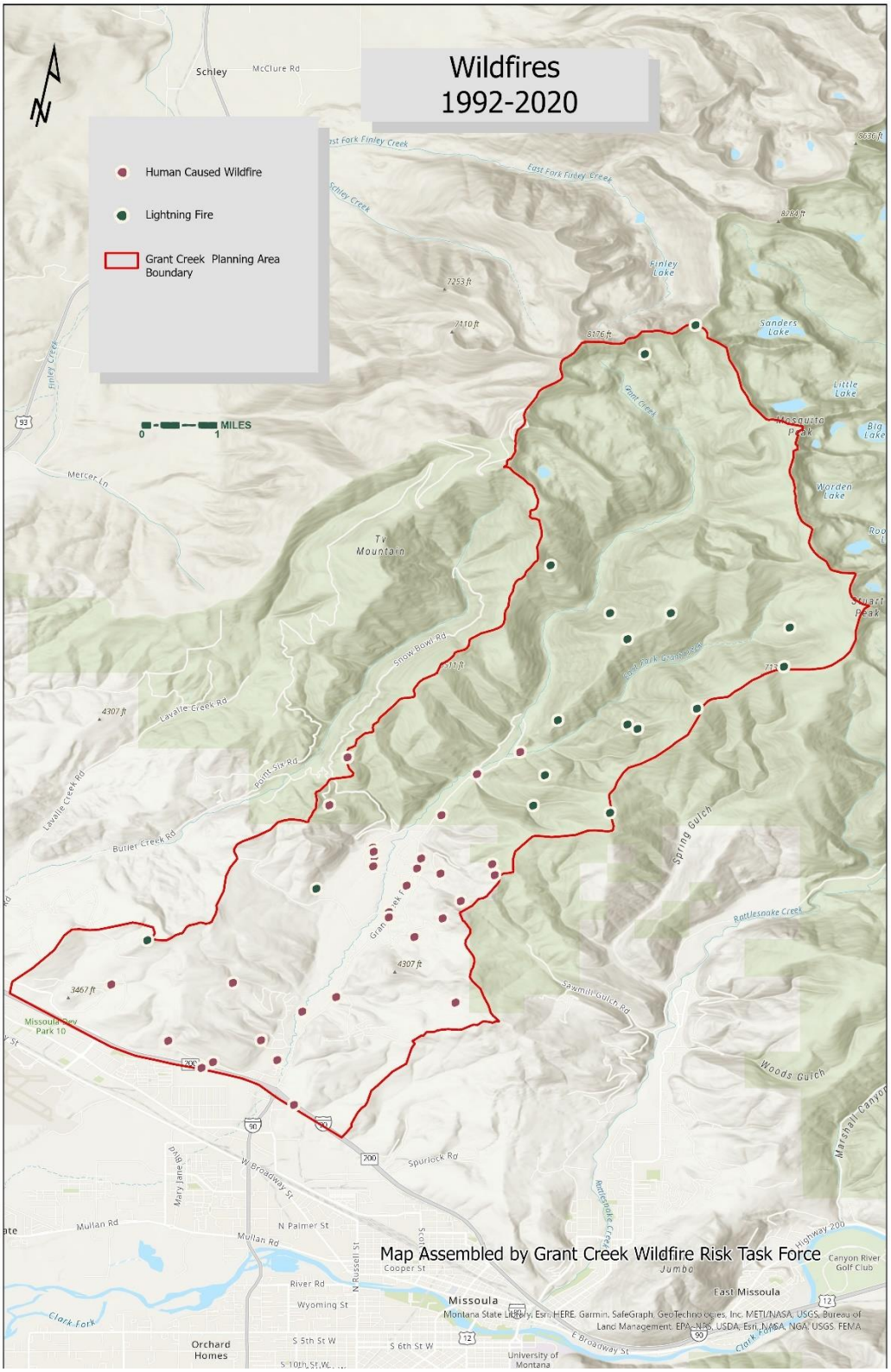
Historical records of past large wildfires are limited in accuracy and details. Mapping records indicate a large wildfire covered an area near present day U.S Hwy 93 in the west through Grant Creek and east into the Rattlesnake drainage in 1919. However, this may have been two separate wildfires. A detailed newspaper account from August 1919 describes a large human-caused wildfire **originating** in the vicinity of Grant Creek Ranch (then owned by Charles Quast) burning east at "…terrific speed…," destroying homes and farms in the Rattlesnake drainage.[25] Since then there is no historical record or physical evidence of **significantly** large wildfires in the drainage.

Between 1979 and 2023, six wildfires of 10 acres or more in size have occurred in the Grant Creek watershed. In 1979 a 250-acre wildfire on the Lolo National Forest burned within 2 miles of the closest residences. Two wildfires threatened homes near the switchback on the Snowbowl Road; a 50-acre fire in August, 1988 and a 91-acre fire at approximately the same location in July, 1994 (Photo 10). In 1999 a 10-acre fire required structure protection at Gleneagle. In May, 2001 a legal burn escaped at Colorado Gulch consuming 15 acres. The largest, recent wildfire was 16 acres and caused by a downed powerline in August, 2016 at Colorado Gulch (Photo 11). No homes were damaged from this fire but some residences were evacuated, and others placed on evacuation warning.

Photo 10 - Keegan Trail vicinity. Looking northeast above the switchback turn on Snowbowl Road at a portion of the 91-acre fire scar from the July, 1994 wildfire. October, 2021. Chris Cole.

Photo 11 - Left photo – aerial retardant drop on the Colorado Gulch fire. This fire had the potential to burn out of Grant Creek and into the Rattlesnake drainage to the east. August, 2016. Kevin Davis. Right Photo - View north up Grant Creek at the 16-acre fire scar from the Colorado Gulch fire. Grant Creek Road on the left, a Colorado Gulch home in the trees, lower middle of photo. August, 2021. Fred Carlson, FDNY.

During the period 1992-2020, there have been 48 reported wildfire ignitions in the Grant Creek planning area. 65% of these wildfires were caused by humans and 35% were ignited by lightning. (Map 10)**.**



Map 10 – Wildfires: 1992-2020.

Wildfire Potential Assessment: Topography, Fuels, Weather

Grant Creek is expected to remain susceptible to wildfire events, with the probability that they will occur more frequently with changes in climate and vegetation.

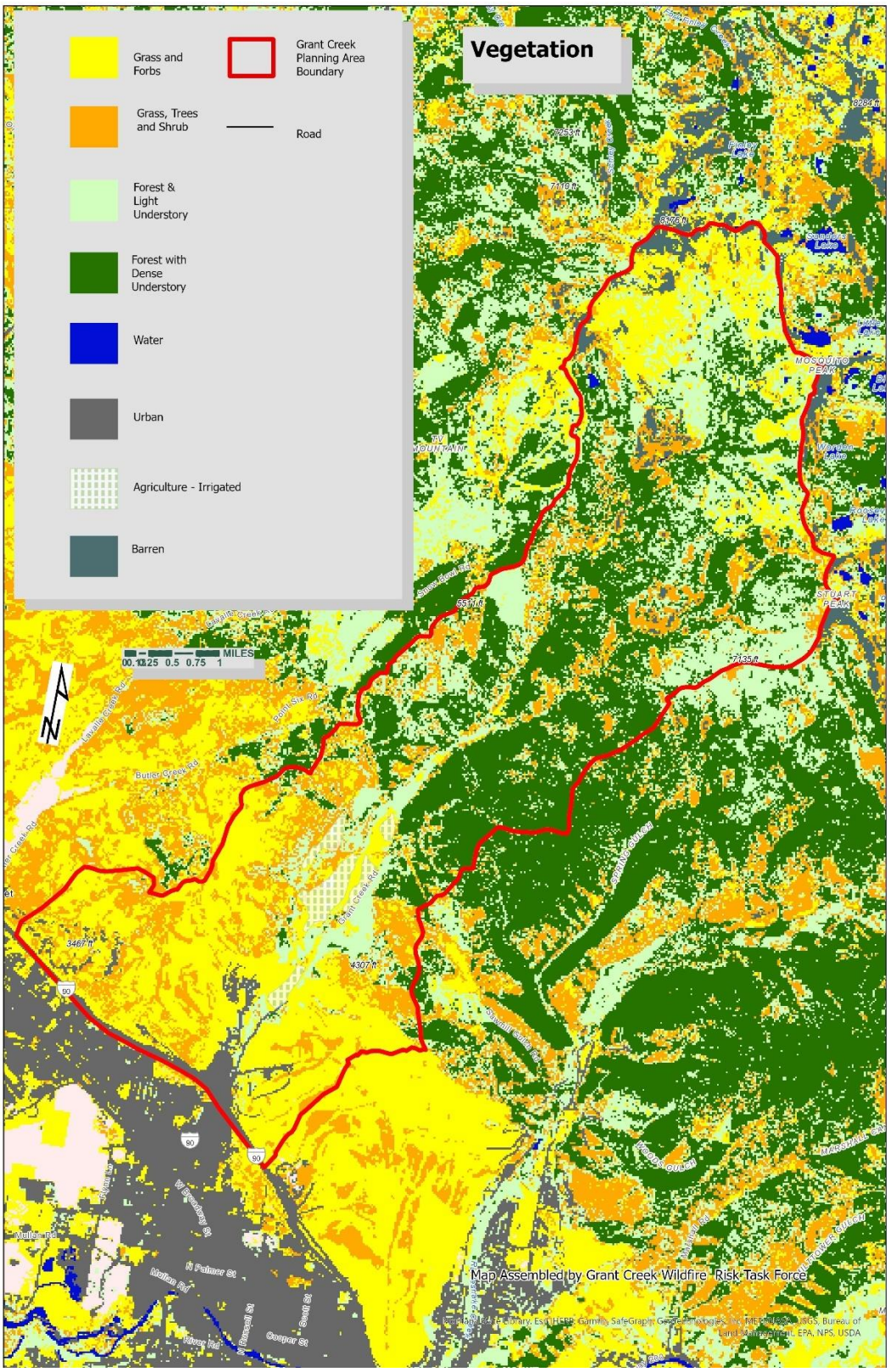
Grant Creek presents a complex fire behavior situation. The principal elements determining wildfire behavior in western Montana are: (1) **topography**, which influences the exposure of fuels and the rate of spread of fire; the character and volume of (2) **wildland fuels**; (3**) weather**, comprised of wind, which often controls the rate of spread of fire; and precipitation (temperature, humidity, solar radiation, and soil moisture) which affects the moisture content and inflammability of the fuels; and 4) **ignition patterns**.

Topography

The Grant Creek drainage is approximately 17,699 acres in size and bordered on the west by the Butler Creek drainage, on the north by the Upper Finley Creek watershed divide, on the east by the Rattlesnake drainage and on the south by I-90. Grant Creek bisects the drainage in a southerly direction with 61% of the landscape having a southerly or westerly facing aspect, allowing direct solar radiation to more effectively dry out fuels during the heat of the day. Elevation ranges from 3340 feet above sea level near I-90 to 8167 feet at Murphy Peak on the northern ridgeline. A large portion of Grant Creek (44%) has slopes that are too steep (greater than 45%) to allow for mechanized firefighting dozers or vehicles.

Vegetation (Fuels)

Information from LANDFIRE was used to characterize vegetation in the Grant Creek drainage[26] (Map 11). Vegetation was further classified into fuel models which was used in fire behavior analysis[27] (Appendix E). A generalized description of the vegetation and associated fire potential in Grant Creek follows.



Map 11 – Vegetation

Grasslands and Agricultural Pastures

Grasslands dominate the landscape adjacent to the riparian zone in the lower elevations of Grant Creek, with intermixed pockets of shrubs and small stands of Ponderosa pine (*Pinus ponderosa*) and Douglas fir (*Pseudotsuga menziesii*) found primarily on north-facing slopes and shaded draws. Approximately 7,205 acres (41%) of the Grant Creek drainage are occupied by grasslands composed of both native Idaho fescue (*Festuca idahoensis*), rough fescue, bluebunch wheatgrass and non-native grasses, or a mix of grass and shrubs. Grasslands are managed for livestock use, wildlife habitat, or open space. Agriculture pastures in the valley bottom in Grant Creek are seasonally irrigated and mowed for hay or maintained for grazing of livestock

Photo 12 – Lower Grant Creek grasslands. View north from Prospect Meadows common area. August 27, 2022. GCWRTF.

Large areas of cheatgrass and conifers are encroaching on grasslands in Grant Creek due to the absence of natural wildfire and changes in management practices over the past 50 - 100 years. These changes make the landscape more susceptible to rapidly spreading higher intensity wildfires.

An example of increasing forest vegetation can be seen in the photo comparison below, a situation which is common in both private and public forested areas throughout Grant Creek.

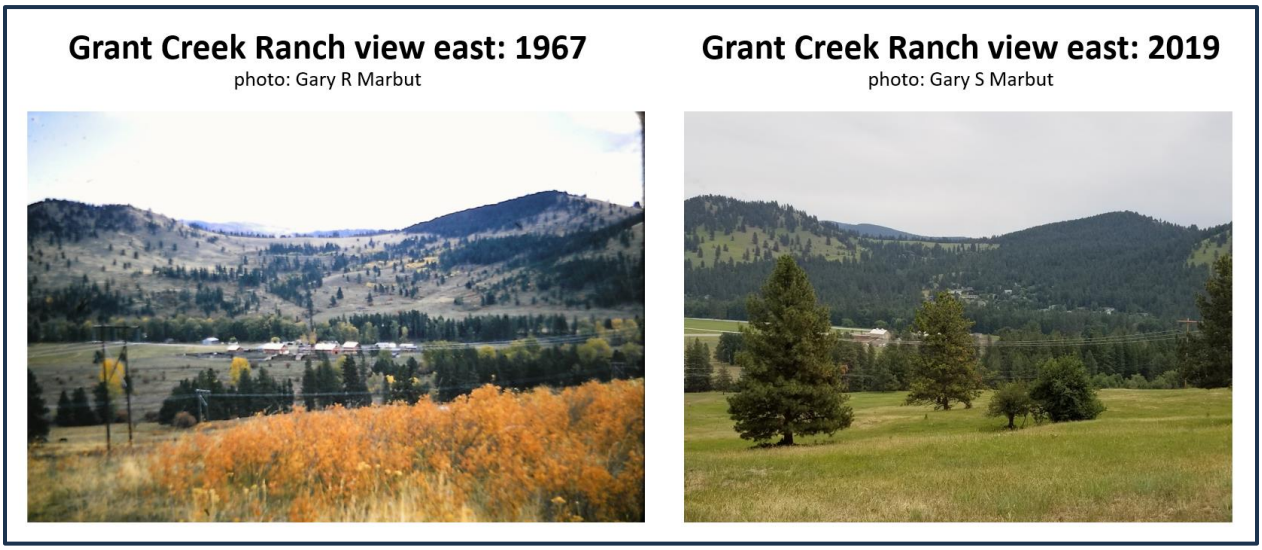


Photo 13 – 50+ Years of Vegetation Changes in Middle Grant Creek. Grant Creek Ranch headquarters is visible in the middle of photos. Left photo - pre-subdivision and pre-Grant Creek Road realignment. Right photo – homes in Grant Creek Hills subdivision and the southern edge of the Colorado Gulch subdivision directly east of the ranch, both in areas previously less densely forested with more grasslands. Photos courtesy of Gary S. Marbut, son of Gary R. Marbut.

Grasslands and Wildfire

Typically, grasslands (Fuel Models GR 1 &2, GS 1,2, &3) support active fire behavior in the spring before green up and in the late summer and fall after curing. Grassland management practices greatly influence the potential for wildfire intensity and its potential to spread. Heavily grazed grasslands limit wildfire intensity and potential for spread, while un grazed lands support faster spreading fires with higher flame lengths. Irrigated hay fields and pastures can serve as fire barriers while irrigated, but without irrigation or haying they will support rapidly spreading fires with higher intensities. Grasslands support rapidly spreading, short-duration wildfires which can quickly spread into residential zones or forested areas. With extreme weather conditions (97th percentile) grasslands support fast spreading fire (50 to 150 chains[28] per hour), with 4-to-8-foot flame lengths.

Grasslands are often under-recognized as a risky fuel model when compared to forests. Recent studies have found that grassland and shrubland fires destroy more houses that forest fires due to increases in WUI housing growth and burned area size.[29]

Forested Lands

Predominantly closed-canopy forests occupy approximately 9,522 acres (55%) within the Grant Creek watershed. Major tree species at lower elevations are primarily ponderosa pine, a fire-adapted species, and Douglas-fir, a shade-tolerant species (can grow in low sunlight conditions) that occurs on north-facing slopes, in shaded areas or as understory in mature ponderosa pine stands where periodic fire has been absent. Englemann spruce *(picea engelmannii)* is found in riparian areas.

At mid-elevations in Grant Creek, the forests transition to a mixture of Douglas-fir, western larch (*Larix occidentalis*), and lodgepole pine (*Pinus contorta*). Grand fir (*Abies grandis*), another shade-tolerant species, is also present, especially on moister north-facing slopes and locations where fire has been excluded. At higher elevations of Grant Creek, forests transition to primarily lodgepole pine and subalpine fir (*Abies lasiocarpa*).

Although many of the tree species are adapted to low intensity surface fire (ponderosa pine, western larch, lodgepole pine and, to a lesser extent, mature Douglas-fir), the absence of fire has led to increased forest density with the understory encroachment of shade-tolerant trees such as grand fir and Douglas-fir into the forests.

Deteriorating forest conditions in some areas, brought about by a combination of insects, tree and root diseases, have produced additional concentrations of woody fuels available to burn in the event of a wildfire.[30]

Photo 14 – Mid-elevation fire-adapted western larch forest. The encroaching shade-tolerant Douglas-fir understory increases potential for high intensity fire and creates ladder fuels. Location: On the ridge along the Ravine Trail (Lolo National Forest) above homes in the valley of the East Fork of Grant Creek. October, 2021. GCWRTF.

Photo 15 – Understory vegetation encroachment in a nearly 50-year-old thinning (1975) initially designed to reduce tree competition and reduce fire hazard in a Douglas-Fir/ponderosa pine stand. An example of why retreatment is necessary to mitigate fire hazards. Location: private land - west side of Bench Road. October, 2021. GCWRTF.

Photo 16 - Selective harvest to reduce understory/ladder fuels and increase canopy distance in a mixed Douglas fir/Ponderosa pine forest. Location: East side of Colorado Gulch subdivision on private land. October, 2021. GCWRTF.

Forested Lands and Wildfire

Forests (Fuel Models TU 2&5, TL 3&8) support high intensity wildfires that are difficult to quickly suppress and can create long-duration air quality issues. With extreme fire weather conditions (97th percentile) flame lengths greater than 11 feet and rates of spread between 20 chains and 150 chains per hour (depending on slope steepness) can be expected. Under these conditions these forests can support high intensity surface and crown fires.

Photo 17 - Dense grand fir/Douglas-fir understory saplings creating ladder fuels to larger trees. Location: Private land on a north-facing slope on the west side of Bench Road. October, 2021. GCWRTF.

Urban Fuel Complex

Approximately 600 acres (4%) are landscapes associated with urban residential development. Many of these residential developments are converting grassland landscapes to a mixture of shrubs, conifers, and hardwoods. Others have been built directly in forested settings. Still others such as those found in lower Grant Creek, border extensive grasslands that may be highly flammable even outside of the main wildfire season. This mixture of vegetation and dwellings allows wildfires to spread rapidly and with high intensity under extreme fire conditions.

Photo 18 – Urban Fuel Complexes. Left Photo - Pasture converted to homesites in Meadows subdivision. August, 2021. Fred Carlson, FDNY. Right Photo - Keegan Trail subdivision homes built in a forested setting. Wide angle lens. October, 2021. Chris Cole.

Urban Fuels and Wildfire

Urban fuel complexes (Fuel Models under development) present interesting fire behavior characteristics that are still being studied to determine potential intensity and spread parameters. Recent wildfire events in California (Camp 2018), Colorado (Marshall 2021) and Hawaii (Lahaina 2023), however, are examples of the potential of wildfires spreading rapidly through urban environments under extreme fire conditions.

Riparian Zones

Riparian vegetation occupies areas adjacent to Grant Creek and its tributaries. Tree species in the riparian zones are predominately black cottonwood (*Populus balsamifera* L. *ssp. trichocarpa*), and aspen (*Populus tremuloides*) with scattered Douglas-fir, ponderosa pine and Engelmann spruce. Surface vegetation is composed of a mixture of shrubs such as alder (*Alnus incana*), willow (*Salix bebbiana*), service berry (*Amelanchier alnifolia*), common snowberry (*Symphoricarpus albus*) and grasses.

Photo 19 – Riparian zone in lower Grant Creek near the Charlotte Reed Marbut Nature Reserve. October 25,2022. Kristi DuBois.

Riparian Zones and Wildfire

Grant Creek Riparian zones (Fuel Model SH 2) can serve as a barrier to wildfire under moderate weather conditions. However, the effectiveness of the Grant Creek riparian zone as a barrier to fire spread can vary widely under extreme 97th percentile weather conditions.

For instance, the zone may retain its ability to serve as a barrier, with rates of spread less than 5 chains per hour and flame lengths under 4 feet. However, the zone may also experience extreme burn severity depending on conditions at the time a wildfire arrives on site. As a result, the riparian zone should not be considered to be a less hazardous environment during any approaching wildfire.

Weather

Wildfires are influenced by a number of weather-related factors, including temperature, humidity, and wind. Long duration climatic conditions such as drought, also contribute to potential severity of the fire season and wildfire spread and intensity. High temperatures combined with strong winds and low humidity can create severe wildfire situations.

Grant Creek has a humid continental climate with warm summers and cold winters. During the summer, Grant Creek can be very dry with low relative humidity, especially in July, August and early September.

Wind patterns play a major role in wildfires in the Grant Creek drainage. Westerly and southwesterly winds are of major concern as these winds have the potential to rapidly spread wildfires into or through Grant Creek. The wind rose (Appendix E) displays the historical occurrence of winds affecting Grant Creek.

Fire Severity Indices

The U.S. National Fire Danger Rating System (NFDRS) calculates indices of potential fire severity.[31] Each index reflects the response of fire potential to seasonal changes in weather. The three indices display elevated fire potential for Grant Creek in the spring after snowmelt and before phenological green up in June. With June green up, fire potential decreases before reaching its highest levels in late July through early September.

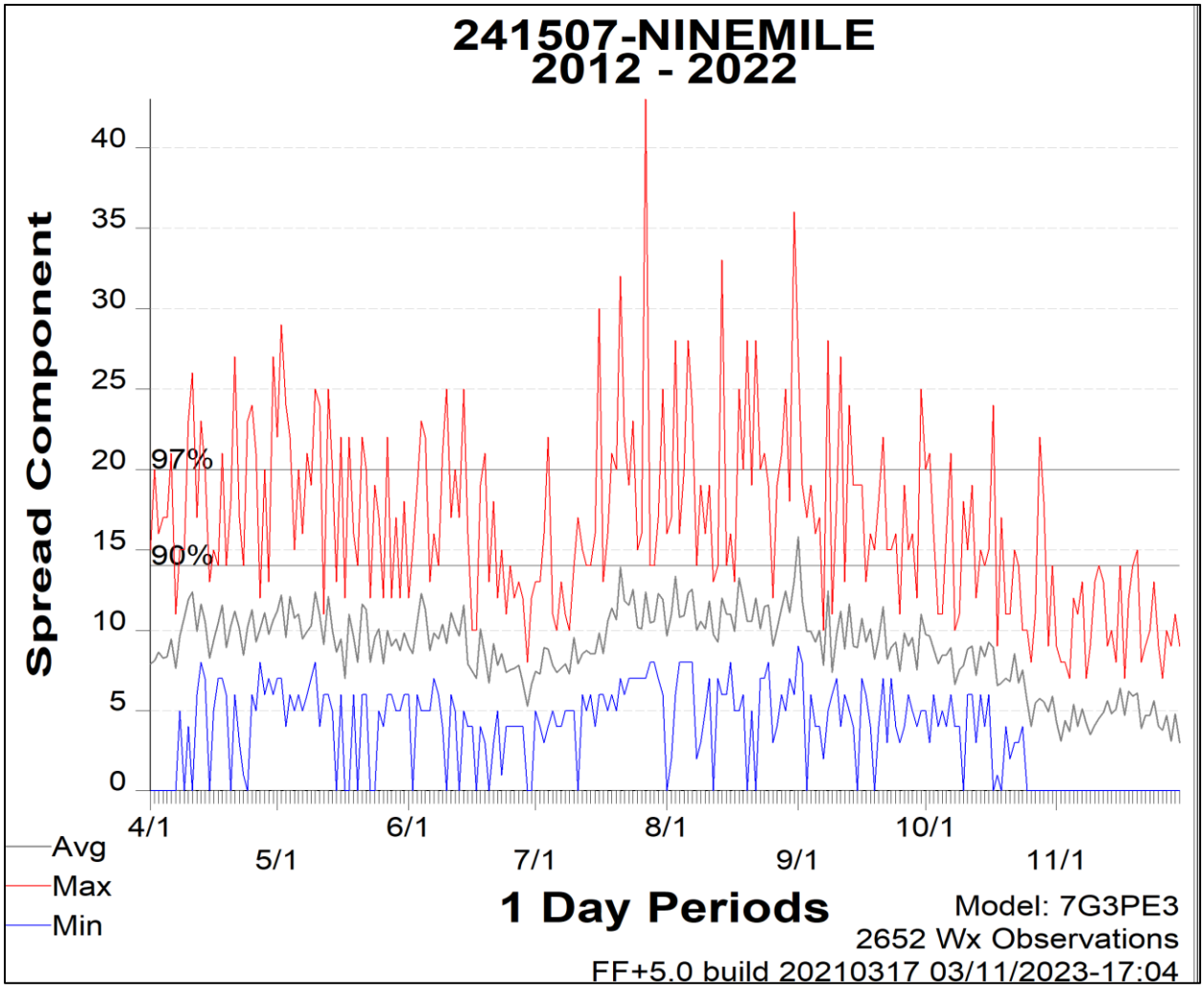
The indices are calculated from values representing topographic and vegetative conditions along with weather data. Each index reflects a different effect of seasonal weather on fire potential. Three NFDRS indices are used in this analysis.

1) **Spread Component (SC)** - a rating of the forward rate of spread of a head fire or ***"how fast it will spread?"***

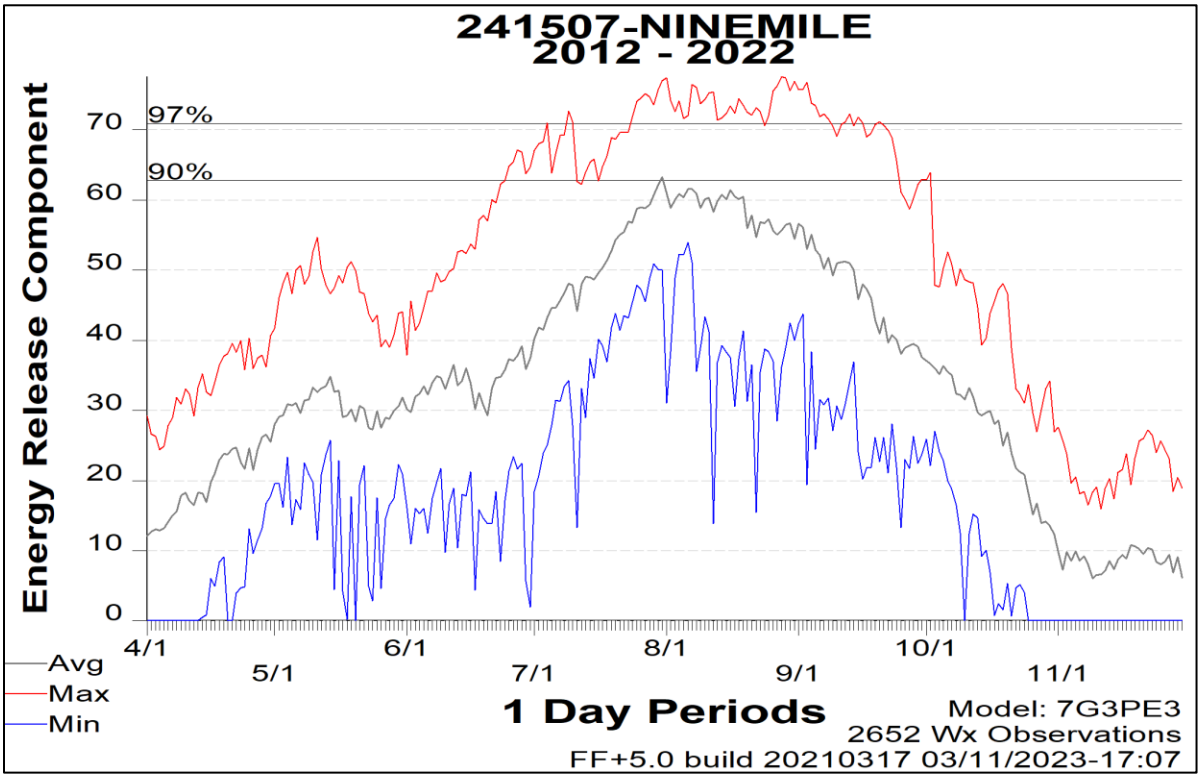
2) **Energy Release Component (ERC)** - a number related to the available energy (BTU) per unit area (square foot) within the flaming front at the head of a fire or ***"how much energy will be produced?"***

3) **Burning Index (BI)** - a number related to the contribution of fire behavior to the effort of containing a fire or ***"how difficult will it be to control?"***

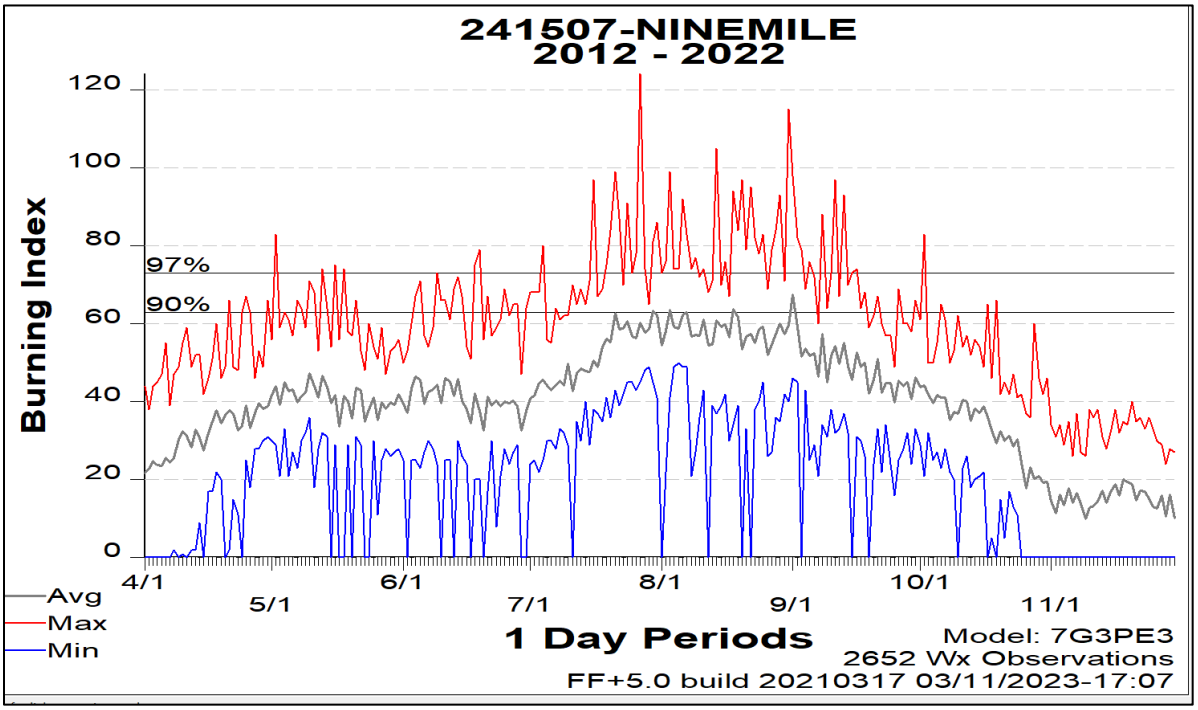
The following graphs (Graphs 1, 2 and 3) display historical seasonal plots for these indices. Data is from the weather station at Ninemile Ranger Station which is considered to be the best available representation of conditions similar to the lower elevations of Grant Creek.[32] Climatological Breakpoints are statistical breakpoints calculated from climatology and are charted in these graphs. When the 97th percentile is selected, only 3% of the days are worse.



Graph 1 – Spread Component



Graph 2 – Energy Release Component



Graph 3 – Burning Index

Wildfire Behavior Assessment

Fire behavior projections were developed to understand the potential fire behavior in Grant Creek. This assessment indicates that the mix of grassland, residences, and forests in Grant Creek has the potential to support rapidly spreading high intensity wildfires under extreme conditions.

With westerly or southerly winds, the location of Grant Creek makes it particularly susceptible to encroachment from wildfires moving through grasslands from the Butler Creek drainage or the I-90 highway corridor into the Grant Creek drainage. Westerly winds can also direct wildfires from Grant Creek to the east into the Rattlesnake drainage.

Although less likely due to historical wind patterns, easterly winds could push wildfire towards the west out of the Rattlesnake into Grant Creek and/or into Butler Creek from Grant Creek.

Projected flame lengths (Map 13) and a fire's rate of spread (ROS) (Map 14) for extreme conditions are displayed on pages 56 and 57 (also shown as charts in Appendix E). These fire behavior calculations focus on extreme weather conditions (97th percentile), as this is when wildfires historically pose the greatest loss and are more difficult to suppress. That being said, wildfires under less extreme conditions can also result in significant loss if suppression resources are unavailable to quickly engage effectively.

The following parameters were used to define extreme 97th percentile weather and fuel moisture conditions for projected flame length and fire spread:

Windspeed – 14 mph

Foliar Moisture (moisture content of the conifer needles in tree crowns - foliage) **-** 100%

Dead Fuel Moisture

Fuel Model	1 Hr Fuel Moisture	10 Hr Fuel Moisture	100 Hr Fuel Moisture	Live Herbaceous Fuel Moisture	Live Woody Fuel Moisture
All	3	4	7	30	60

Table 1 – Dead Fuel Moisture (numbers represent percent of modeled fuel moisture).

Dead Fuels - Modeled Fuel Moisture Content Hour (Hr) Definitions for Table 1

1 Hr fuels – fuels consisting of dead herbaceous plants and round wood less than about ¼" in diameter. Also included is the uppermost layer of needles or leaves on the forest floor.

10 Hr fuels – smaller diameter dead fuels in the ¼ "to 1" diameter range including roundwood and the layer of litter on forest floors extending, roughly, ¼ "below the surface to 1" deep.

100 Hr fuels – fuels that are 1" to 3" in diameter. It can also be used as a very rough estimate of the average moisture content of the forest floor from ¾ "to 4" below the surface.

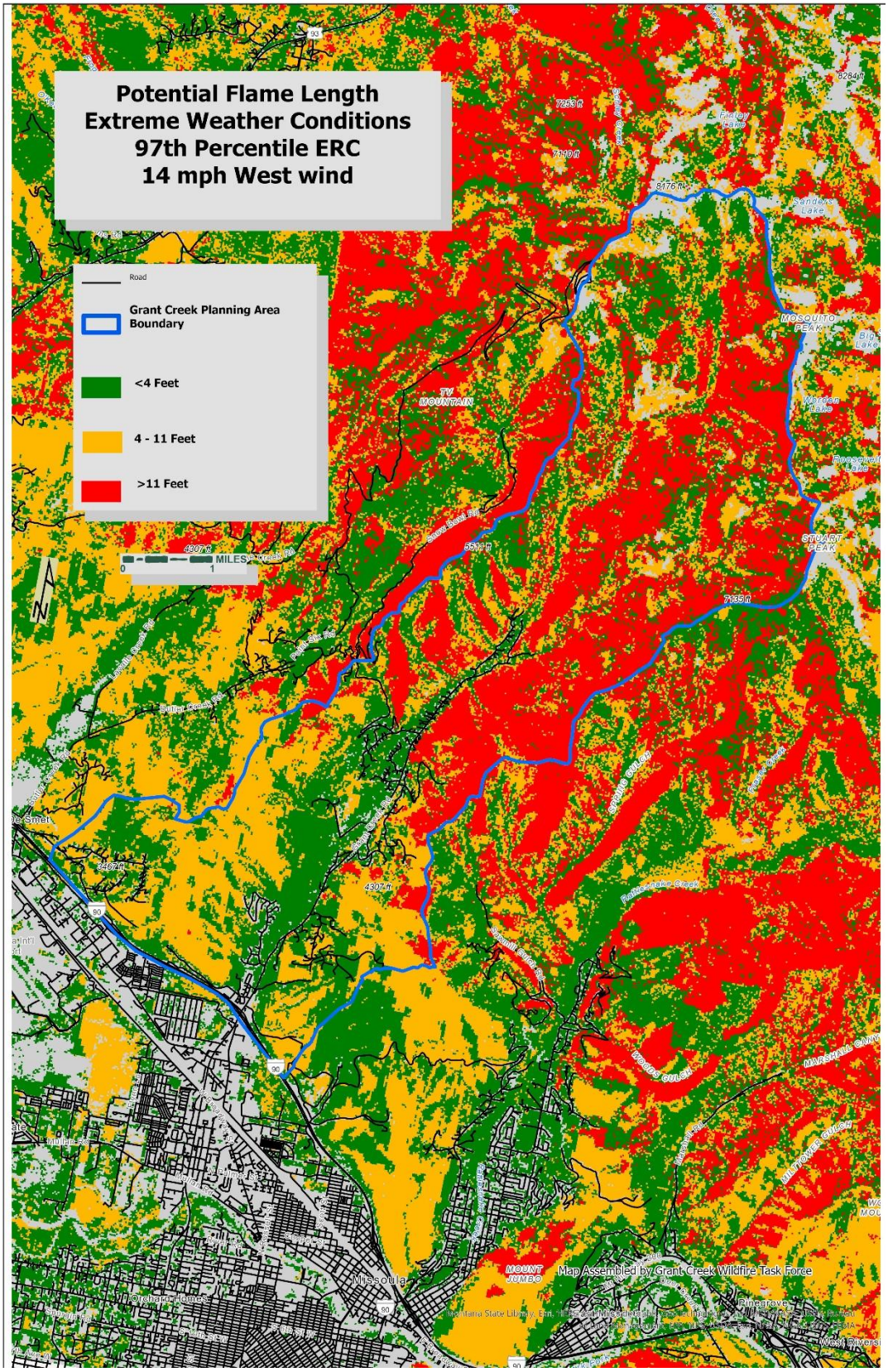
Projected Fire Behavior

Flame Length

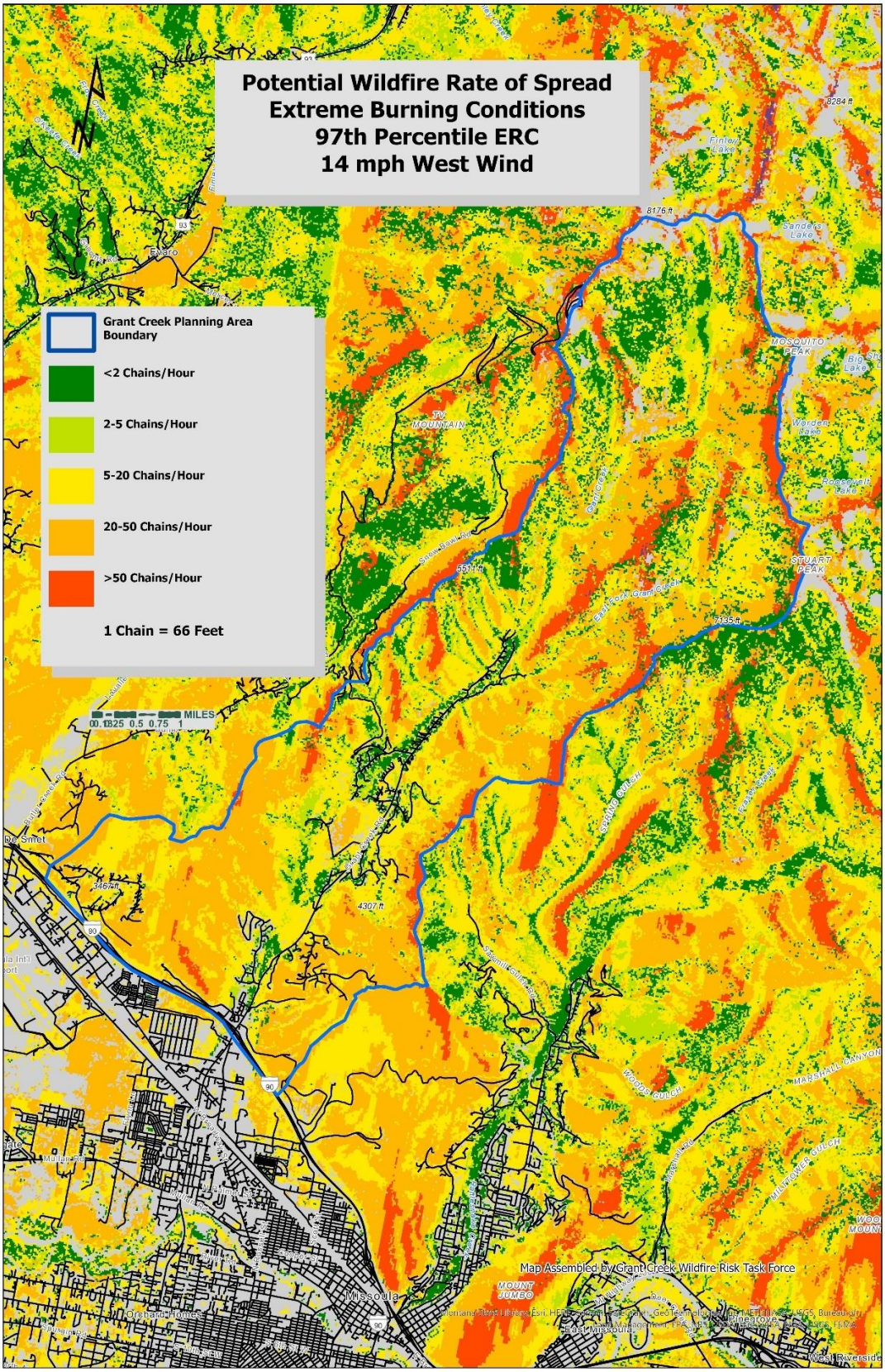
Flame length (Map 13) determines the type of suppression techniques that can be used to manage the fire. Wildfires exhibiting flame lengths less than 4 feet can generally be effectively approached by firefighters with hand tools. As flames increase in length other suppression methods must be employed (Table 2).

Flame Length (feet)	Flame Length Influences Tactics
<4 feet	• Fires can generally be attacked at the head or flanks by persons using hand tools. • Hand line should hold the fire.
4-8 feet	• Fires are too intense for direct attack on the head by firefighters using hand tools. • Hand line cannot be relied on to hold the fire. • Equipment such as dozers, pumpers can be effective.
8-11 feet	• Fires may present serious control problems—torching out, crowning, and spotting • Control efforts at the fire head will probably be ineffective
>11 feet	• Crowning, spotting, and major fire runs are probable. • Control efforts at head of fire are ineffective.

Table 2 - Flame Length Influences Tactics



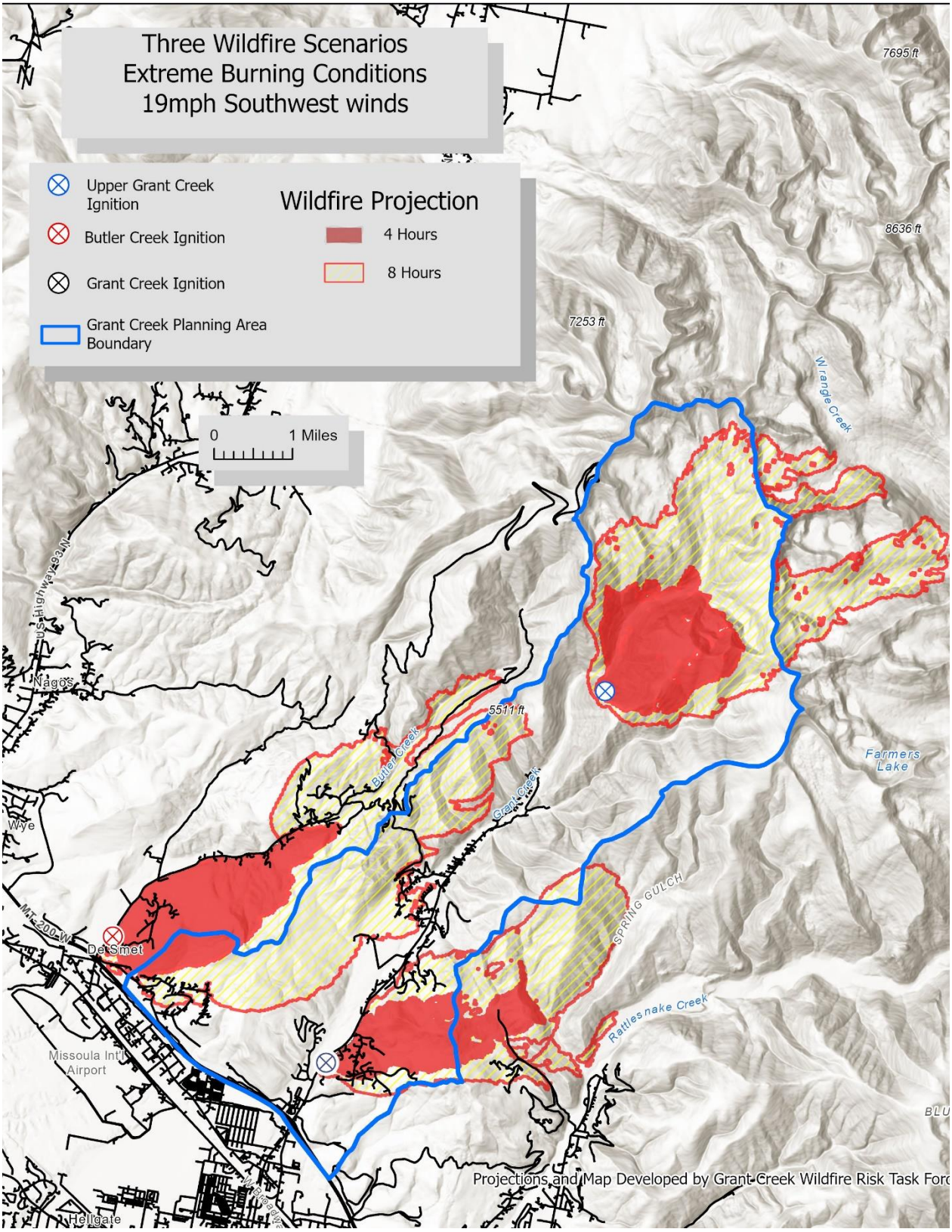
Map 12 – Potential Flame Length – Extreme Weather Conditions, 97th Percentile ERC



Map 13 – Potential Wildfire Rate of Spread, Extreme Burning Conditions, 97th Percentile ERC

Large Wildfire Potential

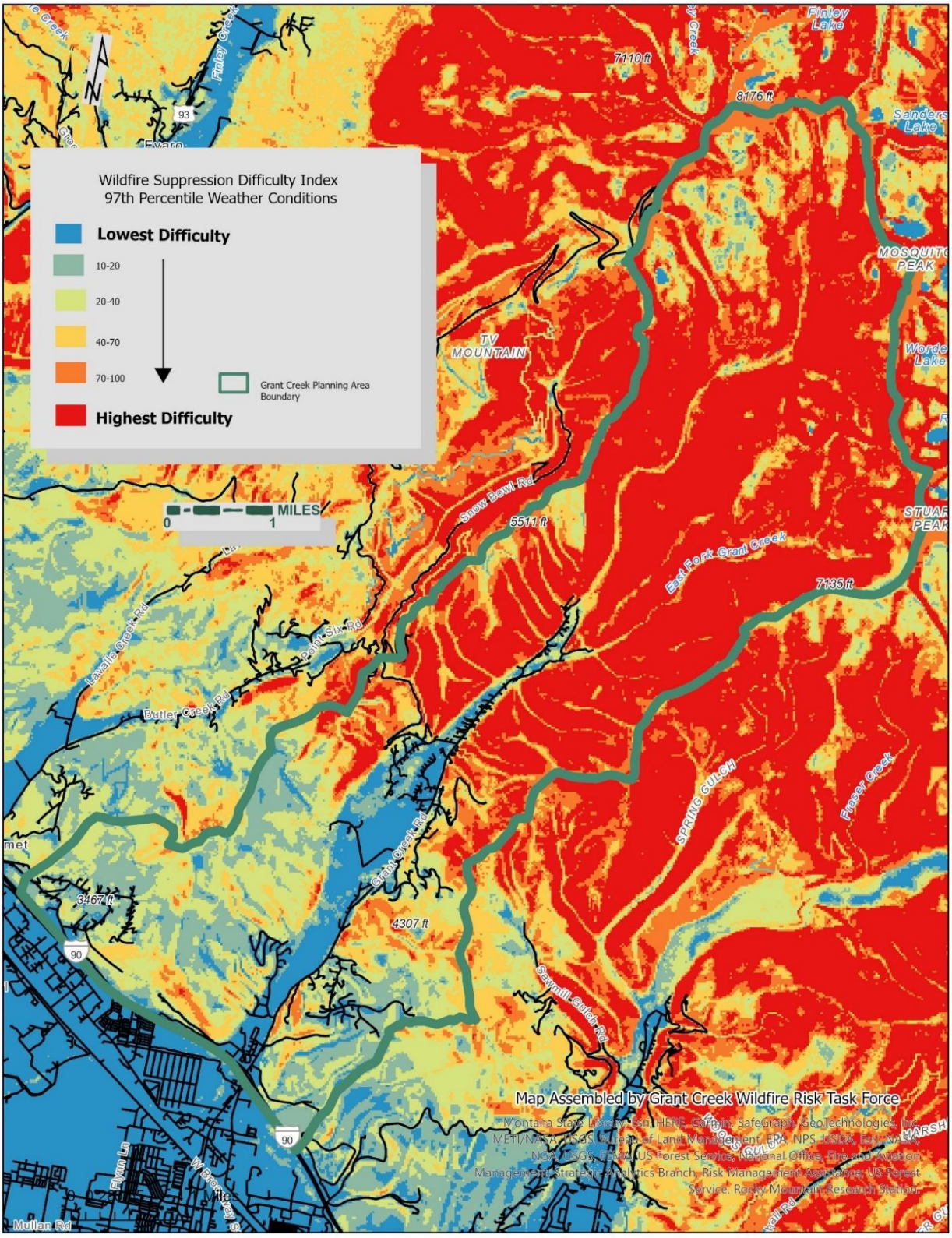
Using Minimum Travel Time Fire Spread model (a fire simulation model in FlamMap[33]) the potential for **unsuppressed** wildfires in 3 hypothetical Grant Creek locations were modeled: a wildfire originating in Butler Creek; a wildfire originating in lower Grant Creek, and a wildfire originating in upper Grant Creek (Map 15). The map shows the direct connection of the wildfire environment in the Butler Creek, Grant Creek and Rattlesnake Creek drainages where similar vegetation types in each drainage provide a continuous fuel source for fire spread when exposed to similar weather conditions. ***The modeling is INTENDED TO PROVIDE CONTEXT for the potential of wildfires burning under 97th percentile fuel moisture conditions that might be experienced during a dry cold front passage.***



Map 14 – Three Wildfire Scenarios. No suppression.

Wildfire Suppression Difficulty

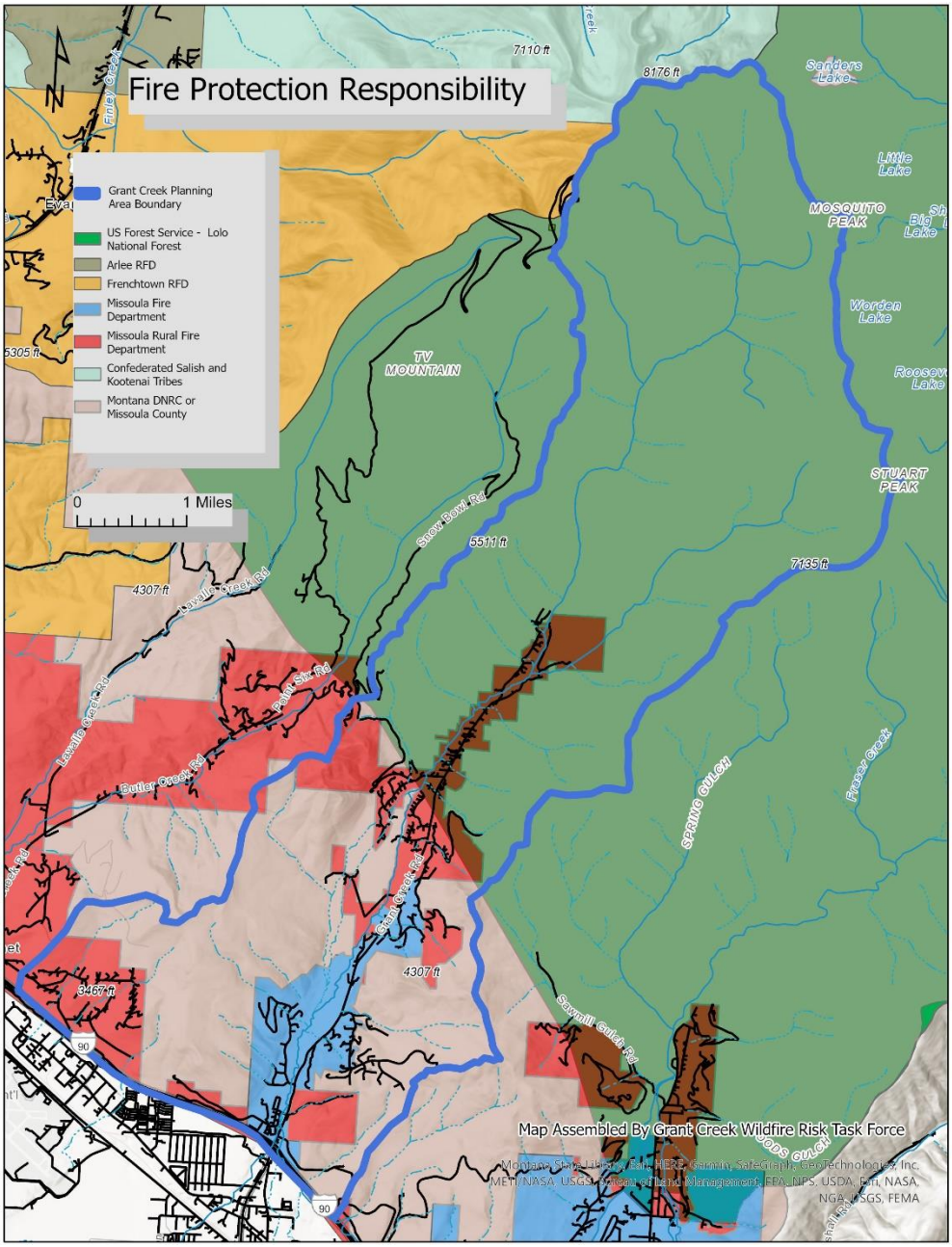
Grant Creek and its mix of vegetation and steep slopes presents a complex wildfire suppression environment. The Wildfire Suppression Difficulty Index (SDI) synthesizes this complexity and develops a rating of the relative difficulty in performing suppression work. SDI factors in topography, fuels, expected fire behavior under severe fire weather conditions, firefighter line production rates in various fuel types, and accessibility (distance from roads/trails) to assess relative suppression effort. The SDI 97th Percentile dataset used for the Grant Creek planning area is modeled with 15 mph up-slope winds and fully cured fuels and displays six difficulty classes, from lowest to highest difficulty[34] (Map 16).



Map 15 – Wildfire Suppression Difficulty Index

Fire Protection Responsibilities

Four agencies (Missoula City Fire Department, Missoula County Rural Fire District, Montana Department of Natural Resources and Conservation, and the USDA Forest Service) have jurisdictional responsibilities to provide fire protection within the Grant Creek drainage (Map 17). Mutual aid agreements between these agencies provide for an initial attack response by the closest fire protection forces.



Map 16– Fire Protection Responsibility

One or all of these agencies may respond to a fire regardless of jurisdiction depending on its size and complexity. However, initial response times for each agency vary depending on two important factors – ***location*** and ***availability*** of closest forces when a fire is first reported.

Closest Forces – Ground

Missoula Fire Department

Fire Station #4 on Latimer Street is the closest fire station to Grant Creek with trained fire personnel. A structural fire engine, aerial ladder truck, and a wildland fire engine are located at Station #4. A typical response from this station would be 3 firefighters on a structural fire engine. ***Personnel are trained in both structural and wildland firefighting.***

Under existing staffing levels, MFD does not meet National Fire Protection Association (NFPA) industry best practice standards for 8-minute travel for the arrival of a full first alarm assignment at a structure fire.[35] There are large portions of Missoula, including Grant Creek, that are beyond the 8-minute travel standard.[36] For example, not all equipment located at Station #4 can respond all at once from that location and only one apparatus can be staffed and respond initially. Secondary response comes from other stations. Once the first engine leaves the station, the ladder truck is unstaffed and if a ladder truck is needed it must come from Station #3 at 39th and Russell or from Missoula Rural (through a mutual aid request).

Missoula County Rural Fire District

Responds from Station 2 at 6550 West Broadway (U.S. Hwy 10). Two fire engines are located there. ***Personnel are trained in both structural and wildland firefighting.***

MT Department of Natural Resources and Conservation, Southwestern Land Office

Responds from 2705 Spurgin Road west of South Reserve Street in Missoula. ***Personnel are trained in wildland firefighting only.***

USDA Forest Service, Lolo National Forest, Missoula Ranger District

Responds from Fort Missoula. ***Personnel are trained in wildland firefighting only.***

Aerial Firefighting Resources – Air Tankers, Helicopters and Smokejumpers

These resources include State, Federal and contract aircraft, and respond to non-federal or non-state jurisdictions only when requested by the city or county. ***Personnel delivered by aircraft are trained in wildland firefighting only.***

These resources respond from the Missoula Airport or the DNRC Helitack base located on Spurgin Road.

Wind speed affects the delivery of any aerial resources. If wind speeds over the fire are too high, aircraft will be grounded due to unsafe flying conditions. In addition, aerial delivery of water and retardant is ineffective in high winds.

Water Sources for Firefighting

Both the City of Missoula and Missoula County maintain fire hydrants in Grant Creek. Wells and water storage tanks supply the hydrant systems (Page 31, Map 5, Infrastructure). One disadvantage to this system is how it could be improperly used during an ongoing wildfire. If residents turn on their sprinkler systems thinking this will limit damage to their homes from an advancing wildfire, they could quickly drain the water storage tank capacity, making the hydrants ineffective to fight structure fires due to low water pressure. Fire engine fill sites (ponds and accessible streams) have also been located and mapped (not shown on Map 5). These are sites where fire apparatus can obtain water where hydrants are not available.

Grant Creek Wildfire Hazard and Risk

There are many definitions that have been applied to the concept of wildfire hazard and wildfire risk. For the purpose of this plan, *Wildfire Hazard* is defined as the conditions that may contribute to damage, loss or harm from a wildfire. This includes factors like topography, the presence of fuel (vegetation) and weather conditions (such as high temperatures, low humidity, and wind). *Wildfire Risk* is defined as the likelihood of a wildfire occurring and the potential damage it could cause.

While both lightning and humans are sources of wildfires in the Grant Creek drainage, continuing commercial, residential and recreational development increases the risk of human-caused ignitions (Map 10, page 42). Increasing traffic on I-90 as well as rail transportation have also been sources of wildfire ignition in the vicinity. The adjoining drainages of Butler and Rattlesnake Creeks, with expected increases in development and similar fuel types, also increases the probability of a wildfire moving into Grant Creek from an adjoining drainage. However, the wildfire hazard and risk vary depending on location as described in this section.

Wildland Urban Interface (WUI)

Missoula County defines the concept of WUI as any area where the combination of human development and vegetation have a potential to result in negative impacts from wildfire on the community. The 2018 Missoula County CWPP classified all of the inhabited areas of the Grant Creek drainage north of I-90 as WUI. Simply stated, the majority of homes and property in Grant Creek are intermixed with, or interfaced with, wildland vegetation susceptible to wildfires.

Wildland Fire Risk Assessments

The Grant Creek CWPP uses the Missoula County 2018 Relative Wildfire Hazard assessment to maintain consistency with the Missoula County CWPP. The County identified the Relative Wildfire Hazard for all lands within the county based on specific mapping criteria and then classified these lands as low, medium, high or very high in regard to their risk level.[37] Grant Creek residents have exposure to all of these risk levels dependent upon where they live in the valley. The 2018 county assessment integrated burn probability and expected intensity (flame length) to portray both the probability and consequences of potential wildfire events in relation to wildfire hazards (Map 17, page 66).

History of Assessments

City of Missoula and Missoula County

As early as 1980, Missoula city and county employees co-authored the Grant Creek Area Plan that identified the limitations of Grant Creek Road in providing ingress/egress to the area. They were especially concerned that increasing development as proposed in the plan and the lack of alternative routes out of the canyon would eventually create a traffic bottleneck near I-90.[38]

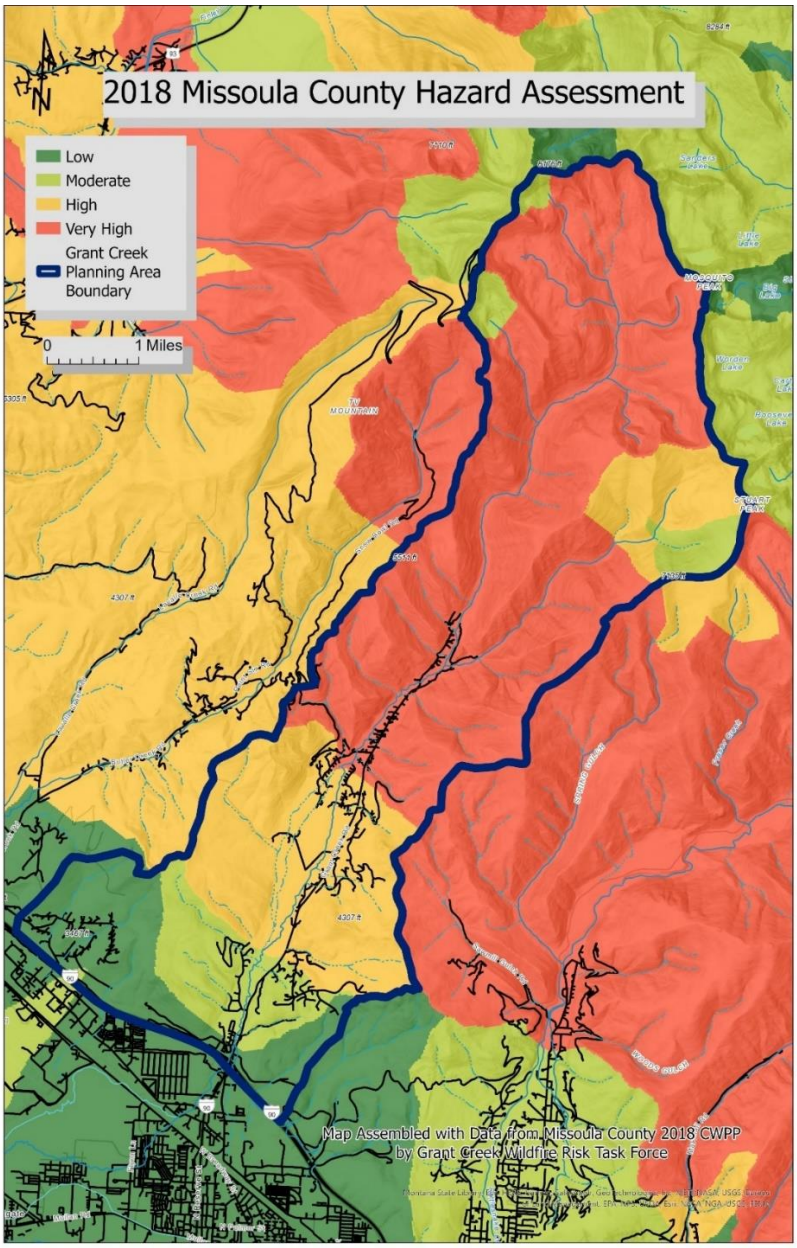
In the 2005 Missoula County CWPP, the City of Missoula Fire Department identified Grant Creek as their Number 2 priority in regard to High Risk for Wildfires.[39] The 2018 Missoula County CWPP was an update of the 2005 CWPP which incorporated the findings from 2005 related to the city's risk assessment.[40]

The 2005 Missoula County CWPP also identified Grant Creek as 1 of 37 Critical Egress areas within the county. These areas were first mapped by the county in 1994, and updated in 1997. Critical Egress identifies "…situations where citizens and/or firefighters could be trapped, which would affect fire response and community safety."[41] The Missoula County Rural Fire District also identified Grant Creek as their Number 1 priority in regard to High Risk for Wildfire within the county "…characterized by heavy fuel loadings, increasing human development and emergency egress/access issues."[42]

In 2011 Missoula County developed an Emergency Operations Plan that included a disaster risk assessment that identified both Major Structure Fire and Major Wildland Fire with a rating of 6.9 on a scale of 3-9, with only HAZMAT and Earthquake disasters ranking higher.[43] Located in designated WUI with both high-density multi-family and single-family residential housing, as well as commercial structures, grasslands and forests, all within fire-prone areas, Grant Creek is susceptible in both of these fire disaster risk categories.

The 2017 Update to the Missoula County, City of Missoula Pre-Disaster Mitigation Plan identified wildfire as the number one priority disaster risk hazard to residents.[44] "According to the Missoula County Growth Policy (2016), there is no doubt in the scientific community that climate change will bring increased fire danger to Missoula County."[45]

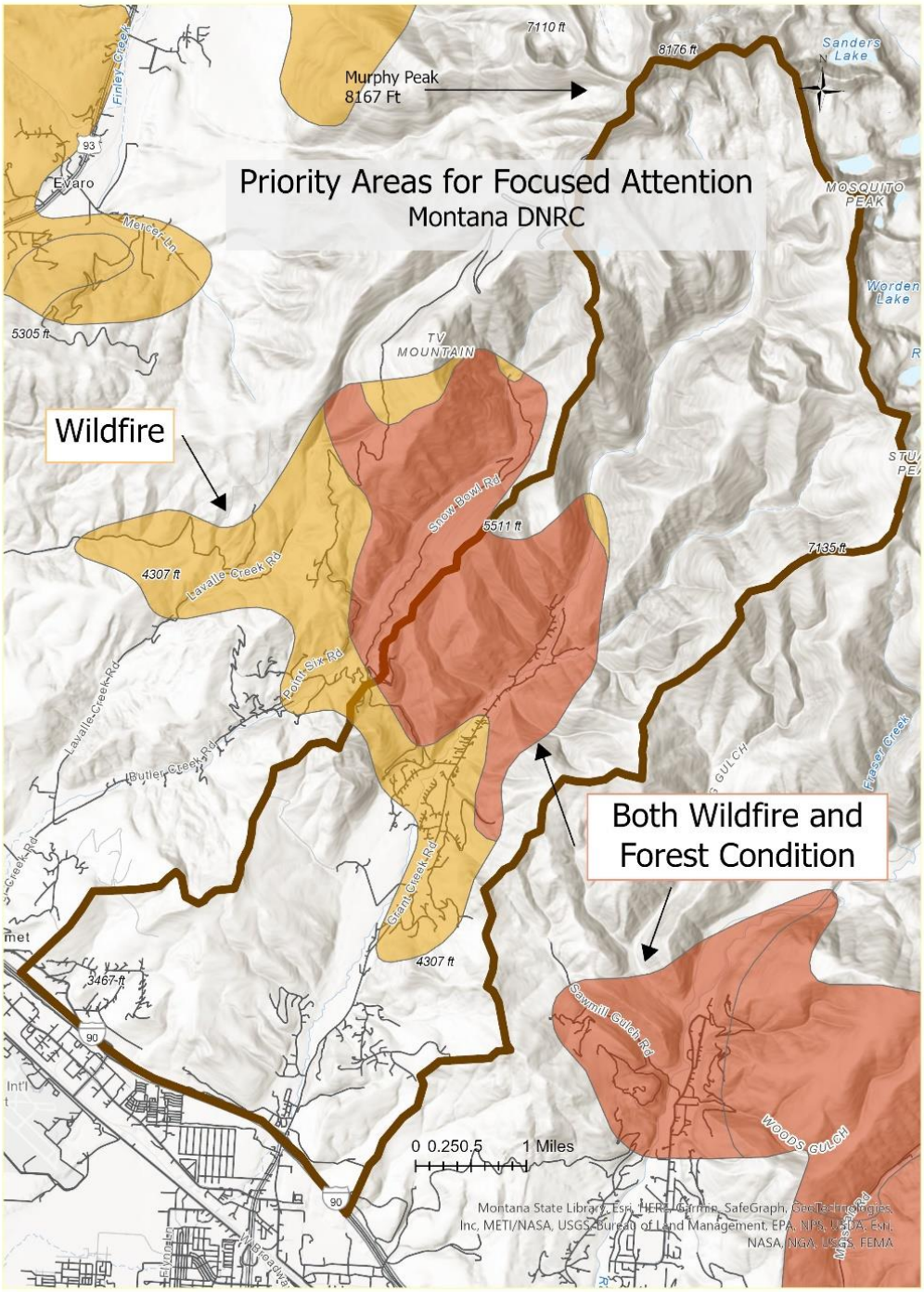
The 2018 Missoula County CWPP classified the majority of lands in Grant Creek as High to Very High in terms of wildfire risk and continued to identify Grant Creek as 1 of 37 Critical Egress areas in the county.[46] The project boundary for Wildfire Adapted Missoula County[47] (WAM), a wildfire risk-based strategic fuels management collaborative project with other agencies that included Grant Creek was based, in part, on information from the Missoula County CWPP.[48]



Map 17 – 2018 Missoula County Hazard Assessment

State of Montana

In December, 2020, the Montana Department of Natural Resources and Conservation (DNRC) issued the Montana Forest Action Plan which identified and mapped WUI areas throughout the state with serious wildfire risk. It identified Grant Creek as a Priority Area for Focused Attention in regard to hazardous fuels in need of treatment to reduce the risk of wildfire.[49]

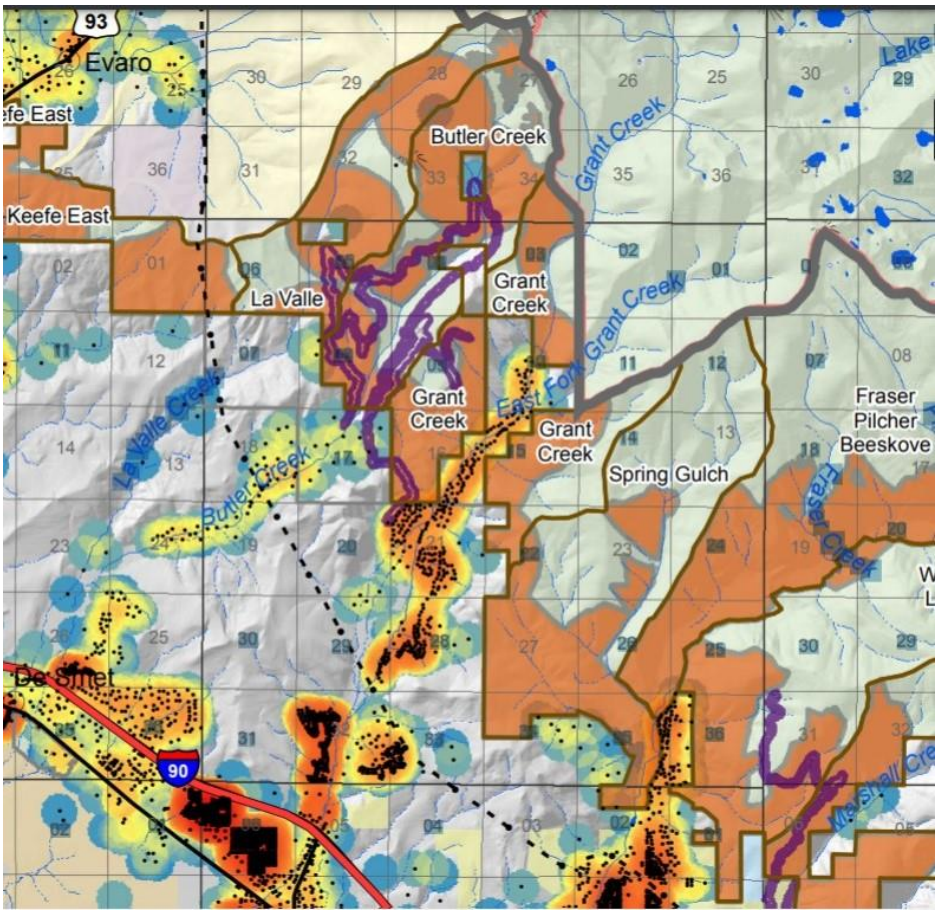


Map 18 – Montana DNRC Priority Areas for Focused Attention

Federal Agencies

USDA Forest Service

A global study in 2015, co-authored, among others, by scientists from the Forest Service Regional Office and the Rocky Mountain Research Station, Fire Sciences Lab, both in Missoula, noted that large fire frequency and duration has increased significantly worldwide, "…with the greatest increases observed in the temperate coniferous forests of the Northern Rockies…".[50] This is the type of forest environment where many Grant Creek residents live.

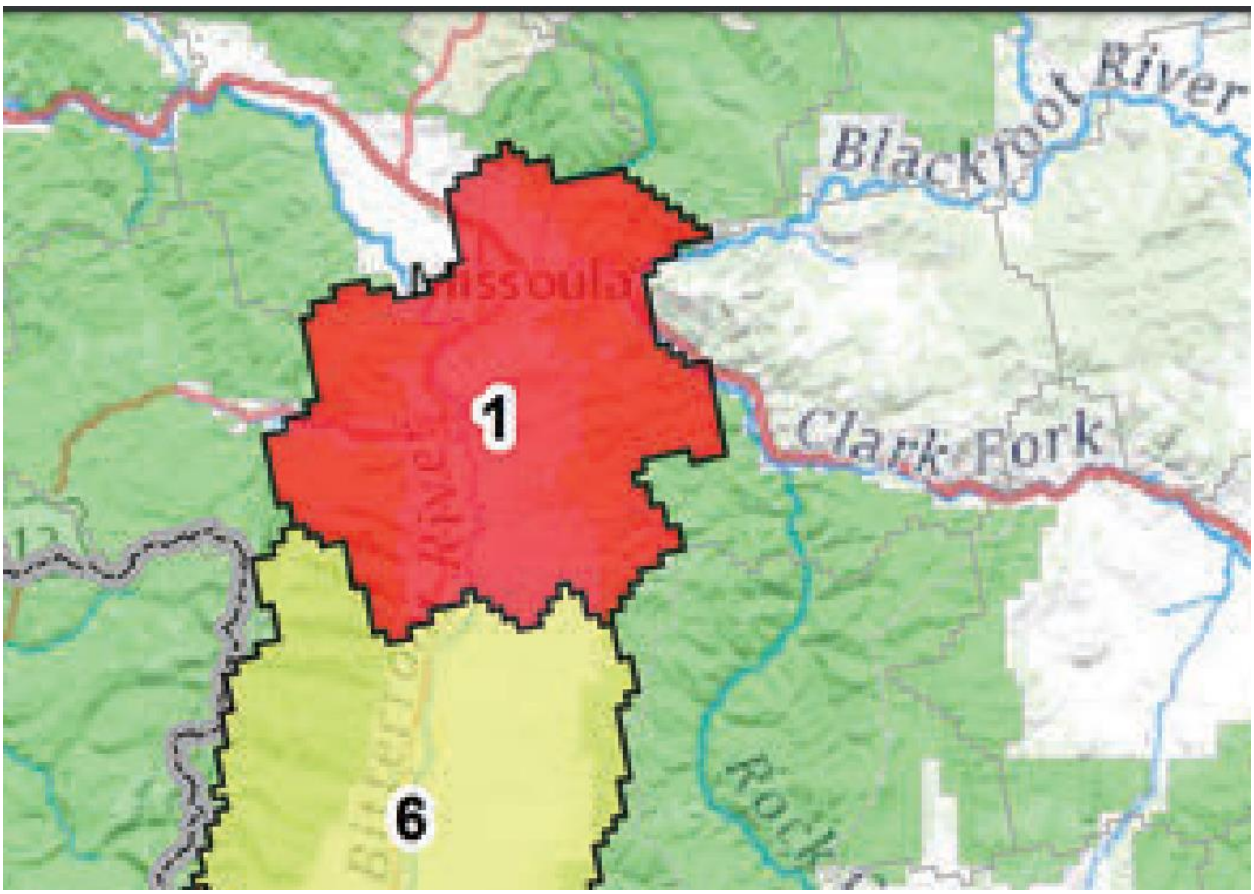


Due to an increasing public concern about the buildup of hazardous fuels on National Forest lands adjacent to private property, the Lolo National Forest initiated their Wildfire Adapted Missoula (WAM) proposal in October, 2020. **This project encompassed Missoula, with three specific areas of concern on National Forest lands in Grant Creek where hazardous fuels adjoin private property.**[51]

Map 19 - WAM - Grant Creek Hazardous Fuels areas, Lolo NF. *This map identifies three specific locations of hazardous fuels on Lolo National Forest land (brown) in Grant Creek that adjoin other forested landownerships. The presence of significant hazardous fuels on steep terrain in these locations could impact both ownerships in the event of a wildfire. This is an example of where collaborative, cross-boundary (federal to private) hazard reduction work could take place and be effective in reducing hazards on all land ownerships.*

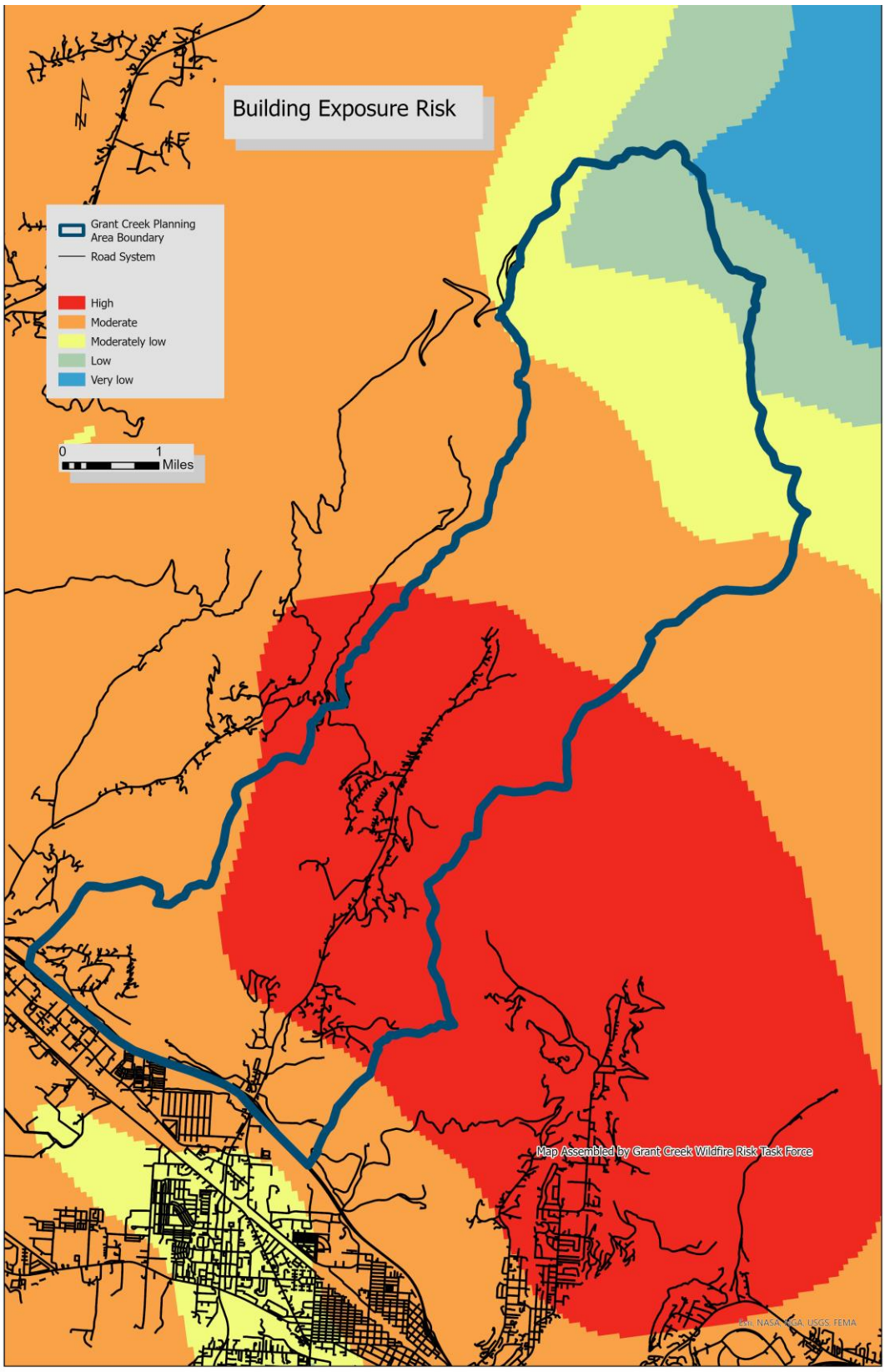
In May, 2021, the USDA, Forest Service developed a national *Fireshed Registry* that examined past, present and future trends regarding wildfire exposure to communities and forest and fuel management. A fireshed is an area of risk where wildfires originating outside of inhabited areas have the potential to burn into residential and urban areas. The report provided the first spatial

assessment framework to specifically address wildfire risk to developed areas covering the continental United States. Community boundaries included both core areas defined by the U.S. Census and their adjacent WUI. It described risk trajectories on lands where destructive wildfires are likely to originate and was the first use of extreme event scenarios in a fire risk application. This research identified the immediate Missoula area, including Grant Creek, as the Number 1 priority fireshed in the USDA Forest Service Northern Region (North Idaho, Montana, North Dakota and northwestern South Dakota).[52]



Map 20 - Fireshed Registry, page 44. Grant Creek is located in the top center of Area #1 north of I-90 (wide red line). Disclaimer: This was a national scale assessment and may not coincide exactly with boundaries of other wildfire risk assessments of Grant Creek. However, the report clearly emphasizes the risk exposure of areas surrounding Missoula that are highly susceptible to fire originating in wildlands and moving directly towards populated areas.

An assessment of areas at high risk of igniting fires that spread to and expose buildings was conducted in 2021 by the USDA, Forest Service.[53] Inhabited zones in Grant Creek were shown to be at Moderate or High risk of exposure to wildfire (Map 21).



Map 21 – Building Exposure Risk

In January, 2022, the USDA Forest Service published a report describing the current nationwide wildfire situation as a "crisis". One of the three primary reasons listed for the growing risk is "…expanding development in the wildland urban interface." With continuing climate change, "It will take a paradigm shift in land management across jurisdictional boundaries to reduce risk…".[54] Due to the values at risk associated with people and private property, fighting wildfires in the WUI also significantly increases costs when compared to fighting remote fires, accounting for as much as 95% of suppression costs.[55] The Grant Creek WUI fits the description of these areas subject to growing wildfire risk, including the potential for future extreme events due to climate change and expanding development that would increase suppression costs.

The Lolo National Forest, in recognition of wildfire hazard and risk in Grant Creek, has identified two landscape-level Potential Operational Delineations (PODs) for the area. PODs may be used for cross-boundary planning. Refining the Grant Creek PODs to identify a network of best available control features across boundaries will help quantify and summarize risk into strategic response zones that will provide the starting point for strategic planning of incident response.[56]

FEMA/USFA

In June 2022, the Federal Emergency Management Agency (FEMA) and the U.S. Fire Administration (USFA) issued a report on recommendations for elected officials, policymakers and response agencies dealing with issues and resolutions concerning wildfires in growing WUI populations nationwide for areas (e.g., Grant Creek) with inadequate ingress/egress evacuation route(s) and congested traffic flow. Many, if not all, of the recommendations are applicable to existing wildland fire risk issues in the Grant Creek WUI.[57]

The FEMA/USFA report also identified the growing challenge of dealing with uninsured and uninsurable households in the WUI. The growing size, complexity and damage caused by wildfires is beginning to have an effect on home insurance rates and even the availability of insurance in some WUI areas in the United States unless mitigation programs can be effective.[58] ***Grant Creek residents have exposure to these same risk factors that could influence fire insurance premium rates and availability.***

Transition: Knowledge to Action

The previous pages have identified the past and current history of Grant Creek in the context of how environmental and human factors (associated with development) have changed the natural environment over time to create the current WUI landscape. This included a look at the past and current wildfire environment, the science behind understanding wildfire behavior, what risk exposure has been identified in different parts of the Grant Creek WUI and how individual residents and landowners might be adversely affected in the event of a wildfire -

physically, materially and financially. This is intended to create what is known as "situational awareness" for residents as they begin to understand their surroundings in the context of living in an environment that will always be exposed to wildfire risk. ***Situational Awareness includes understanding that there is a common misperception among homeowners that emergency response will be rapid and substantial in numbers when often times the opposite occurs due to unforeseen circumstances.***

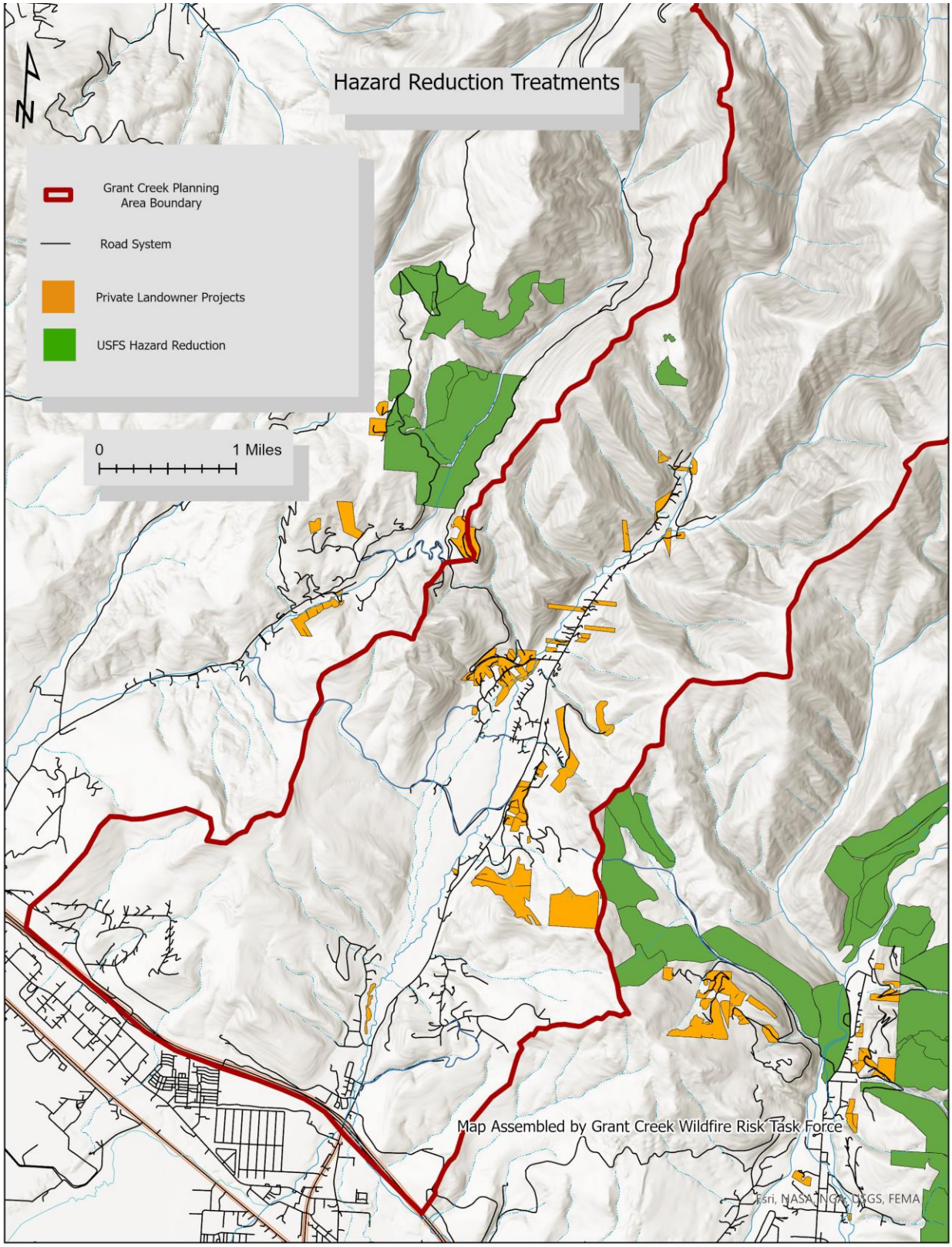
The following sections of the CWPP will describe what are known as "mitigation measures" – ways to reduce different types of wildfire hazards in Grant Creek that can be accomplished by property owner(s) making changes on site that will reduce their wildfire risk. It will also describe the need for evacuation planning and what needs to be included in a plan specific to Grant Creek. The final section will identify how to effectively monitor progress made in implementing the plan with residents, landowners and agencies.

Fuels Mitigation

Fuels Mitigation is the removal of burnable or ignitable materials so they do not provide fuel in the event of a wildfire. This can be accomplished from an individual homeowner level all the way up to a landscape level project. The objective is to reduce catastrophic losses to resources and property in the event of a wildfire. Many of these options are possible for Grant Creek residents and landowners. ***However, each person needs to have the will to act in preparing their property before a wildfire starts.***

Fuels Mitigation Treatment History

Past large acreage fuels treatment in Grant Creek has been minimal when compared to total forested acres within the watershed. Many forested lands in Grant Creek are not accessible for mechanical treatment due to cost effectiveness, topography or land use designation. These include both public and private forested lands near residences in Grant Creek. Many small acreage fuel treatments that have been accomplished do not show up on the following map due to the map's scale, but are still beneficial to individual landowners in protecting their property. However, any acres, regardless of size, that have been treated require retreatment at specific intervals to remain effective. ***Fuels mitigation must be viewed as a continual long-term maintenance process in the WUI as vegetation continues to grow.***



Map 22 – Hazard Reduction Treatments

Focus Areas for Hazardous Fuels Treatment

For the purpose of this plan, Grant Creek is divided into four inhabited WUI areas within the following boundaries based upon a combination of the previously identified city, county, state and federal wildland fire risk assessments. The areas are also based on the previous wildfire behavior assessment (page 54) including burn probability and building exposure (Map 21).

Upper Grant Creek – starting at the Grant Creek Road/ Snowbowl Road junction, the inhabited areas to the north accessed by Grant Creek Road, including the East Fork of Grant Creek, Bench Road and Ravine Trailhead and trail.

Vegetation is predominantly continuous forest on steep, mostly inaccessible terrain.

Photo 20 – View north from junction of Bench Road (on left) and East Fork of Grant Creek (road in center of photo). Western larch are the conical shaped trees with yellow needles. Cottonwood and aspen in riparian area of Grant Creek on the left side of photo are also changing to their fall foliage colors. Homes are located along each side of both roads. October, 2021. Chris Cole.

Middle Grant Creek – (**a**) the inhabited areas between Gleneagle Way and the Snowbowl Road junction accessed by Grant Creek Road including the Grant Creek Trail, AT&T building, Creekside, Grant Creek Hills, Old Grant Creek Road/Dark Horse Lane, Colorado Gulch, Lime Springs Trail, Rankin Road, Mellot Lane, Nevada Trail and individual homes in that area accessed by private driveways.

(**b**) The inhabited areas accessed from the Grant Creek Road/Snowbowl Road junction west to the bottom of the switchback on the Snowbowl Road including Keegan Gulch, Keegan Trail, Dark Horse Estates and individual homes in that area accessed by private driveways. Vegetation in this area is transitioning from grasslands to forest with some steep terrain.

Photo 21 – Grant Creek Hills subdivision in Middle Grant Creek. Compare with the Marbut photo on page 46 taken in 1967. This area had more grasslands in 1967 but has continued to transition to more forest as a result of subdivision and the absence of fire on the landscape. Ski runs at Snowbowl Ski and Summer Resort in upper Butler Creek are visible on the distant horizon (center top of photo). October, 2021. GCWRTF.

Lower Grant Creek – from I-90 north to Gleneagle Way including all commercial businesses, residences and recreational services accessed by Grant Creek Road including Expo Parkway, Old Indian Trail West, Grant Creek/Bluebird Trails, Stonebridge Road, Prospect Drive, Gleneagle Way and individual homes in that area accessed by private driveways.

Vegetation is predominantly grasslands in rolling terrain with some steep, but mostly open, slopes.

Photo 22 – Lower Grant Creek grasslands. View looking east from Prospect Meadows Common Area across Grant Creek riparian area/agricultural pasture/Grant Creek Road to houses along Gleneagle Way in the distance. Prospect Drive is the road in the middle right of the photo. March 27, 2022. GCWRTF.

Airway Boulevard, I-90 exit 99 - the inhabited areas **north of I-90 within the Grant Creek Watershed** including all commercial businesses and residences accessed by Airway Boulevard, Gooden Lane, Keil Loop, Thornbird Lane and Miranda Lane including isolated residences accessed by private driveways.

Vegetation is predominantly grasslands in rolling terrain with some steep, but mostly open, slopes.

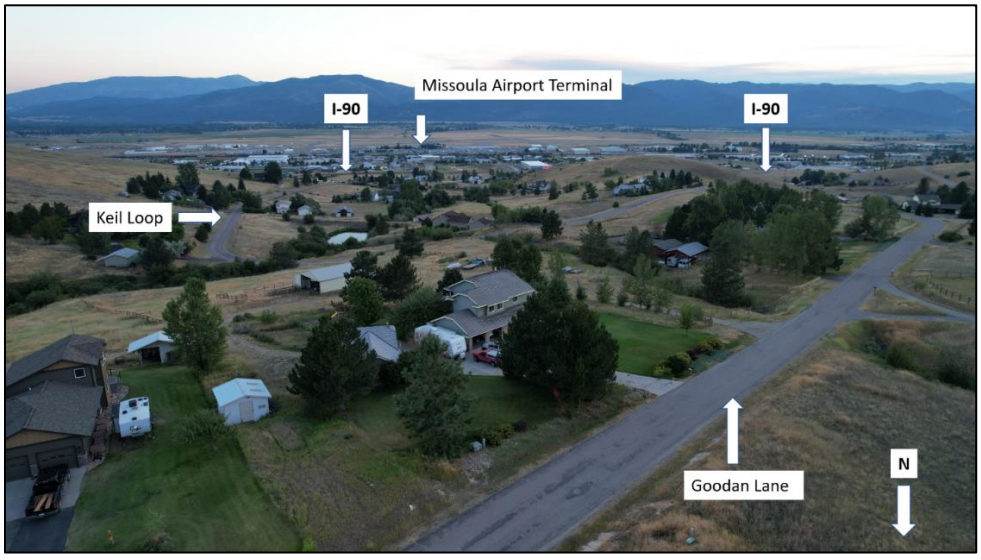


Photo 23 – Goodan Lane/Keil Loop area north of I-90 within the watershed but with no direct road access to Grant Creek other than I-90. Goodan Lane also accesses Butler Creek Road. August, 2021. Fred Carlson, FDNY.

The Home Ignition Zone in Grant Creek

Wildland fires are a natural process that have existed for millennia and their continued occurrence is inevitable. At the same time, development in the WUI has placed Grant Creek residences in the path of potential wildfire as a result of building exposure. Many homes are located adjacent to stream corridors in Grant Creek. However, homes can't be considered at less risk just because they are located in, or adjacent to, a riparian zone.

The condition of the Home Ignition Zone (HIZ), regardless of a resident's location in Grant Creek, will determine the potential survivability of structures on the property in the event of a wildfire. It will also affect the survivability of neighbors' structures. ***Each homeowner needs to prepare their residence to be able to survive a wildfire in a worst-case scenario - when the area has been evacuated and there may be no firefighters available to protect their home.*** In all likelihood, if there is ever a large acreage wildfire in Grant Creek, there will not be enough firefighters and equipment to protect every Grant Creek home that may lie in the fire's path.

Home ignition (when a house catches on fire) during a wildfire is primarily determined by the local conditions of the home and adjoining structures in relation to their immediate surroundings. The HIZ is composed of the structure itself and three distances around the structure based on its potential vulnerability to ignition – the immediate surroundings (0-5 feet); the intermediate surroundings (5-30 feet) and the extended surroundings (30-100 feet). These distances are based on flat ground and may increase for structures built on hill sides.

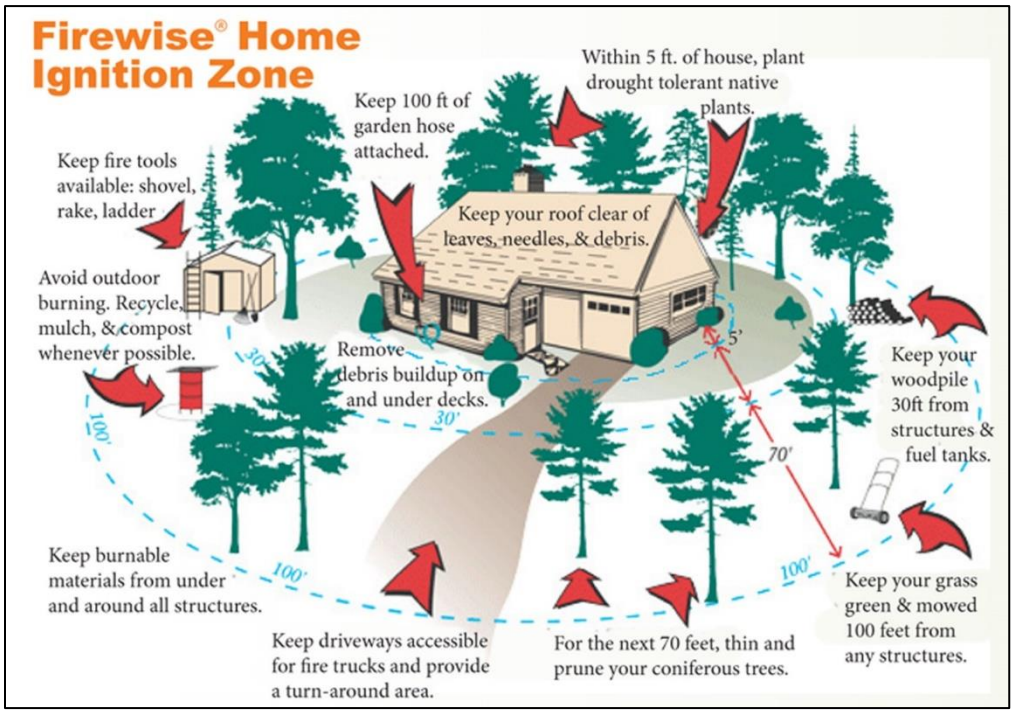


Figure 3 – The Home Ignition Zone. A very simplified depiction of potential ignition vulnerabilities around a structure. Source: Missoula County Office of Emergency Management. https://www.missoulacounty.us/government/public-safety/office-of-emergency-management/wildfire-preparedness

To reduce their structures' ignition potential prior to a wildfire, each homeowner has the responsibility for identifying and mitigating any significant home ignition vulnerabilities. This is not only for homes located within forested areas, but also those surrounded by grasslands in lower Grant Creek.

Decades of scientific research and observation have proven that "walls of flames" burning out of a forest or grasslands into home site areas do not usually ignite structures. Evidence of this can be found where homes have burned to the ground but are still surrounded by green trees. However, wildfires often produce "showers" of firebrands (burning embers) that can be carried aloft up to a mile or more distant from the main fire. They are the principal ignition source for directly igniting structures as well as igniting surface fires (spot fires) that spread on the ground to contact and ignite structures.[59] **Research indicates up to 90% of home ignitions are caused by burning embers rather than direct flame contact or radiant heat from a flaming fire front.[60]**

Any firebrand that can sustain ignition in a susceptible fuel, especially if assisted by wind, and can be maintained through flaming, glowing or smoldering combustion in gaps, corners, nooks and crannies will eventually ignite the structure. Once ignited and fully involved, the structure can produce its own, often larger, firebrands to ignite other homes, moving from structure to structure in a neighborhood and creating an urban fire.

Free home inspections provided by Missoula County OEM, Missoula County Rural Fire District, City of Missoula Fire Department and DNRC are the key to having homes in Grant Creek prepared prior to fire season by identifying and reducing these vulnerabilities. An inspection will identify whether a residence has a low, medium or high level of risk in the event of a wildfire, and what can be done around the structure to reduce that risk level. Each residence is unique in both structural design and exposure in Grant Creek's fire-prone environment where there is a continual source of dry, decaying, flammable debris such as trees, branches, needles, leaves and grasses. As both structural and vegetative conditions change over time, it is recommended that these inspections are repeated every five years so homeowners remain vigilant in keeping their risk level as low as possible.

Once inspected, the risk level information is added to a database for use by local agency emergency response during a wildfire. During a fast-moving fire, this information provides firefighters with a quick tool to identify homes that have had HIZ inspections and if they have low, medium or high risk for damage or loss based on their specific conditions.

Appendix A, Action Plan, provides other recommendations for improving conditions and reducing hazards in the WUI for the benefit of individual homeowners and their neighborhoods.

Potential Hazardous Fuels Projects by Focus Area

Upper Grant Creek

1) Create/maintain fuel breaks along the following roads (in order of priority):
   a) Grant Creek Road
   b) Bench Road
   c) East Fork of Grant Creek Road
2) Create/maintain continuous fuel breaks between homes and densely forested lands of adjoining ownerships
3) Canopy cover reduction around homes
4) Remove hazardous fuels next to structures
5) Identify/maintain fire buffers on ridgelines/roads/trails above homes to create fuel breaks
6) Improve fuel breaks/clearance along driveways and private roads
7) Complete home inspections and set up a 5-year review program for all homes
8) Identify structures that will not be protected due to hazards, driveways, etc.
9) Make home ignition zone modifications to landscaping
10) Use WUI landscaping and construction materials

Middle Grant Creek

1) Create/maintain fuel breaks along the following roads (in order of priority):
   a) Snowbowl Road
   b) Grant Creek Road
2) Create continuous fuel breaks between all homes/subdivisions and densely forested lands of adjoining ownerships
3) Canopy cover reduction around homes
4) Remove hazardous fuels next to structures
5) Identify/maintain fire buffers on ridgelines/roads/trails above homes to create fuel breaks
6) Improve fuel breaks/clearance along driveways and private roads
7) Complete home inspections and set up a 5-year review program for all homes
8) Make home ignition zone modifications to landscaping
9) As applicable, modify HOA covenants to incorporate WUI landscaping and construction.

Lower Grant Creek

1) Create continuous fuel breaks between all homes/subdivisions and grass lands of HOAs and/or adjoining ownerships
2) remove hazardous fuels next to structures
3) Implement and maintain identifiable fire buffers on ridgelines and along trails above homes to create fuel breaks
4) Improve fuel breaks along driveways and private roads
5) Complete home inspections and set up a 5-year review program for all homes
6) Make home ignition zone modifications to landscaping
7) As applicable, modify HOA covenants to incorporate WUI landscaping and construction.
8) Create and maintain fuel breaks along the following roads (in order of priority):

a) Grant Creek Road (Gleneagle Road south to the Snowbowl Parking Lot)
b) Gleneagle Road

9) Work with commercial businesses to modify landscaping around structures.

Airway Boulevard, I-90 exit 99

1) Create continuous fuel breaks between all homes/subdivisions and grass lands of HOAs and/or adjoining ownerships
2) remove hazardous fuels next to structures
3) Create/maintain identifiable fire buffers around homes/neighborhoods to create fuel breaks
4) Improve fuel breaks along driveways and private roads
5) Complete home inspections and set up a 5-year review program for all homes
6) Make home ignition zone modifications to landscaping
7) As applicable, modify HOA covenants to incorporate WUI landscaping and construction.
8) Create and maintain fuel breaks along the following roads: a) Goodan Lane; b) Keil Loop.

Hazardous Fuels - Large Project Recommendations

Introduction

There are three primary areas of concern when developing a plan to reduce hazardous fuels in the WUI throughout Grant Creek. The first is to reduce structural ignitability around buildings by creating defensible space between vegetation and structures and by making modifications to the home ignition zone of individual residences and businesses. ***How well defensible space and the home ignition zone of each residence has been prepared prior to a wildfire influences the survivability of each structure****.* The second is to create wildfire buffers between grasslands/forest lands and multiple structures in neighborhoods through mowing, creation and maintenance of shaded fuel breaks, use of riparian areas and use of existing road/trail systems. The third is to manage vegetation along travel routes to assure safe evacuation of residents. The issues become more complex as one travels north of I-90 up Grant Creek due to the transition from rolling hill grasslands to dense forest on steep, inaccessible terrain. ***Specifics of the large projects recommended for the Grant Creek WUI are found in Appendix F.***

Participation, Effectiveness and Reality

Fuel reduction improvements by individual landowners within the home ignition zone around their own homes are the critical elements in any fuels mitigation effort. All fuels treatment projects identified in these recommendations outside the home ignition zone will be most effective if conducted on a larger scale, such as entire neighborhoods, HOAs, multiple subdivisions or other group entities within Grant Creek. Larger projects covering multiple acres create a greater return on the investment in protection of the entire community**.**
Likewise, large landowners need to consider what actions may be necessary on their own lands located within the WUI to create a buffer where they adjoin residential areas in the event of a

wildfire. The WAM project on the Lolo National Forest addressed earlier in this document is the equivalent of a large landowner identifying hazardous fuel risks to residents in the WUI and developing a plan to reduce that risk.

If these recommended projects are not accomplished and a wildfire later threatens properties, residents need to be prepared for the expected consequences. Fire crews might do the same type of prep work prior to the arrival of a fire front, but only ***IF*** they have time and resources. In the Northern Rockies lack of resources including firefighters and equipment is usually a predominant problem during the main wildfire season due to resources already committed in other areas of the United States. Having firefighters do this type of prep work also takes valuable time away from their primary mission of fighting the fire. ***The concept of defensible space implies the availability of firefighters to protect property that is already prepared.*** Vegetation density may preclude doing any prep work at all during a fire emergency because there is usually no place to dispose of large quantities of burnable woody debris in a timely manner. As a result, private property and roads that are unprepared for a wildfire event are often identified during a wildfire as indefensible, with firefighters informing residents that they will only enter a driveway, road or residential area once the fire front has passed to see what structures might still be standing and might be saved.

The visual results of this type of work being done under chaotic fire emergency conditions in order to save structures may not result in the same outcome on the landscape as it would if homeowners make these decisions in preparing their property before fire season. Consider the difference between; 1) heavy equipment and firefighters building fire line through private property as fast as possible during an ongoing fire and; 2) removing vegetation ahead of wildfire season with a plan in place that considers the aesthetics of what the final outcome will look like on the property as the work is being performed.

Participation by individual homeowners in all of these recommendations is voluntary, but what one homeowner does or does not do on their own property in the WUI can affect the survivability of everyone's home in a Grant Creek neighborhood.

How to Pay for Work

Many grant opportunities are available that will help pay for a large percentage of the work involved for hazardous fuel treatments on private lands in Grant Creek, regardless of the size of an individual property. For homeowners who feel they may not be able to afford contributing monetarily to their portion of the costs, other options may be available to cover those costs such as trading all or a portion of commercial timber value removed to cover their matching dollars (refer to Appendix G, Cost Share Guidelines, for examples). It is worth the time to explore all these options in an effort to protect your property. ***The end goal is to increase the survivability of the investments in personal property, to assure the continued availability of homeowner's insurance at affordable rates and to increase the survivability of residents in the event of a wildfire evacuation in Grant Creek.***

Several local agencies regularly keep track of matching hazardous fuels grant opportunities for both small and large projects throughout the year including United Way of Missoula, Montana DNRC, Missoula County OEM and Bitter Root RC&D. Contact Missoula County OEM for current grant opportunities and organizations (refer to acronyms in the Table of Contents).

Wildfire Evacuation Planning

Development of a Grant Creek Evacuation Plan

There are good reasons to develop a Grant Creek Evacuation Plan. ***To take effective actions during a wildfire emergency, residents need a site-specific plan with information that is relevant to their own physical environment and personal safety and which increases their knowledge and situational awareness.***

The 1980 *Grant Creek Area Plan* was the first time local government acknowledged potential hazards related to ingress and egress associated with future Grant Creek development and population increases (page 65). By 1994 Grant Creek access became identified with critical egress issues related to wildfire response and community safety (page 65). Over the ensuing years, Grant Creek residents have continued to express their concerns about their safety in the event of an evacuation during a wildfire as new development and associated traffic continues to increase and the wildfire threat grows.

A written plan would address safety issues, infrastructure limitations, information gaps and specific actions needed to implement "best practices" necessary to provide the greatest opportunity for survival of residents in the event of a wildfire. It would also address the 2022 FEMA/USFA guidance and recommendations that identified the need for site-specific plans in locations like Grant Creek. This included recommendations for enhanced community warning systems in high-risk areas, identification and inclusion of safety zones for areas with limited ingress/egress such as one-way in/out, best practices for residents who cannot evacuate, transportation modeling, and drills at the community level for areas with inadequate ingress/egress evacuation route(s) and congested traffic flow. ***All of these wildfire evacuation issues that the report raises have been identified in Grant Creek.***[61]

Information to develop an evacuation plan specific to Grant Creek is either already available or could be obtained in support of developing a written plan. Statements made, and documents prepared, reviewed or approved, by fire, law enforcement and emergency services agencies at recent Missoula City Council hearings, the Grant Creek STEX exercise, communications with Grant Creek residents and associated with Grant Creek development proposals includes the following:

- There are a plethora (large or excessive amount) of safety zones* in Grant Creek.[62]
- A frontage road going west from Expo Parkway would be useful for an evacuation.[63]
- The existing tunnel under I-90 at Wilke Street may have potential as an evacuation route.[64]
- At this time Dodd Ranch Road is not recommended as an evacuation route.[65]
- Several written wildfire evacuation traffic control scenarios for Grant Creek exist.[66,67]
- Emergency Management Zones/"Know Your Zone" programs are used in other jurisdictions.[68]
- There is interest in funding a "time to evacuate" study.[69]
- Residents could shelter-in-place** if they could not get out during a wildfire.[70]

Many residents are lacking information on evacuation issues such as limitations of safety zones and entrapment situations. Developing consistent, county-wide guidance would increase public awareness and create a foundation for site-specific evacuation planning.

*There are no officially designated safety zones in Grant Creek at the time this document was prepared. Refer to Evacuation Planning Information Needed (page 84) as a remedy to this situation.

** This is not currently an officially-recognized procedure in Missoula County. See page 84 for remedies.

Proposed Elements of a Grant Creek Wildfire Evacuation Plan

- A purpose and goals statement **specific to** Grant Creek residents and first responders.
- Incorporation of 2022 FEMA/USFA guidelines and recommendations.
- Delineation of the Grant Creek WUI (Upper, Middle and Lower) based on wildfire risk.
- Identification of evacuation issues based on individual neighborhood risk and location.
- Identification and mapping of all viable evacuation routes and their limitations.
- Identification of potential new evacuation routes when planning for future growth.
- Identification, limitations and mapping of all safety zones.
- Traffic and time-to-evacuate analyses of Grant Creek Road specific to wildfire/tourist season.
- Identification of other traffic sources that may impact evacuations (Snowbowl, etc.).
- A plan for the timing of either on-site relocation or removal/transporting ranch livestock.
- Limitations of, and alternatives to, the Smart911 system within the Grant Creek WUI.
- Planning and scheduling of evacuation drills with Grant Creek resident participation.
- MAPs for extreme wildfire events, especially those fires originating from adjacent valleys.
- Maximum temperature/wind and minimum humidity trigger points to initiate Evac Warnings
- Evacuation traffic control scenarios for different locations within the WUI.
- Day, night and heavy smoke driving hazards in the event of an evacuation.
- Best practices for last resort wildfire entrapments (residences, vehicles, safety zones).
- Examples of potential evacuation shelters/public meeting locations relevant to Grant Creek.
- Safety considerations when returning to a residence located within a Grant Creek fire area.

Evacuation Planning Information Needed

- Identify neighborhood risk zones and all viable evacuation routes and their limitations.
- Identify decision points, decision makers and process for evacuations, road closures, etc.

• Identify, map and verify effectiveness of safety zones.
• Complete a “time to evacuate” analysis.
• Conduct a traffic study related to wildfire season and seasonal tourist traffic.
• Identify and map cell phone service coverage for SMART 911.
• Identify Management Action Points (MAPs) and protocols for early Evacuation Warnings during extreme wildfire events.
• Develop best practices guidelines for wildfire entrapment situations.
• Develop safety information on what to do when returning home following an evacuation.

Similar to a CWPP, a Grant Creek Evacuation Plan needs periodic updating as conditions and information change. Any information that is currently lacking for Grant Creek could be identified as an action item in the initial Evacuation Plan and will be identified in this CWPP, but would not be necessary in order to complete the first plan using all currently available information.

As of October, 2023, the City of Missoula Fire Department is gathering information concerning evacuation planning for Grant Creek.

CWPP Plan Monitoring and Evaluation

The Grant Creek CWPP was developed to provide direction for a 5-year time period. Many of the Action Items and Large Project proposals identified in this plan can be accomplished at different scales from an individual homeowner to landscape-level hazardous fuels treatments. Implementation costs associated with these actions also vary significantly from individual home owner labor in the HIZ to larger projects requiring additional funding from grants. Multiple stakeholders other than local Grant Creek residents are included in these action items because of their interests in Grant Creek. Many of these stakeholders represent cross-boundary interests necessary to implement successful hazardous fuels mitigation. In short, this plan represents actions that can be accomplished anywhere from immediately to over the course of years because of the multiple players and interests involved, all looking to accomplish the same goals - wildfire hazard reduction and the safety of firefighters and residents.

Missoula County’s CWPP already has a system in place for plan updates and maintenance.[71] The Grant Creek CWPP is tiered to the County CWPP and can be included in the protocols for CWPP updates, coordination with stakeholders and identifying annual accomplishments in the Grant Creek WUI as a way of monitoring progress on implementation and to discuss updates or changes as needed. The Action Plan should be used to monitor the overall effectiveness of implementing the plan as well as for out-year planning of work that needs to be accomplished that involves larger projects and multiple stakeholders.

As representatives of the Grant Creek Community, the Friends of Grant Creek organization, under whose direction this plan was developed, should be the stakeholder representative at these meetings. Working as a member of the stakeholder group, and advocating for the interests of Grant Creek, the organization will be in a better position to get action items accomplished within the WUI for the benefit of residents, landowners and first responders. It should be FOGC's role to annually gather pertinent Grant Creek information together and play an active role within the stakeholder group. To maintain local community involvement, they should prepare an annual report of Action Plan accomplishments by all stakeholders in Grant Creek to provide to residents. This will also benefit Missoula County as an example to other WUI communities and neighborhoods as it attempts to get additional areas involved as stakeholders, and maintain and grow those relationships necessary to continue to reduce wildfire risk.

Additional information

How to cite this document: Michael Cole and Richard Lasko, *Grant Creek Community Wildfire Protection Plan 2024*, Friends of Grant Creek, Missoula, Montana, 2024.

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