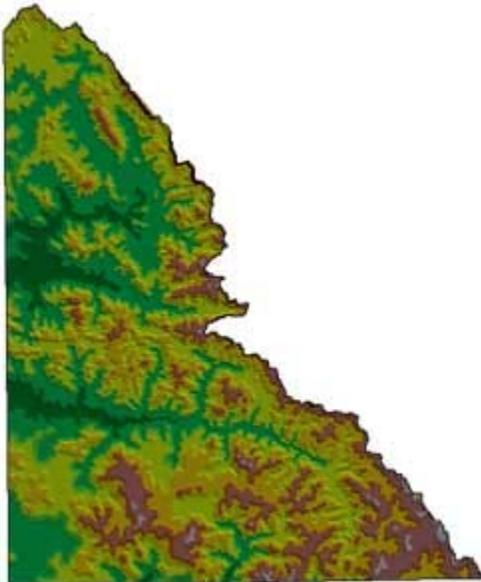


**SHOSHONE COUNTY  
WILDLAND URBAN INTERFACE FIRE MITIGATION PLAN  
FINAL REPORT**



Northwest Management, Inc.  
233 Palouse River Dr.  
P.O. Box 9748  
Moscow ID 83843  
(<http://www.consulting-foresters.com>)  
([NWManage@consulting-foresters.com](mailto:NWManage@consulting-foresters.com))

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**Shoshone County, Idaho**

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## **Introduction**

Shoshone County initiated a contract to develop a wildland–urban interface fire mitigation plan to aid in the protection of the communities within the County. The management of Federal lands has declined over the past twenty years and the forest has continued to grow, becoming dense and overcrowded which increases the fuel loading and the risk of a severe fire. Shoshone County is over 87 percent forested and 75 percent of these lands are Federally managed. This Plan will provide the basis to identify the risk areas within the county and the fire mitigation treatments to reduce the risk to communities. The Plan will address these goals and objectives:

### **Goal:**

To reduce the rate of spread and acres of land burned by forest fires through the implementation of targeted fuel mitigation treatments where the landscape has the potential to sustain fires that threaten communities in the rural-urban interface.

### **Objectives:**

To meet this goal, the following objectives will be evaluated and implemented.

- Identify high risk areas for fire ignition
- Locate landscape features with a high risk for rapid fire spread
- Search out significant concentrations of home sites and other buildings
- Determine areas where initial efforts should be concentrated
- Develop risk reduction activities

The Shoshone County Fire Mitigation Plan has been instituted by the County of Shoshone with funding provided by the USDA Forest Service and the Federal Emergency Management Agency (FEMA) of the US Government. Northwest Management, Inc., is a professional forestry-consulting firm located in Moscow, Idaho,

that was selected by the county-based committee to evaluate the wildland fire situation in the county and develop mitigation projects for meeting the goal stated above. The contract award was made in April 2002, with a targeted completion date of October 1, 2002. This report is the final report summarizing the accomplishments and results.

## **Background on Shoshone County**

Shoshone County is located in the Idaho Panhandle and encompasses a total area of approximately 2,178,738 acres (881,675 ha). The elevation of the county ranges from a low of 2,126 feet above sea level at the western boundary of the county on the St. Joe River to a high of 7,664 feet above sea level at Illinois Peak along the Idaho/Montana Border.

The ownership of the county is dominated by federal government ownership (see Appendix V for a graphical representation):

- US Forest Service                      1,538,895 ac                      70.66%
- BLM    84,521 ac                              3.89%
- State of Idaho                              79,541 ac                              3.65%
- Private Lands                              473,786 ac                              21.75%
- Open Water                                      1,137 ac                              < 0.00%

Three major river drainages dominate the landscape of the county; St. Maries River and the St. Joe River in the south, and multiple forks of the Coeur d'Alene River draining areas from the north end of the county.

Shoshone County's terrain is highly irregular and dominated by forest vegetation in all ages of development. Land cover classification of Shoshone County reveals that forested uplands dominate the landscape, covering approximately 87% of the county.

• Urban or Developed	6,027 ac	< 1%
• Agricultural	78 ac	< 1%
• Non-Forested	213,035 ac	9.8%
• Forest Uplands	1,888,941 ac	86.7%
• Water	721 ac	< 1%
• Riparian & Uplands	38,923 ac	1.8%
• Barren	30,973 ac	1.4%
• Snow & Ice	38 ac	< 1%

Shoshone County suffered the brunt of the historic 1910 fires resulting in many communities being burnt, including a portion of Wallace (Pyne 2001). The scars of that fire are still evident across the landscape of Shoshone County as some previously forested regions still do not support forest trees and shrubs, especially along the southern facing slopes, while other areas have a mosaic of regeneration of different size classes. Other areas have begun to support trees due to aggressive reforestation programs that were initiated two decades ago and have made significant headway on these previously barren sites.

Subsequent fires have spotted the landscape of the county. During the 15 year period from 1983–1998 there have been approximately 400 fires in the county (averaging 26 per year). Only one fire reached the size of 1,438 acres during this period, with over 98% of the fires in the county being contained below 10 acres (IDL 2001). However, the scenic beauty of the county has increased its attraction as a destination vacation point. This fact, coupled with the number of homes located in the rural–urban interface, the incidents of human caused fires, and the maturing forestlands of the county place the region at increased risk to both wildfire spread and the potential for loss of homes and property.

### **Community Clusters**

Shoshone County had a population of 13,771 people as of the census of 2000, down from a 13,931 population in 1990 (-1.1% annual rate of growth). Although there are 29

identified "places" in Shoshone County, only 16 of these places can be considered a "community" (more than 50 people living in the area).

For the purposes of this analysis and assessment, the 16 communities identified by largest population were selected as target communities. Around these communities, a three-mile-radius circular zone was created to represent the area of initial concern for controlling wildfire hazard. These zones overlapped where target communities were within 3 miles of each other, creating irregular circle boundaries.

The creation of these zones is consistent with the philosophy of protecting communities, not specifically individual homes. While our recommendations for management are concentrated on what is applicable and prudent in these community zones, they can easily be adapted for use in smaller communities and for protecting individual home sites.

### **Community Input**

In order for fire mitigation efforts to be successful there needs to be a commitment by the citizens of the community to become proactive in managing their property in a way that facilitates fire fighting activities while reducing the risk that it will burn. While it is critical that the entire landscape be evaluated for fire risks, individual home site preparation can make the difference between a saved home and a lost one.

In order to assess the risks associated with homes in the county, a citizen survey was developed for homeowners in the rural–urban interface of Shoshone County. This survey (Appendix I), allowed the evaluation team the ability to determine some key factors of risk associated with roof materials, concentrations of trees and vegetation surrounding homes, access by fire fighting equipment and personnel in the event of a fire, their familiarity with fire fighting issues, access to water and tools, as well as other data.

## Survey Results

The Shoshone County Assessor provided the assessment team with the names and addresses of rural landowners in Shoshone County that owned at least 10 acres, had a home on the property, and were not in the limits of any city. There were a total of 123 identified families for this survey. A cover letter, survey, return envelope, and an offer of a free GIS map for respondents was mailed on August 3, 2002. A postcard reminder was sent to non-respondents on August 13, 2002. Another survey, return envelope, and free offer for a GIS map was sent on August 21, 2002, to non-respondents.

A total of 90 residents responded to and completed the survey, 3 of the names were removed from the list for various reasons. The final response rate is calculated at 75%. The evaluation team feels that this represents an excellent sampling of the rural home and property owners in the county.

The respondents to the survey owned a total of 7,290 acres and lived on the property. The average respondent owns 82 acres with the largest owning over 2,100 acres. Out of this, the average respondent indicated that 42 acres of their property are forested, representing approximately 3,745 acres of forestlands in the rural-urban interface of Shoshone County.

Survey participants indicated the roofing material covering their homes. Approximately 29% of the roofs were covered with a composite material, 62% with metal, 3% with wooden shake, and 6% with some other material. Based on these numbers, only the owners with a wooden shake material covering their homes would be at high risk in this category; a low percent of the total.

Respondents also assessed the number of trees near their homes. Roughly 60% of the homeowners indicated that there are more than 25 trees within 250 feet of their homes. Just over one-fifth (21%) indicated that there were between 10 and 25 trees in this zone. About 13% indicated that there are less than 10 trees, while only 7% indicated that there are no trees within 250 feet of their homes. When asked to narrow this buffer to 75 feet around their homes, 16% of the respondents indicated there are more than 25 trees, 35% had between 10 and 25 trees, 40% had fewer than 10 trees, and 9% had no

trees. Because a dense forest can carry a forest fire in the crowns of trees, the number of trees close to home sites is a concern to fire managers in the rural-urban interface. The highest risk landowners in this category are those with more than 25 trees within 75 feet of home sites. We estimate that approximately 16% of the rural landowners in the county are in this highest risk category, with 35% more possibly at risk from an excessive number of trees close to homes. These sites should be evaluated individually to determine if these trees are accompanied by flammable shrubs, grasses, and forbs, and whether a continuous forest tree layer exists to threaten homes.

Approximately 86% of the rural homeowners indicated that they maintain a lawn around their homes. The majority of these homeowners indicated that they keep that lawn green all summer and fall. This is a positive factor in assessing the ability of a ground fire to be carried in the grasses and forbs.

The average rural homeowner in Shoshone County has a driveway in excess of 1,350 feet. The longest driveway reported in the survey was 8.5 miles. The respondents to this survey represent a total of 32.3 miles of driveways. Approximately 67% of the respondents with a driveway over one-half a mile indicated that their driveway has turnouts that would allow two vehicles to pass each other. This is a rather positive indication for the county in general. However, approximately one-third of the rural homeowners with driveways over half-mile do not possess turnouts. This may become a factor in the event of an emergency and evacuation for these residents. These rural homeowners without turnouts are encouraged to assess their specific situations to determine if these structures can be added to their home access.

Rural homeowners in Shoshone County are extremely well prepared for structure and wildfire firefighting response as indicated by these surveys. Approximately 97% of the homeowners have hand tools that could be used to fight a wildfire that threatens their homes. Portable water tanks are owned by 16% of the respondents, 30% have stationery water tanks, 19% have a pond with a pump, 28% have a pond with no pump, and 42% indicated that they have some other type of equipment that could be used such as tractors, skidders, and other equipment.

Almost one-third (31%) of the respondents indicated that someone living in the household has received wildland fire fighting training, while in 21% of the homes someone had received structure fire fighting training. Out of these families, 11% had received both types of training. This is also an excellent factor in determining the preparedness of the county's residents to fight wildfire in the rural-urban interface. However, these number also indicate that the majority of homes in the rural areas do not have any training in fire fighting as 60% of these homes indicated that they have neither type of training.

Approximately 69% of the respondents to this survey indicated that they conduct some sort of fuels reduction program around their home periodically such as grass or brush burning. Above all other factors, this one provides a good insight to the attention and awareness rural homeowners in the county have for wildfire issues. This is a positive factor to reducing the risk of casualty loss.

Near the end of the survey, respondents were asked to rate their home site's defensibility in the case of a wildfire that threatens their home and adjacent buildings. The highest rating (excellent) was claimed by 11% of the respondents, 34% rated their home site as good, 44% as Acceptable, 6% as poor, and only 4% as unacceptable. The categories were further defined in the following ways: Excellent—very defensible, Good—some minor risks, Acceptable—if we had time, we could save it, Poor— many risks, even with time is would be difficult to save, and Inadequate—multiple ways for fire to spread across the landscape and burn our home or adjacent buildings in a short time.

Finally, approximately 70% of the respondents indicated that members of the household would be interested in attending a free, or low cost, one-day training seminar designed to teach homeowners in the rural—urban interface how to improve the defensible space surrounding their home and adjacent outbuildings. Approximately 38% of the respondents indicated that they would be interested in participating in a cost-share program for wildfire risk reduction. We recommend that Shoshone County host training sessions of this nature as part of an integrated wildland fire risk reduction program.

The assessment team would like to thank all of the Shoshone County residents that participated in this survey.

## **Fire Fighting Responsibilities in Shoshone County**

A separate document titled “Shoshone County Fire Fighting Resources and Capabilities: Rural and Wildland” has been prepared. This document details the location of each fire district in the county, where fire stations are located, and the resources available to fight structure fires. In addition it details the wildland fire responsibilities in the county and resources for fighting those types of fires. Maps of the coverage of each district (rural and wildland) are provided with additional statistics on each district.

## **Fire Hazard Analysis: A Three Stage Approach**

In order to assess the fire risk in areas of the county, we have developed and implemented a three-stage analysis. The first stage assesses the potential of a fire to start in any given area based on where fires have started historically in the county. The second stage determines where the highest risk areas are located in terms of potential fire spread. To determine fire spread, we evaluated the factors of slope, aspect, weather conditions, plant cover type, absence of riparian zones, and other related factors that contribute to the rate of spread after fire ignition. Stage I estimates where fires are likely to start while stage II predicts how rapidly and in what direction a fire ignition will spread across the landscape. Stage III of the assessment determines where homes are located in the county. The location of these homes are then identified in relation to these highest risk areas. This helps to determine where the greatest potential exists for casualty loss due to fire spread. These factors are then all considered in selecting priority sites where fire mitigation projects should be implemented within Shoshone County. Each of these stages will be discussed in detail in the following sections.

### **Stage I: Predicting Where Fires Are Likely to Ignite**

The Idaho Department of Lands maintains detailed records on fire ignition points in the state of Idaho. Data on wildfire starts in Shoshone County was selected from the Idaho

Department of Lands database for the years 1983–1998 (IDL 2001). During this period, approximately 400 forest fires were recorded in the county. Site data from the ignition point on each fire was evaluated to determine where and when fire starts occurred. A Geographic Information System (GIS) analysis was conducted to determine what characteristics these points shared in an effort to map other areas that share similar characteristics.

While approximately 64% of all wildfires in Idaho start from lightning, only 57.9% of the fires in Shoshone County were started this manner during the analysis period. Debris burning in the county accounts for 7.3% of fire ignition with camping accounting for an additional 6.5% of fire starts. Smoking accounts for 4.8%, equipment use for 4.5%, and arson for 4.5%. Children playing with fire contributed to 4.3% of the fires in the county while the remaining 12.5% of fire starts in the county were attributable to miscellaneous causes.

As expected, most fires in the county were started during the summer and early fall months, as follows: June 14%, July 29%, August 31%, September 14%, and October 6%. Three-quarters (74.7%) of all forest fires in Shoshone County during the period 1983–1998 were contained at under a quarter of an acre. Fires growing larger than this amount were generally contained at under 10 acres (23.6% of the total). Less than 2% of all fires (by count—not acres) grew larger than 10 acres in Shoshone County during this time, with one fire reaching 1,438 acres in 1986.

Further analysis of fire ignition sources in Shoshone County were less than intuitive in terms of slope, aspect, and elevation of fire starts during the analysis period. For example, the highest occurrence of fire starts was observed not on southerly or westerly aspects as expected, but on northwestern aspects (16.5%). Although these aspects are generally the sites with more moisture on the landscape, they experienced the highest initial fire ignition frequency. Southwestern aspects ranked second (14.2%), with western aspects third (13.8%), respectively, in rank of wildfire ignition location. Northern aspects the wettest aspect, represented the fourth highest (12.7%) fire ignition occurrence rate. Southeastern aspects ranked fifth (12.3%), and southern aspects

ranked sixth (10.8%) in this classification. Northeast and eastern aspects experienced the lowest ignition rates with each accounting for approximately 8.6% of all fire starts in the county.

Slope is a measure of the steepness in a landscape. Generally, the steeper the slope the higher the fire spread risk. Steep slopes provide a rapid spread potential coupled with the most difficult areas to access and protect. However, historic fire occurrence records indicate that the flattest slopes (0–15%) accounted for 46% of all fire starts in the county from 1983–1998. Slopes from 15% to 25% accounted for eighteen percent of the ignition points. Slopes of 25% to 35% accounted for sixteen percent of the ignition points. Slopes 35% to 45% accounted for eleven percent of the ignition points and 45% to 55% slopes accounted for only four percent of the ignition points. Slopes greater than 55% accounted for five percent of the fire ignition points in the county. It should be noted that slopes over 45% in the county are not widely represented in comparison to the flatter slopes.

Over a third of the fires (39%) during the evaluation period were ignited between 2,000 and 3,000 feet elevation. One-quarter of the fires (25%) in the county ignited at elevations between 3,000 and 4,000 feet. Approximately 22% of the fires in the county ignited between 4,000 and 5,000 feet, with the remaining 14% of the fires igniting at elevations above 5,000 feet. It should be noted that the variation in ignition rates was not significantly different between 3,000 and 5,000 (22-25%) feet elevation. However, the number of fires igniting below 3,000 feet (39%) was significantly higher than expected.

Many of the historic fire occurrence factors were not what would be anticipated in predicting fire ignition locations in a forested ecosystem. However, an evaluation of these factors is useful. The data would indicate that the most common location of wildfire ignition was observed on northwest aspects with a flat slope (0–15%), below 3,000 feet elevation during the month of August. These locations define the prime camping locations, vacation cabins, and home sites throughout the region. Considering the fact that 6.5% of the fires in the county were started from careless campers, 7.3% of

the fire ignitions from debris burning, 4.8% from smoking related ignition, and 4.3% from careless children (22.9% all combined), these locale would be considered high risk fire ignition points.

In addition, it should be noted that ridge tops also have what would be considered seemingly level slopes. These points on the landscape were common locations where lightning ignited fires were observed. When combined, human carelessness and lightning caused fires accounted for the overwhelming majority of fire starts (81%).

The landscape features corresponding to the highest occurrence of historic fire point ignition sources has been mapped across the entire landscape of Shoshone County. This is not a map of past fire ignition points, but a map of where the landscape has the characteristics common to past ignition points. These are useful in identifying where the highest risk of fire occurrence is located.

## **Stage II: Determining Highest Risk Landscapes for Fire Spread**

A geospatial analysis, using GIS, has been conducted to predict those areas of Shoshone County which have the greatest potential for fire spread once a fire has ignited in the vicinity. A number of factors were considered in developing the model including aspect, slope, juxtaposition to streams and lakes, and cover vegetation. In this model, these factors were combined to select high risk areas in the following ways:

- More than 150 feet from the nearest flowing water source (non-riparian)
- Aspect of southerly or westerly
- Vegetation cover equal to high risk plant communities (see Appendix II for descriptions)

The conditions were then selected in classes of slope from a minimum of 0% to a maximum of 90%. This was done in 10% increments. The result is an index of potential fire risk displayed on the fire risk assessment map of the county in shades from yellow to bright red (low risk (yellow) to high risk (red)). As the slope increases, the estimated fire risk increases as well. As expected, steep southerly and westerly slopes covered

with dry-site forest tree species dominate the highest predicted risk areas (Appendix II descriptions).

Approximately 18.3% of the area of the county was assessed in one of these 9 categories of risk for the spread of a wildfire. These are the areas that represent the greatest challenge to protect in the case of a wildfire.

On the landscape level, large fires have spread to the northwest after ignition. Although these fires will tend to race uphill and backdown hills, the general direction of fire spread is to the northwest (see attached maps).

### **Stage III: Identifying Communities and Concentrations of Dwellings**

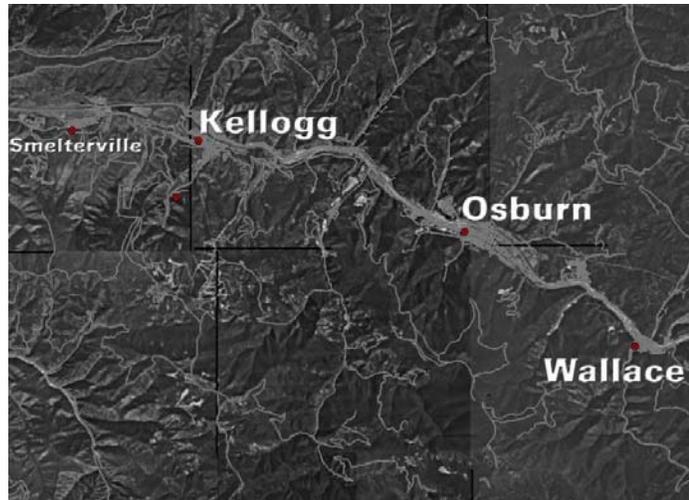
In order to identify communities in Shoshone County, data from the US Census of 2000 was used and augmented with local information on where people in Shoshone County live. Initially, community clusters were identified as named communities with a population of at least 50 persons. The community of Prichard did not meet this standard but was added to the list of communities based on observations on the number of homes found there. Around these selected communities a 3 mile circular zone was created to identify the area of greatest concern from wildfire spread. These community clusters include:

- Prichard–Eagle–Murray
- Western I-90 Corridor: Enaville–Kingston–Pinehurst–Smeltonville–Kellogg–Wardner
- Eastern I-90 Corridor: Osburn–Wallace–Bunn–Gem–Mace–Burke–Mullan
- Avery
- Calder
- Clarkia

The I-90 corridor of buildings is actually continuous, but was separated into two groups for the purposes of this analysis.

Ortho-photos are photographs of the earth's surface from the vantage point of space. US Government satellites record images of the earth in a sun synchronous orbit that record images of the entire planet about every 4 days. Ortho-photo quarter quads were

translated into a usable GIS format and assembled for the entire area of Shoshone County. Each image was optically and visually scanned (so-called “heads–up digitizing”) for evidence of home sites, buildings, and industrial complexes. These building locations were recorded on a GIS point layer of building sites in Shoshone County. Once completed, the data layer included over 5,600 building locations. It is evident that this layer of information contains more than just homes, but also includes garages, businesses, and factories: occupied and unoccupied. However, the data layer is not



perfect. The layer contains some errors, such as indications of building locations where none exists, and actual building locations that were not mapped. These occurrences were due to a variety of reasons; heavy vegetation that obscured roof tops from overhead view, roof tops with vegetation growing on them, large container truck vans parked in home site areas (mistaken for metal roofs of mobile homes), and piles of sheet metal mistaken for roof tops, only to name a few. These errors do not significantly affect the analysis since the addition or omission of several buildings does not influence where the home site concentrations are located.

Analysis of these building locations was further conducted to assess the degree of concentration of buildings in the county. The analysis followed a methodology that assigns a physical location to each building site and then calculates the distance to every other building location in its cluster to determine the “average” building location in each cluster of buildings. The distance from each building to the closest core or center concentration of buildings produces a density index. The analysis determined physical boundaries of where the highest concentration of 95% of the building locations in the county was found. It is no surprise that the greatest majority of building locations were found along the I-90 corridor. Additional concentrations were found in the remote

communities of the county where the concentrations of buildings were the highest (eg. Avery). See attached maps for examples.

While the previous analysis demonstrates where the majority of the building locations are to be found, a second analysis layer may be more useful for identifying where fire mitigation efforts will be the most effective. This additional analysis layer depicts a continuous zone extending 1 mile from each building location in the county. While many of the homes in the large communities (e.g., Kellogg, Wallace, Pinehurst) are highly concentrated, the second analysis for these communities is only concerned with the outer perimeter of buildings creating a one mile zone from these home sites, with no implications for building concentrations.

This second analysis layer has been clipped by the community buffer layer. This produced an interesting map layer that showed not only where communities are located but where the residents of each community are located: 3 miles around each community and 1 mile from each building in that community. This map layer was useful in identifying the highest risk areas and to focus attention when conducting forest fire mitigation projects.

### **Identifying Target Areas**

Using the map layers identified in the three stages of analysis, it was possible to identify the home site areas where fuel mitigation efforts should be targeted. This information was used to meet the project's goal of reducing the rate of spread, treating fuels, and reducing the area of land burned by forest fires in Shoshone County. To better identify these areas, a GIS analysis was again applied to locate those areas that met all of the following criteria:

- Within a community cluster area (3 mile radius of an identified community)
- Within a home site/building location zone (1 mile cluster from all buildings)
- Within 300 feet of an area identified at high risk to fire ignition
- Areas within 300 feet of one of the 9 slope risk categories for fire spread hazard

Locations that meet all four criteria are considered to be at high risk for ignition of a fire, a rapid spread of that fire, and possess the potential to cause significant casualty loss to multiple homeowners when it happens. Maps of each community cluster are included and identify where these highest risk areas are located.

Forestlands outside this zone were also evaluated and will be summarized in a separate section of this report.

## **Risk Assessment and Fire Mitigation Projects**

### **Community Level**

All of the communities of Shoshone County and much of the critical lands surrounding communities were visited during the summer of 2002 by Northwest Management, Inc., personnel to assess the fire risk, the risk of casualty loss due to wildfire, the potential for effective mitigation efforts, and cost effectiveness. Input from local citizens, fire district personnel, wildfire specialists, and others was incorporated into these recommendations. Specialists from the US Forest Service, the Bureau of Land Management, the Idaho Department of Lands, and Shoshone Fire Districts 1 & 2 provided valuable time, information, and input to this analysis.

The cost of mitigation treatments is highly variable and will require extensive efforts to complete. However, we have summarized a wide range of treatment options and the approximate cost of those treatments in a separate document. Cost estimates from the specific community assessments can be combined to determine approximate costs of project implementation.

### **Characteristics of a Defendable Home**

At the community level, individual home sites were evaluated for their characteristics to resist ignition during a wildfire. Defendable home sites have many factors in common:

- 100 foot buffer between buildings and the forest
- nonflammable roofing material
- nonflammable decking material

- firewood stacked 100' or more from the home or in an enclosed metal building
- accelerants such as fuel and rubber tires out of the house zone
- a green yard, or a yard covered with rocks or nonflammable materials
- nonflammable siding material
- a wide driveway with room for fire equipment to turn around
- no limitations to access such as inferior bridges, cattle guards, or sharp turns

Many homes in the county were found to have some or all of these characteristics while others possessed multiple risk factors. Here are some examples of homes with good characteristics:



Firewood stacked away from the home, a wide driveway suitable for equipment to turn around in. Trees beyond the house might be a concern, but pruning and debris burning would reduce this risk.



A green lawn bordered with rocks, a covered front deck and a cement rear deck combine to reduce fire risk.



Metal roof, gravel around the house, and pruned trees combine to reduce fire risk. The trees on the left side of the house present a risk factor.



The paved street, green grass and lack of combustibles around this house limit the fire spread risk to this home. However, the forests behind the house may pose a risk in the event of a wildfire.

## Specific Community Recommendations

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### Avery

#### Fuels Assessment

##### Areas within the one mile of home sites:

Sections 9, 10, 11, and portions of Sections 15 and 16 that lie south of the St. Joe River are closed canopy, mature or over mature timber with a component of heavy down material and a large amount of timber litter. In portions of section 15 (south of the St. Joe River, adjacent to the town of Avery), particularly on cut-over private lands, the fuel is composed of litter from western red cedar and western



hemlock selective cuts (partial cuts). This area has approximately 50 tons/acre logging slash with an additional 35 ton/ac standing green left on site. This area could be

represented by a combination of fuel models 12 and 10 at a 60/40 percentage respectively.



Areas immediate to Avery and the St. Joe River are steep—50-60% slopes. As the slope lessens near ridge tops, commercial logging has provided a patchwork of mature timber broken up with plantations of 12-20 foot tall trees. There are also areas of interspersed

selective harvests where some slash abatement has occurred either by burning, or by natural decomposition, or a combination of both. The mature timber in this area is characterized primarily as fire fuel model 8. Timber plantations in this area are characterized by fire fuel model 5. These plantation areas would provide a good break in the fuels should a large fire occur.



Sections 14, 15, 16, that lie north of the St. Joe River, as well as sections 9, 10 & 11 are a mixture of steep, open shrub and grassy fuels with a great deal of open, rocky areas, especially when close to the St. Joe River or the North Fork. Where timber grows, it is patchy to uniform Douglas-fir with some areas more prone to ponderosa pine transitioning to Douglas-fir. Very little downed material

or timber litter is present. This area is mostly characterized as fuel model 8, but the open areas tend to be characterized more as fire fuel model 4.

**Areas within 3 miles of the community center, but outside the one mile home zone:**

These areas south of the St. Joe River, are mature to over mature forests with a large down fuel component (slash and debris). They are characterized as fire fuel model 10. However in this zone there are plantations and previous commercial timber sale areas where slash has



been burned that provide small areas of relief in the fuel base should a large fire occur.

In general, on north side of St. Joe river the fuels are younger Douglas-fir stands with little to no timber litter with much area in dense brush fields with little to no timber present. Timbered areas could be characterized as fuel model 10, brush fields as fuel model 5, unless extremely dry then fuel model 4.

### **Community Risk Assessment**

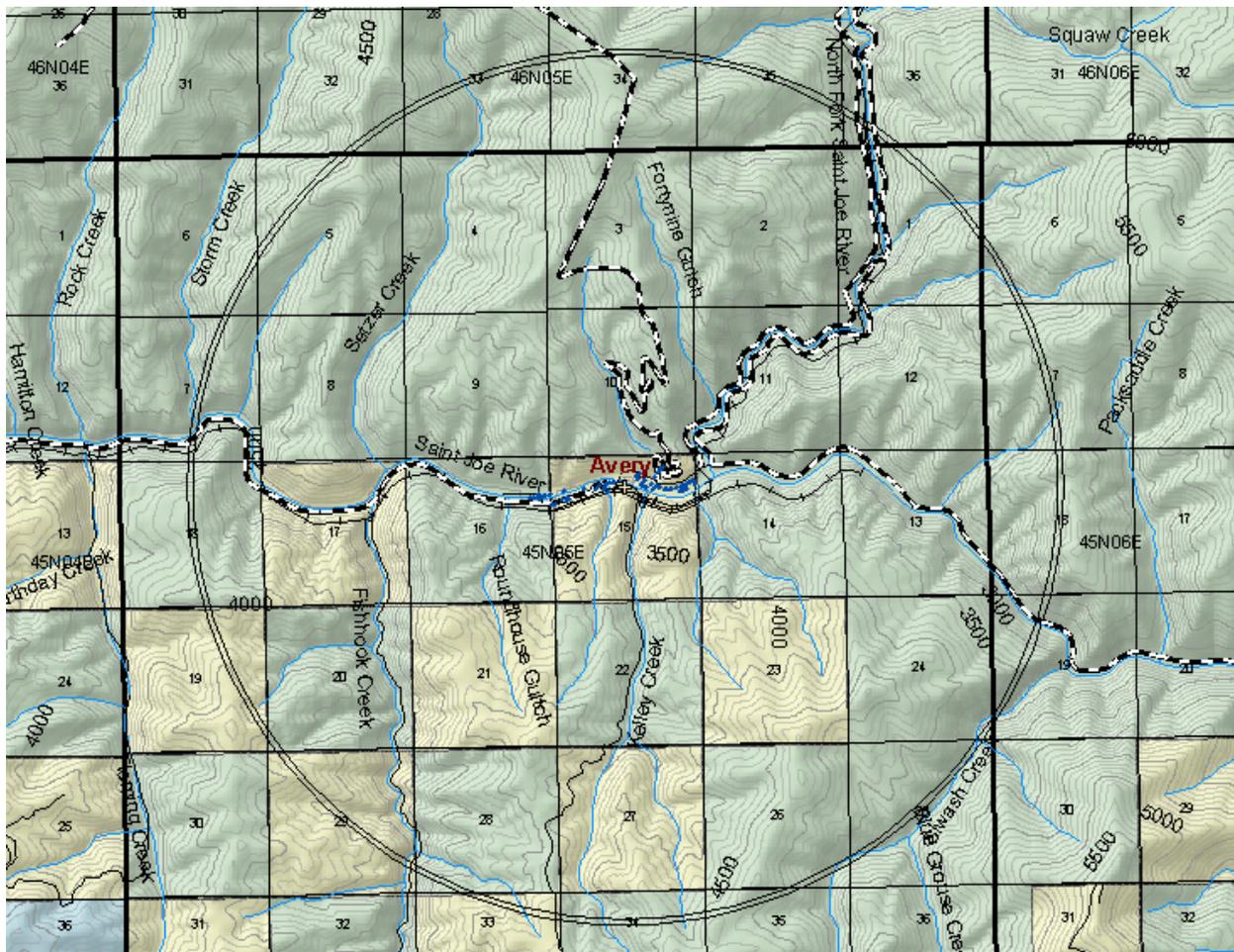
Avery had a population of 420 individuals in the 2000 census. There are about 66 structures in this community, concentrated tightly near the community center. All of these buildings are considered at-risk to loss in the event of a wildfire that threatens this area because of the characteristics of the region which has mature forests, logging debris, and limited access surrounding the community. There is no rural fire department protection for homes in the community of Avery. Wildland fire protection is provided by the US Forest Service–St. Joe National Forest.

The highest concentration of forest fuels near homes have been created in the area immediately adjacent to the community of Avery, on the south side of the St. Joe River. In this locale, logging debris has been generated in a steep forested area where western red cedar, western hemlock, and other species have been logged. Debris on this site is deep, cured, and presents a real fire danger risk. In places, the logging debris is within 100 feet of homes. When combined with the steep slopes of this area, this region becomes a high risk area for wildfire risk.

Two activities should be undertaken in this community to reduce the risk of casualty loss in the event of a fire. First, a community defensible zone should be created that extends from the paved road to approximately 250 feet above the roadway (on the north-facing slope adjacent to the homes), extending from the Kelly Creek road west to Roundhouse Gulch (approximately 5,000 feet long–28.7 acres). Within this protection zone, trees should be thinned, pruned, and shrubs removed, piled, and burned. At the “top” of this fire-break a dirt line should be constructed that would serve to provide a locale where a fire could be stopped. This protection zone is very important to increase the probability

that homes will not be lost in the event of a forest fire on the hill-slope above the community of Avery.

Second, the logging slash in the private land above (south) Avery in section 15, should be treated with fire. This will involve creating a fire line around the entire unit and igniting the logging slash. The timing of the burn should be scheduled for the fall or spring when conditions merit. The combination of treating the fuels on the previously logged site, and creating the community buffer zone will greatly reduce the risk of losing homes in the event of fire in or around the community. After this treatment, Avery will be a much lower risk community in comparison with the other locale in Shoshone County.



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## Calder

### Fuels Assessment

#### Areas within the one mile of home sites:

On the north side of the St. Joe river and on the flat area south of the river in sections 1-4, the area is grass and grass pasture land that is grazed and mostly green until late summer. Fires in this area would most likely burn through this fine, porous grass, especially in moderately- to extremely-droughty years. Mostly the area would be characterized as a fire fuel model 1, but if un-grazed and



cured, would be better represented as a fire fuel model 3, particularly in winds greater than 10 miles/hour. Fires can be expected to be surface fires that move rapidly through cured grass. High rates of spread can be expected in un-grazed, cured areas.

All sections north of the river transition from grass pastureland into grass and shrub with a timber overstory. The steepness of the slope also increases while the terrain changes



from flat to moderate slopes with short benches and rolling terrain within the one mile radius from homes in the community. This area is represented by fuel model 2. Fires in this type are generally surface fires with intensities governed by the amount of herbaceous fuel and down and dead stemwood.

Sections 1 and 6 (east of town) and all sections north of the river within the 3 mile radius of the community center change from open grass and shrub with a timber overstory to mixed conifer stands that range from open ponderosa pine and Douglas-fir mix to closed Douglas-fir or Douglas-fir/grand fir mix. Both fuel model 8 and 10 are represented in these areas. Fires in fuel model 8 are generally ground fires with occasional flare ups through fuel concentrations. Fires in fuel model 10 areas can be expected to burn with more intensity. Torching of individual trees, spotting, and crowning out can be expected.

South of the river, all areas transition from a short distance of flat grassy/pasture lands to closed canopy/mixed conifer stands with a heavy load of down material either from over maturity of the stand or from activity in the stands. Although there are areas with recent harvest where the slash is not completely abated, overall the area could be classified as a fuel model 10. Fires in this model can be expected to burn quite intensely, especially through areas of heavy ground fuel concentrations. As described above, crowning, spotting and torching and expected control problems can be expected.

### **Community Risk Assessment**

The 2000 census reports that there were approximately 130 individuals living in the community of Calder during that year. There are approximately 58 structures at-risk within 3 miles of the community of Calder. All of these structures are considered at moderate-risk due to the dispersion of these buildings and the high degree of wildland-rural interface characteristics in this

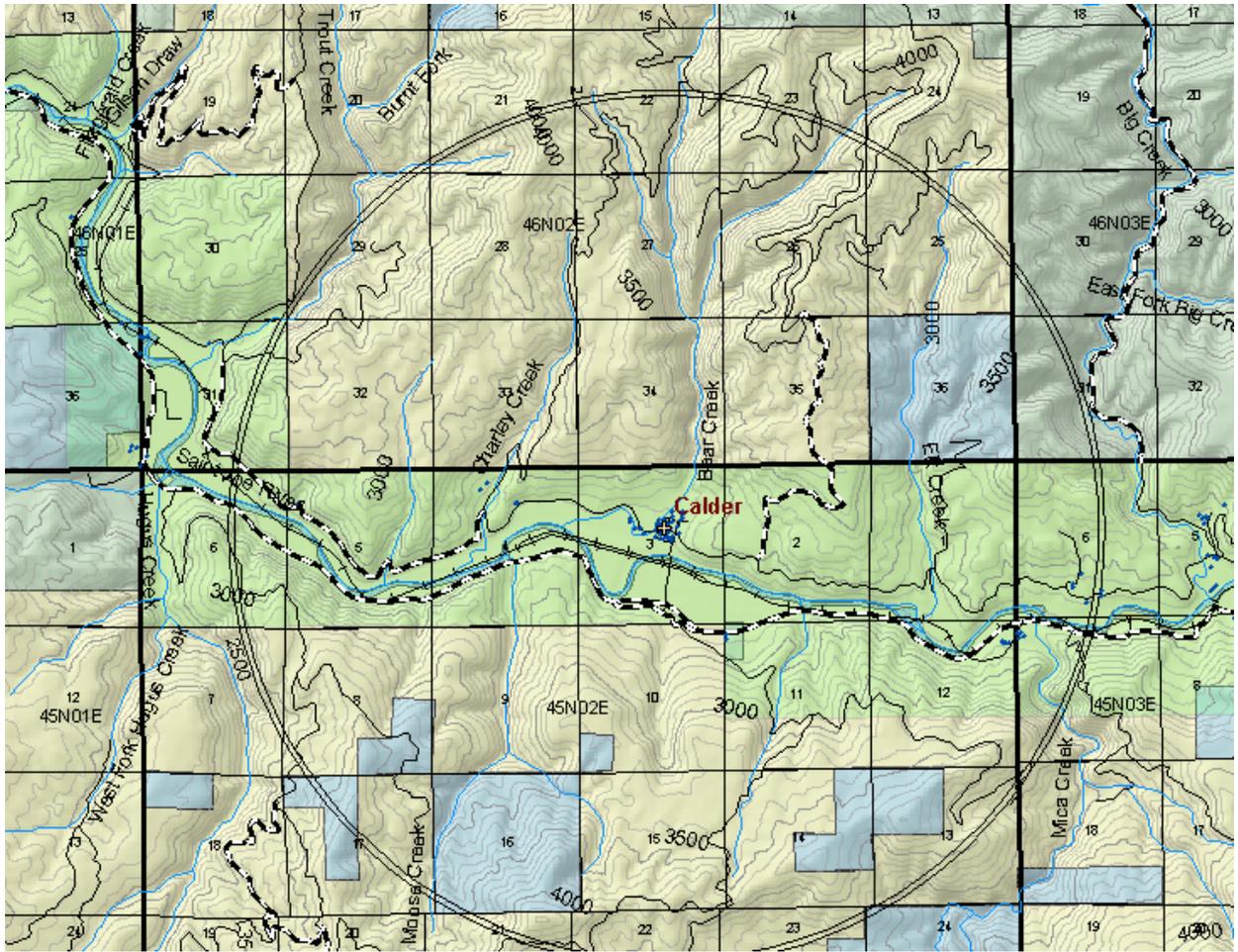


community. The vegetation in this area is predominately young, intermixed with grasses and shrubs. Although it is not a high-risk area currently, this may change in the next decade, depending on growth rates, and potential fire mitigation efforts in the area.

This community supports the county's Rural Fire District №4 with fire stations in Calder and further up the St. Joe River in Marble Creek. Wildland fire control efforts are provided by the Idaho Department of Lands—west St. Joe in St. Maries. However, the boundary of the protection zone for this agency extends just to the border of the 3-mile community buffer zone. Beyond this zone, to the east, the US Forest Service St. Joe protection district begins with offices in St. Maries and Avery.

Because of the reduced fuels risk, the moderate slopes, and the dispersion of the homes in this community, home site defensible zones are recommended for the residents of this community. These zones should follow the basic recommendations for homeowners in the rural–urban interface and include the removal of shrubs, ladder fuels, and dense forests within 150 feet of homes, with fire breaks strategically located around homes or groups of homes. Access issues should be addressed for each home and include an assessment of driveway width, the creation of turnouts, and an evaluation of weight restrictions posed by bridges and cattle guards. In some instances, evacuation routes should be marked while some routes will require road improvements to insure that homeowners will have access to these roads in an emergency.

Cattle grazing in this community is common and has served to reduce the late summer fuels in fields and forestlands around this community. This reduction of grasses and shrubs serves the community well and should be continued into the future. If it is discontinued for some reason, then the accumulation of grasses around home sites will need to be reevaluated.



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## Canyon Creek Drainage

### Fuels Assessment

#### Areas within the one mile of home sites:

The entire Canyon Creek drainage, from Wallace to beyond the community of Burke, is characterized as steep forested slopes climbing dramatically from Canyon Creek to surrounding ridges. The forests of these slopes are primarily Douglas-fir and associated species that are between 60 and 90 years old. Forest fuels on these sites are composed on herbaceous shrubs, some minor amount of grasses, and litter from the tree canopy. Timber harvesting has been conducted in various areas with road building activities accessing only a minor amount of the drainage. Slopes are steep, averaging around 60-70% in some areas. Fire fuel models 8 and 10 are common in this area. The areas that have been recently logged are represented by fire fuel model 11. The south and west facing ridge tops supporting ponderosa pine are characterized as fire fuel model 2.

Home sites in this drainage are all concentrated along the river bottom from Wallace to Burke in small community clusters. These homes capitalized on the flatter areas for building sites, however, the steep canyon walls climb immediately from these sites to the forest and the canyon walls. In many instances, forest trees overtop homes, obscuring them from view, even from only a few yards away.



**Areas within 3 miles of the community center, but outside the one mile home zone:**

There is no significant difference between the forest conditions surrounding the home sites of this drainage and the timber found along the ridge tops. For planning purposes, the differentiation between the two can be ignored in favor of considering the creation of defensible zones around the home sites and considering fire spread potential in the river drainage.



The upper end of the drainage (sections 1 & 12 and beyond) transitions from a mixed conifer forest to a mountain forest ecosystem dominated by subalpine fir, western red cedar, mountain hemlock, and wetter site shrubs. The duff layer in these forests is very thick. Fires are rare in these high elevation ecosystems, but when they do occur (about every 100-500 years) they can be very intense.

Power lines and access roads cut through the forest providing a connection between Idaho and Montana power grids in this area. Shrubs and small trees are growing under the power line right-of-way. Although it is not a problem at this time, the right-of-way must be kept cleared of vegetation that may interfere with the power lines causing a wildfire ignition. Trees along the edges of the right-of-way for a distance of 100 feet should be evaluated for potentially falling into the power lines as well. Although this component of the ecosystem is at a high elevation and at a low risk of rapid wildfire spread, it is a very important component of the Canyon Creek drainage fire assessment because this route is the only escape for residents of the community if access to Wallace is cut off. In the event that a fire ignites lower in the drainage, residents may be forced to flee the area through this escape route. Every effort should be made to guarantee that this area has a low probability of fire ignition.

## Community Risk Assessment

Canyon Creek includes the communities of Burke, Mace, and Gem. State Highway 4 winds up the river bottom where homes, mining structures, and other buildings are located. There are approximately 103 structures located in this river bottom. Although all of these structures are along the Canyon Creek and the state highway, they are all at very high-risk to wildfire loss in the event of a wildfire in the region. Rural fire protection is provided by Fire District №1 with a fire station in Osburn. Wildland fire protection is provided by the Idaho Department of Lands in Cataldo.

The greatest risk for casualty loss in the Canyon Creek Drainage is a wildfire that starts in the vicinity of Wallace and then spreads up-canyon in the direction of Gem, Mace, and Burke. If this ignition is accompanied by northeast winds (which is the prevalent wind in late summer), the steep canyon walls may act to blow the heat, flames, and smoke of the fire up the river bottom. This “worst-case-scenario” would be difficult to access and fight. In fact, it would be a challenge to evacuate the residents of the area by exiting the drainage via the US Forest Service Road 7623 to the northeast of the drainage (into Montana).

If high winds from the northeast were not present at the time of ignition, then it is probable that the fire spread would be limited to upslope locations, with spotting across the drainage highly likely. Fire spread in the area could easily approach 500 feet per hour on the flat slopes, and over 5 miles per hour on the steeper slopes. It would not be difficult for an up-slope fire spread to torch-out and be carried in the crowns of the trees if fuel moisture were below 8% and midslope flame speeds were above 5 miles per hour.





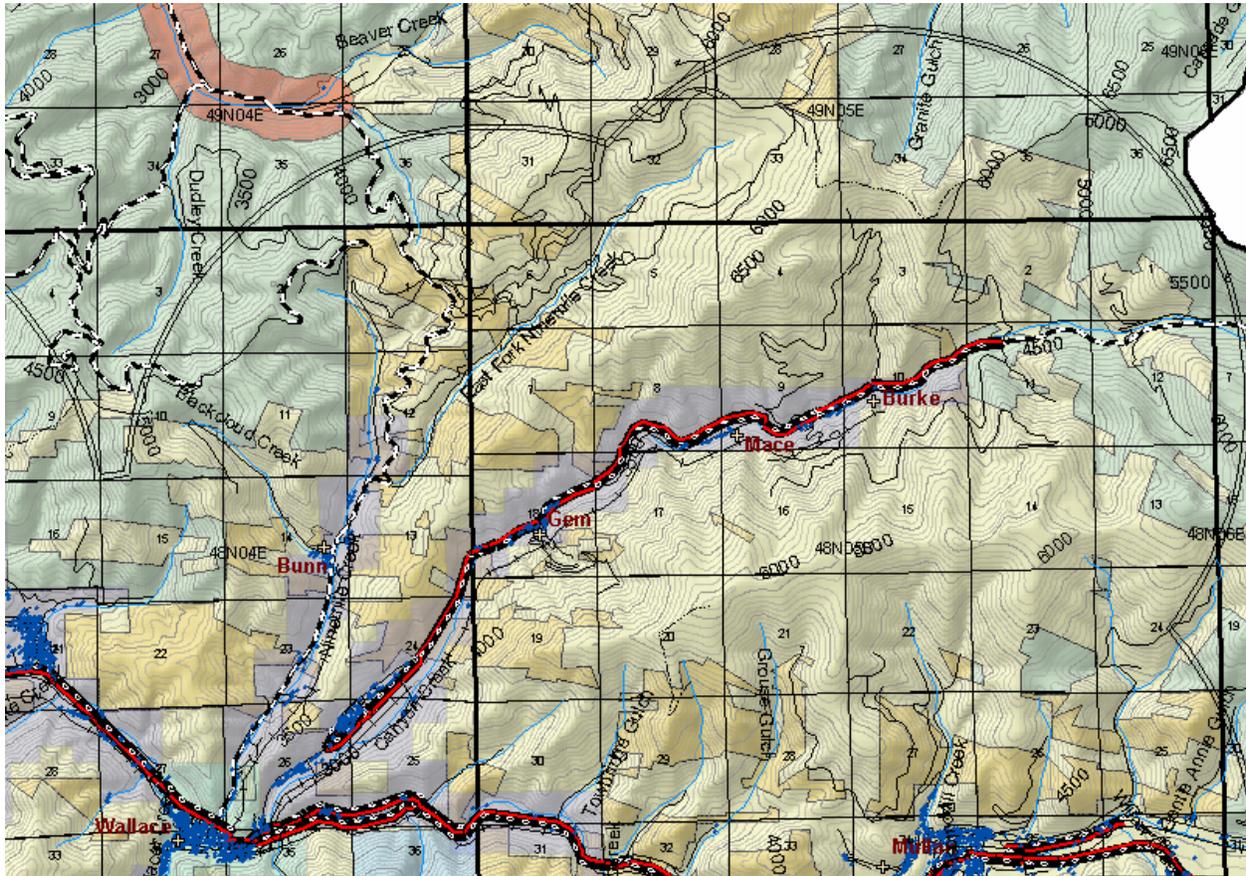
Homes in this river drainage are at risk to ignition in the event that a fire starts in the drainage. Only a few home sites in this area, near Wallace, have any defensible space surrounding them. Other home sites in the drainage are characterized by dense forest canopies that overtop roofs and overhang outbuildings. All of these home sites would benefit greatly from the creation of a home defensible

space surrounding personal property at a distance of 250 feet (horizontal).

In these zones, trees within 100 feet of homes should be removed. Trees above the home sites and beyond the 100 foot zone to 250 feet should be thinned so that crowns are not touching. All trees in the 250 foot zone should be pruned of all branches (living and dead) to a height of 15 feet. Brush taller than 3 feet tall should be slashed. The debris created from the selective thinning, pruning, and slashing should then be disposed of through chipping, pile burning, or broadcast burning when weather conditions warrant. Homeowners should consider creating a “fire line” 2 feet wide of mineral earth at the edge of the forest and the protection zone to further hamper potential wildfire spread from the forest to the home sites.

Access for fire fighting equipment should be evaluated in respect to bridges in this river drainage to determine the maximum weight the bridges will support. These ratings should be posted on the bridges and kept in a record book at the fire district №1 station. In addition, evacuation routes should be clearly marked in the event of a fire emergency. Further, these routes should be evaluated by a roads specialist from the county and the US Forest Service to insure that two-wheel-drive personal vehicles can use this route as a reliable escape route.

Additional forest fuel modifications for this drainage are addressed in the section on the Nine Mile Creek Drainage (located immediately to the west of this drainage).



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## Clarkia

### Fuels Assessment

#### Areas within the one mile of home sites:

Located in the southwestern corner of Shoshone County, Clarkia is surrounded by managed forests in the possession of a variety of federal, state, and private owners. The owners in this area are actively managing these forestlands through timber harvesting, fuels and slash management, reforestation, thinning, and roads maintenance. The resulting landscape is a diverse mix



of forest tree species, tree ages, and tree density. As a result, fire risk in this area is generally lower than in other locale in Shoshone County.



To the west of Clarkia, US Forest Service ownership dominates. These forests have been actively managed to a lesser degree than the surrounding forests that are privately owned. These lands show evidence of past fires and some logging. While most of this region would be classified as fire behavior fuel model 8, a lesser amount (10%) would be classified as model 10. Because of

the close proximity to the community of Clarkia the dense, overcrowded forests with dead and dying trees closest to the community (in sections 1 & 12, T42N, R1E, and

sections 6 &7, T42N, R2E) represents increased risk to wildfire spread. This land is managed by the US Forest Service and is also the location of the US Forest Service work center.



Surrounding the community of Clarkia and much of state highway 8, pasture lands and scattered shrubs dominate the landscape. These areas transition from fescues and grasses to scattered forest tree species. Fire behavior fuel model 1 is representative of the fields surrounding the community, with model 2 representing the transition from fields to forestland, including many miles of river bottom land that extends into the forest. These grasses represent fire spread risk when the fuels are cured or dead as fire spread is governed by the fine, very porous, and continuous herbaceous layer. Fires can move rapidly through this layer and transition into or from the forest, or into home sites. These fields support an active cattle grazing interest. These bovine serve to keep the grasses clipped and the resulting fuels reduced. Because of this, the home site risks are abated greatly.





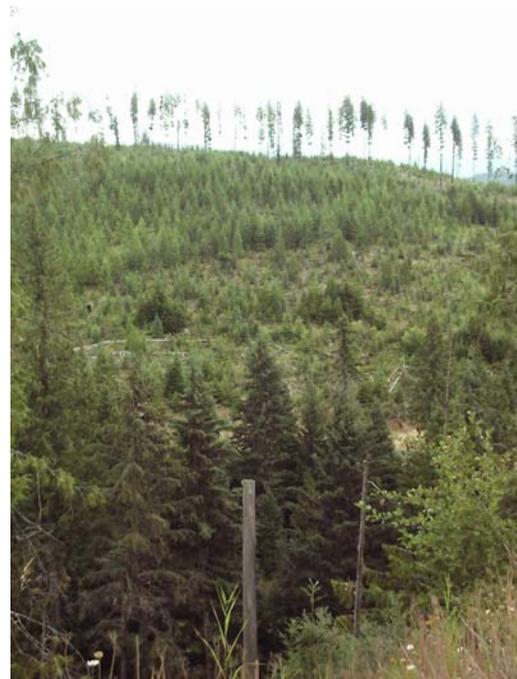
Commercial forestlands near homes, and beyond, are representative of a diverse mix of tree species, tree ages, and density, giving rise to a diversity of fire behavior fuel models that range from model 5 (green low shrub fields with tree regeneration) to model 8 (scattered dead material in mature forests), and from model 12 to 13 (where active logging has

created logging slash prior to treatment). This area has moderate slopes and is well roaded.

Fire fighting efforts in this zone are aided by the diversity of forest cover types and a landscape that would burn only in the most extreme weather conditions because of the discontinuous tree canopy and forest fire fuels present. When considering the entire county and where communities are located, the community of Clarkia is most likely at the lowest risk to wildfire spread because of this buffer of actively managed forestlands.

### **Community Risk Assessment**

The 2000 census reports that the population of Clarkia was 190 persons in 2000. There are approximately 85 buildings within a 3-mile buffer of the community of Clarkia. All of these buildings are considered at low to moderate risk to loss in a wildfire that burns the forests surrounding this community. This particular community is surrounded by managed forests that are not likely to burn intensely, but still have a potential to burn. For this reason, this community has been ranked



with a low to moderate risk rating.

There is no rural or volunteer fire district serving the community of Clarkia. The Clearwater-Potlatch Timber Protective Association provides most of the wildland fire protection in the area—mainly to the south and southeast, with the Idaho Department of Lands (St. Maries) providing wildland fire protection services to the north. The US Forest Service (St. Maries) provides wildfire protection to the northeast of Clarkia (see accompanying maps of the coverage boundaries).



Although this community is at a relatively low risk to wildfire losses of homes, there are specific treatments that can improve the risk rating for individual homes and areas. Specifically, some of the homes in this area are built at the intersection of fields and forestlands. While these areas are scenic and

desirable from an access standpoint, they are also at increased risk to wildfire because of trees with branches from the ground to the tip of the tree, dead and dying trees near homes, and tall grasses that are not grazed. These individual homes would benefit from home site defensible spaces at a distance of 200 feet surrounding the home and out-buildings. In addition, some of these homes have small bridges or cattle guards in the driveway that should be rated for weight restrictions. In a few cases driveways should be trimmed of overhanging shrubs and trees to allow emergency vehicles better access.

Cattle grazing in this community serves to keep the forbs, fescues, and shrubs trimmed and reduced in volume. This serves the community well from a wildfire standpoint and should be continued into the future. Adding additional acres of forestlands to active cattle grazing would serve to proportionally decrease the forest fuels in these areas as well.



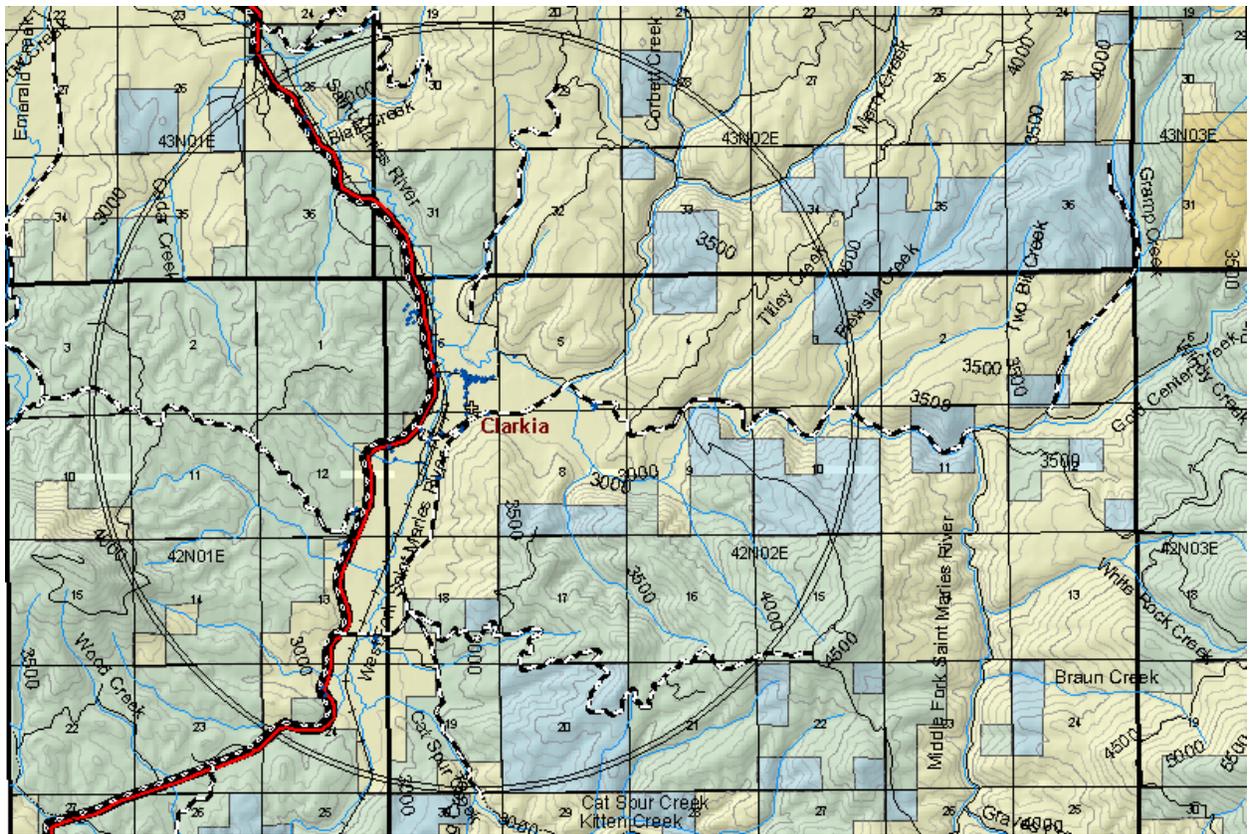
Active forest management south and southeast of Clarkia has targeted mature forests with increased risk of wildfire. US Forest Service land managers have entered stands and removed the small diameter trees, cut the underbrush, and prepared the site for prescribed fire treatment as of the summer 2002. These sites are located near roads, on south aspects, and on a variety of slopes from relatively flat to steep. The trees left on site are generally dominant and co-dominant Douglas-fir, ponderosa pine, and western



larch. The trees are healthy and well spaced. These sites represent an excellent example of wildfire mitigation efforts in and around communities and should be repeated on hundreds of acres in the region. These sites would further benefit from pruning of the leave trees, although these dead branches do not pose a significant fire risk in these managed stands of trees.



Additional US Forest Service lands to the west of Clarkia and state highway 8 would benefit from similar treatments to mitigate the fire risk from the west. Treatments should focus on those lands adjacent to the highway, and where recreational uses are the greatest.



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## Kellogg & Wardner

### Fuels Assessment

#### Areas within the one mile of home sites:

Located at the base of the Silver Mountain Ski area, Kellogg has excellent access to the Interstate. The community is concentrated on both sides of I-90 and up the slopes to the south in the area of Wardner. Other home sites are scattered up gulches in this region where access and forest fuels are a concern, but will be addressed individually. North of Kellogg, the hill slopes still carry



the verification of wildfires in the region as tree establishment and growth are slowed. South of Kellogg, young trees (mainly western white pine) less than 30 feet tall dominate the scenery. Fire behavior fuel model 1 is represented in this area.

To the east, Montgomery Creek has a couple dozen homes located on either side of the river. The west side of the gulch is dominated by brush fields with scattered ponderosa pine trees while the east side of the gulch has young trees and little underbrush. Access is provided by the interstate to the south and by a forest access road 2.3 miles north of the interstate that leads into National Forest lands and access to Prichard and other points. Further to the east, north of I-90, Moon creek is similar to Montgomery Creek, with the exception that the escape route to the north has been blocked by a US Forest Service closed road.

## **Areas within 3 miles of the community center, but outside the one mile home zone:**

Beyond the immediate zone of homes in this area, the ridge tops support a variety of forest types with moderate risk factors for wildfire. The management of these areas are addressed in the county-wide recommendations for landowners and land managers.

### **Community Risk Assessment**

Kellogg had a population of 2,591 in 2000 according to the US census, earning it the distinction as the largest community in the county. This community's structures are concentrated near the downtown area which is located on either side of Interstate 90. The community of Wardner is combined with Kellogg for this analysis. There are in the neighborhood of 1,028 structures within 2 miles of the community center (excluding those near Smeltonville). The downtown area is not considered to be at-risk to wildfire loss. The areas surrounding Kellogg are not at high-risk to wildfire loss either, due to past wildfire history, and environmental complications related to mining in the region.



The structures located beyond 0.5 miles from the city center are at low to moderate risk to wildfire risk in the future. These are the structures located along the perimeter of the community, in the drainages, and in the surrounding forests. There are approximately 475 structures in this low to moderate risk zone. These structures are not at the same degree of risk as many of the other

homes in the moderate "at-risk" zone in the county. These structures should be re-evaluated in 10 years to determine where wildfire risk factors have changed.

This entire area has rural fire protection provided by Shoshone County Fire District 2 with a station in Kellogg. Wildland fire protection is provided by the Idaho Department of Lands in Cataldo.

South of Wardner, Milo Creek is tapped to provide domestic water supplies for the communities down stream. The forests in this drainage are young, healthy, and at only a slight to moderate risk to wildfire. However, just as the forests surrounding this community should be re-evaluated in 10 years, so should the health of this valley. Because it provides a domestic water supply, Milo Creek fire risk should be monitored.

Multiple access routes for the residents of Milo Creek between Wardner and Kellogg is a minor factor at this time because of the minor fire risk rating, however, access through section 12 (T48N R2E) should be improved in the future as this route will be beneficial in the event of an emergency.

Although dual access is provided in the Montgomery Creek drainage, the potential escape route to the north is not marked. It is highly recommended that this route be signposted all the way to Prichard where evacuees can be sent. Home access bridges in this drainage should be evaluated for maximum load ratings, and posted, with load rating kept on record at the



Shoshone County Fire District 2 office and the IDL Cataldo office. From a fire fuels standpoint, the brush fields to the west of the gulch present some degree of risk. However, this brush field is comprised primarily of hardwoods, is east facing, and there are no homes located on the hill slope above it. Live fuel moistures will tend to retard any ignition and subsequent spread rates meaning that a substantial defensible space

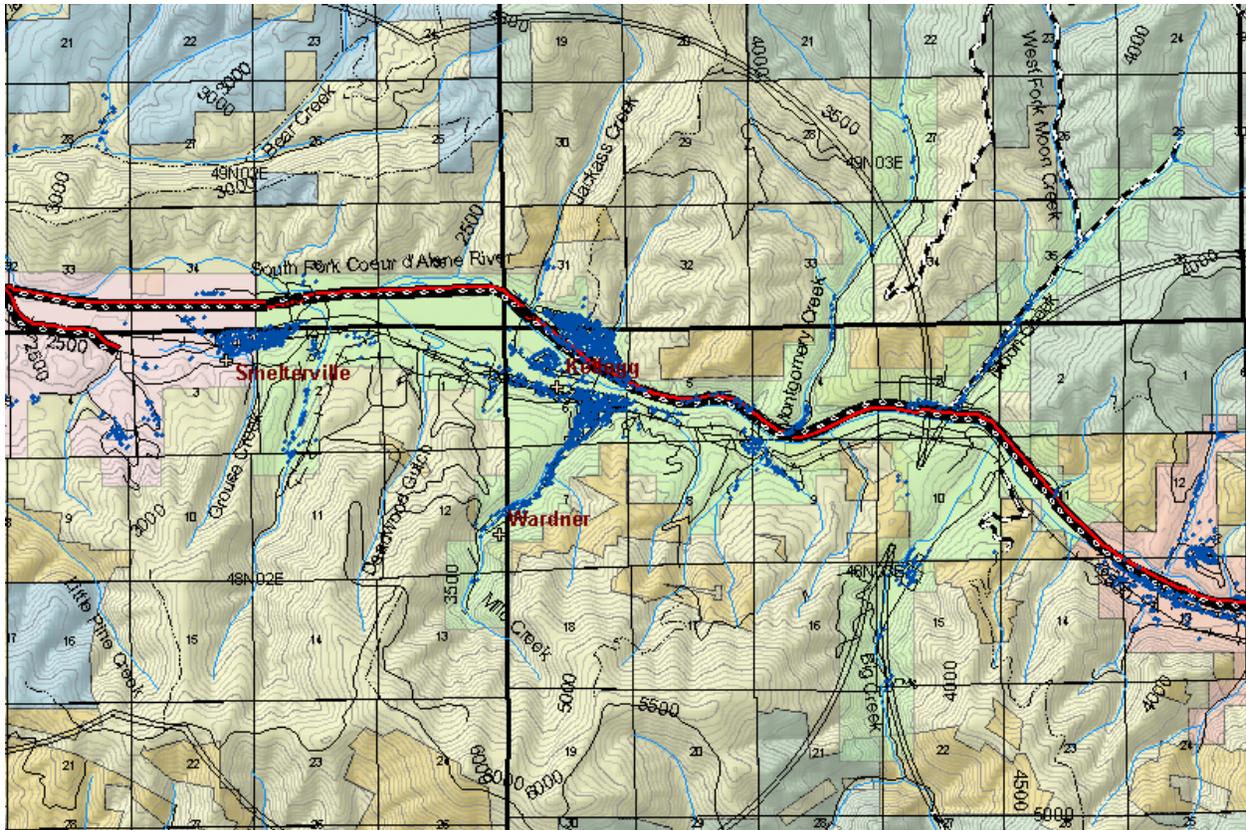
around the homes adjacent to this brush field should be adequate to protect homes and property.

The Moon Creek Drainage, east of Montgomery Creek, is similar in forest fuels and conditions. However, the US Forest Service road that would normally provide an escape route to residents, in the case of a fire at the southern end of this drainage, has been



blocked. National Forest Development Road 930, when originally built, provided an escape route to Prichard and other points north from this valley. The US Forest Service is strongly encouraged to re-evaluate this permanent road closure in favor of a solution that would allow its utilization in the event of a life threatening emergency.

The forests surrounding Kellogg should be monitored over the next 10 years as these young western white pine forests mature and under brush thickens. Depending on this rate of change, pruning and the creation of fire breaks along the natural terrain breaks should be implemented in the future. Although it is at a low risk to wildfire currently, this will change over time.



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## Kingston

### Fuels Assessment

#### Areas within the one mile of home sites:

Kingston is located on the western side of Shoshone County along the I-90 corridor. Homes in this community are scattered near the interstate, and along the river valleys running north and south including French Gulch, Hunt Gulch, and along the Coeur d'Alene River. Slopes near homes are more gentle in this area than most of the county with structures scattered in a more diverse pattern. A small



amount of livestock husbandry is practiced in the vicinity of Kingston.

Forest habitats are a range of wet site species near the river to drier site species along the hill slopes and ridge tops. Forest fuel model 8 is common in the forests of this region. Mature forests in this area are characteristically dense, with a moderate amount of dead and dying trees in the tree canopy and a noticeable amount of forest floor duff that could carry a ground fire in droughty years.

Wildfire spread in this region would be carried in the tree canopies and move in the characteristic northwesterly direction after ignition. Residents in this neighborhood have ample escape routes when needed, but there are no signs or planned routes for residents to follow. Home site defensibility in this area ranges from excellent to poor. For the most part, the scattered nature of the home sites dictates that defensibility zones will be built around individual homes, or smaller clusters of homes (2 or 10).

**Areas within 3 miles of the community center, but outside the one mile home zone:**

Beyond the immediate zone of homes in this area, the ridge tops support a variety of forest types with moderate risk factors for wildfire. The management of these areas are addressed in the county-wide recommendations for landowners and land managers.

**Community Risk Assessment**

This community along the Coeur d’Alene River had a population of 500 as reported in the 2000 census. Combined with Enaville, Kingston is less than 2 miles from Pinehurst, and is scattered in all directions from the intersection of the Coeur d’Alene River Road and I-90. There are approximately 288 structures within 3 miles of Kingston, excluding those attributed to Pinehurst. The structures



within 0.25 miles of I-90 are not considered at high risk to wildfire, however, those beyond this distance are at increased risk to wildfire loss. There are approximately 151 structures in this high-risk zone.



Rural fire protection is provided to this community by Shoshone County Fire District 2 with a station in Pinehurst. Wildfire protection services are provided by the Idaho Department of Lands in Cataldo.

Because of the extremely rural nature of this community, most of the

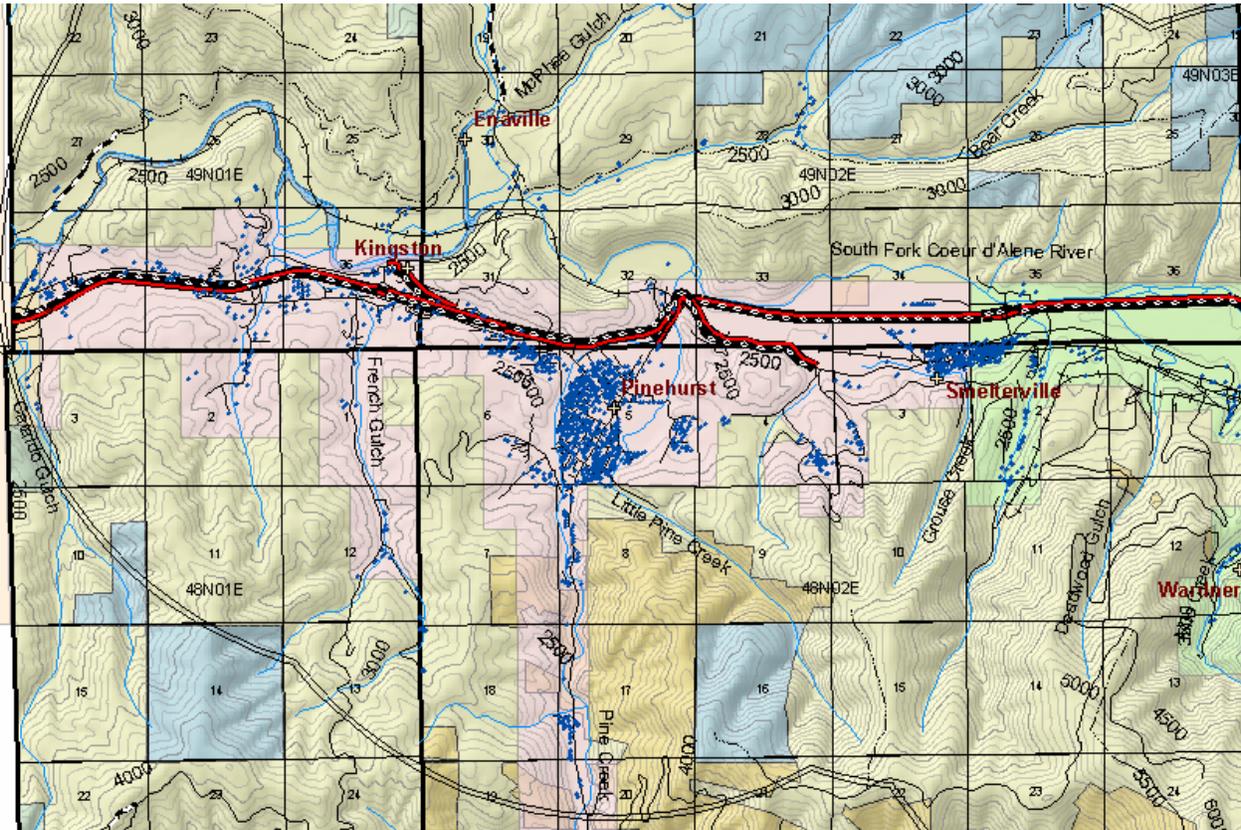
nearly 300 structures are next to the rural-urban interface. Homes have generally been built at the junction of trees and farm fields. Livestock feed in many fields reducing the threat from a grass fire, but the threat presented by the forest fire is still a concern for many residents. Individual home site defensibility zone should be constructed around homes and groups of homes at a width of 150-200 feet. Livestock grazing has kept many of the grasses and shrubs in these areas trimmed down, meaning that defensibility zones should concentrate on thinning, pruning, and debris removal.

A few homes in this zone exhibit extremely risky characteristics such as firewood stacked against the wooden deck, cedar shake roof tops, dense forest trees and shrubs against the house, and limited access. These homes are at risk to wildfire while putting other homes at risk to a fire that starts in the home which can rapidly spread to the forest and then other homes. These homeowners are strongly encouraged to reduce home site risk factors.



Many of the homes located along river valley bottoms access their homes through the use of single driveway bridges. While some of these stream overpasses are well

constructed, others are not. As with scattered locale around the region, this area is in need of maximum load calculations on each bridge with the results posted on each structure and kept on file at both the rural fire fighting office and the Idaho Department of Lands office.

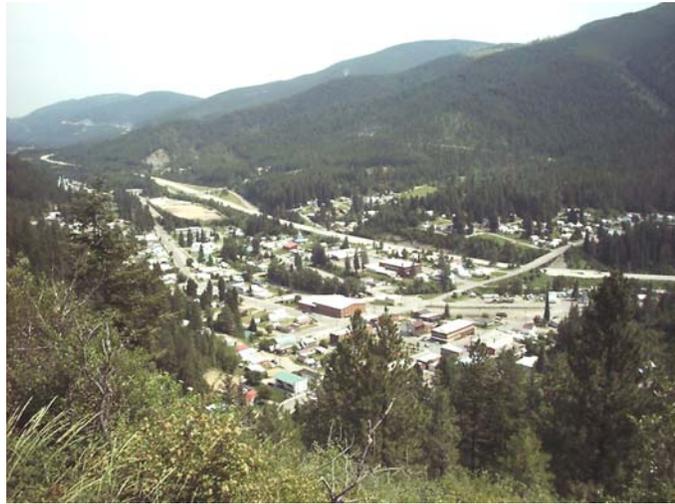


# Mullan

## Fuels Assessment

### Areas within the one mile of home sites:

Located near the eastern extent of Shoshone County, along Interstate 90, and the South Fork of the Coeur d'Alene River, this community is fairly flat in comparison to other communities in the county. Forests surrounding the community extend into the borders of town. Access to and from the community is provided by Interstate 90 both east and west bound.



Forest conditions in the area differ based on which side of town you consider. To the north of Mullan, the slopes are predominately south facing and dominated by Douglas-fir, ponderosa pine, western white pine, and assorted other species. The fire fuel model on these forest sites is mainly model 2 and 5 on upslope locale and model 8 near

streams. The south side of town is relatively flat to north facing and supports western red cedar, western white pine, western hemlock, grand fir, and lodgepole pine. Forest fuel models in these habitats range from model 8 to 10. Slopes in both locations range from fairly flat to over 40%.



North of Mullan, up the Mill Creek Drainage, a couple dozen homes are

located very near the road. The forests in this creek drainage extend right up to the edges of private homes. As is the case with other home sites in the county, these homes would greatly benefit from the construction of defensible spaces; removal of trees immediately adjacent to homes, pruning, piling of debris, and prescribed pile burning of the slash. However, there have been forest management activities conducted on the west side of the road (east facing slope) on the private ground. The selective harvest on that parcel did an excellent job of removing understory trees from the parcel, leaving dominants and co-dominants behind. The spacing is adequate to limit the potential of a crown fire to spread in that stand. This is a respectable model to emulate in the region in an effort to manipulate forest stand conditions to reduce the risk that wildfires will destroy homes adjacent to the forest. There are still a few activities that will further reduce the risk in this creek drainage, but they will be detailed in the following section.

**Areas within 3 miles of the community center, but outside the one mile home zone:**

There is no significant difference between the forest conditions surrounding the home sites of this community and the conditions found out to a 3 mile radius, except for the obvious differences dictated by the changes in elevation. For planning purposes, the landowners in these areas should carefully consider modifying silvicultural prescriptions,



when they are implemented, to adhere to the principles outlined in this report which details silvicultural practices. These practices, implemented on a broad scale, have the potential to make a meaningful difference in fire protection to the community of Mullan.

From Mullan, elevations climb to over 5,000 feet where the US Forest

Service is the primary owner. The BLM is also a significant landowner in this area (within 1 mile of the community). Forest health issues dominate any discussion of this forest ecosystem as insects have infected large areas of this region, killing thousands of trees and turning them red. These trees are easily seen from I-90 as motorists travel from Mullan into Montana. These landscapes present a significant fire risk to the surrounding communities of Mullan, Larson, and the homes along the valley bottom of the South Fork of the Coeur d'Alene River. The federal land management agencies responsible for the stewardship of these forests should make every effort to mitigate the potential for loss due to a wildfire in the area.

### **Community Risk Assessment**

Mullan had 821 residents recorded during the 2000 census. This community has approximately 426 structures located within 3 miles of the city center. This community has fire fighting resources and access to the interstate highway and surrounding forests. Not all of these structures are considered at high risk to wildfire loss. Those buildings within 1 mile of the city center are at-risk, but not to the degree of the buildings located beyond this limit. It is estimated that 60 of these buildings are at high risk, and that the remaining 366 buildings are at a moderate-risk to wildfire. Shoshone County Fire District №3 and the Mullan

Volunteer fire district both provide home site fire protection in this area. The Idaho Department of Lands in Cataldo provides wildland fire protection for the Mullan area.

As already mentioned, the homes located in the northwest corner of the community, along mill





creek, have been the beneficiaries of good forest management practices near their homes. However, there are still a few activities in this area that will further increase the defensibility of these homes against wildfire. First, trees above the homes up to the level of the forest access road should be pruned to a height of 15 feet. The branches from the pruning should

be hand piled. In the fall, after rains have made the forest safer for fire, a hand-ignited broadcast burn of the area should be conducted. This underburn should concentrate on burning the piles of branches from the pruning as well as igniting jackpots of existing slash that currently remains on site. While most of this is private land, there is a small amount of BLM ground in this fuels abatement area. These fuel modifications should be conducted from the edge of the BLM land on the northern extent, southward 3,500 feet on the east facing slopes all the way to the center of section 34, just above Faye St, in Mullan.

The homes along the northern edge of the community are all bordered with forest trees. Normally, this condition would dictate that a large buffer zone be created upslope of the homes where trees are thinned and debris is burned. However, the trees that border the homes along the northern edge of the community only extend up the slope approximately 300 to 400 feet and give way to shrubs and scattered trees (and the Mullan “M” overlooking the community). Homeowners should create a defensible space around their homes that includes trees pruned



to 15 feet or above, with all forest debris and litter disposed of through chipping or burning to a range of 125 feet from their personal property.

South Mullan is divided into two distinct groups of homes separated by a stand of trees around Boulder Creek. This stand of trees is quite substantial and provides both a visual and a noise buffer from the interstate adjoining the stand. However, this dense thicket of conifers is also a fire risk for the residents of South Mullan. This forested area possesses forest fire fuel models 8 and 10, with predicted rate of fire spread of between 100 and 520 feet per hour. Given the average August conditions at midday, a fire starting on one side of the community would spread to the other side of the community in as little as 45 minutes, but not more than about 4 hours. Given the number of homes in the area and impact that forest management activities would have to mitigating these potential losses, this area receives a high priority for treatment in the county.

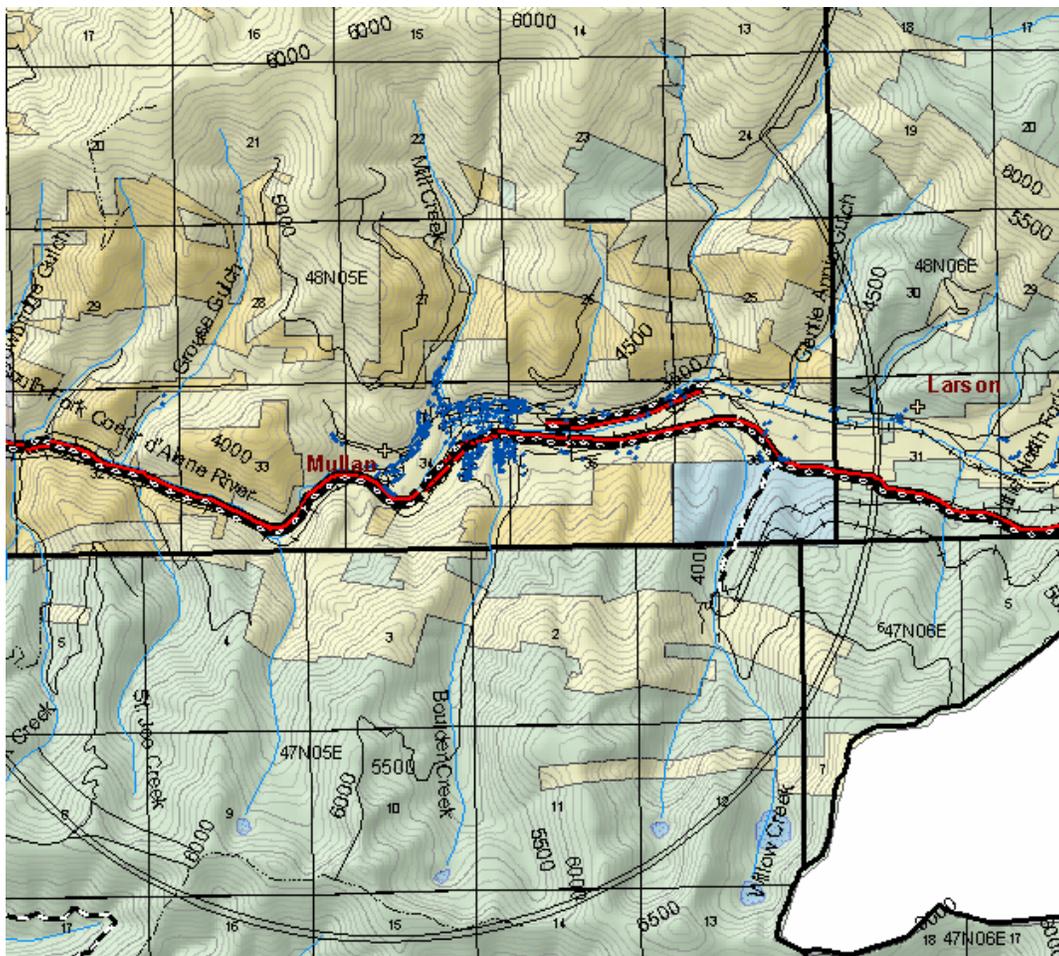
Further south of the community, timber harvesting activities have selectively harvested trees from the area leaving a stand that will retard the spread of a potential wildfire, once the logging slash has been disposed of (currently that logging slash would classify that area as fuel model 11 and 12). We strongly recommend that the trees found in the three patches surrounding the community of South Mullan (east and west of the community and in the center of the community) be thinned and pruned with all of the logging slash disposed of through pile and broadcast burning.

Homeowners in this community are advised to create 300 foot defensible zones around their homes in conjunction with the fuel mitigation activities to be carried out on the forest stand inside the community. Many homeowners in South Mullan have wood piles against home structures, have rain gutters piled with needles, and buildings overtopped by trees.



These conditions put all homes in the community at risk. A community focus to make their homes “fire-safe” would benefit the entire town.

The remaining areas of Mullan, beyond the community’s borders are a variety of home conditions from houses in the valley bottoms surrounded by a combination of trees and grass fields, to homes located completely in the forest. While fuel conditions are not at the highest risk for wildfire spread, the homeowners are advised to create home defensible spaces around their homes and limit the potential that a crown fire could ignite their personal belongings.



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## **Nine Mile Creek Drainage**

### **Fuels Assessment**

#### **Areas within the one mile of home sites:**

The Nine Mile Creek Drainage runs primarily north-south from Wallace through the community of Bunn. Nine Mile Road provides access between Wallace and Bunn and the communities to the north including Prichard and Murray. The ownership of the drainage is a scattering of BLM, US Forest Service, and private owners. Forest conditions in the drainage support wet site tree species such as western red cedar, western hemlock, grand fir, and some of the drier site species such as Douglas-fir and ponderosa pine.

Forest management activities in this drainage have created a mosaic of forest conditions from dense forests to open, young timber. Fire spread in this drainage would not be expected to move rapidly and with intense heat, except for the factor of the very steep slopes. In less than 5 miles, the steep slopes of this drainage raise from 2,700 feet in Wallace to 4,186 feet at Dobson Pass. These steep slopes will dictate that any fire fighting activities will only be able to hold the line at the crest of ridges. Home site protection will rely on the creation of defensible spaces around homes before the fires start.

Steep canyon walls and the north-south orientation of the drainage both contribute to the wet microsite conditions found here. Although this translates into a reduced fire risk as compared with the dry conditions to the east in the Canyon Creek Drainage, it also means that the site has produced more debris from branches, brush, and dead trees from increased competition. This increased fuel is a concern, especially when high temperatures, low humidity, and winds combine to increase the forest fire risk.

A few homes in this drainage are surrounded by fields while some have the trees near their home thinned. These sites are considerably more protected from a potential forest fire than their neighbors are. Fire fuels in the areas frequented by home sites in this

drainage range from fire behavior fuel model 8 to 10. Some of the south and west facing aspects, higher on the slope, are better characterized by fuel model 2.

**Areas within 3 miles of the community center, but outside the one mile home zone:**

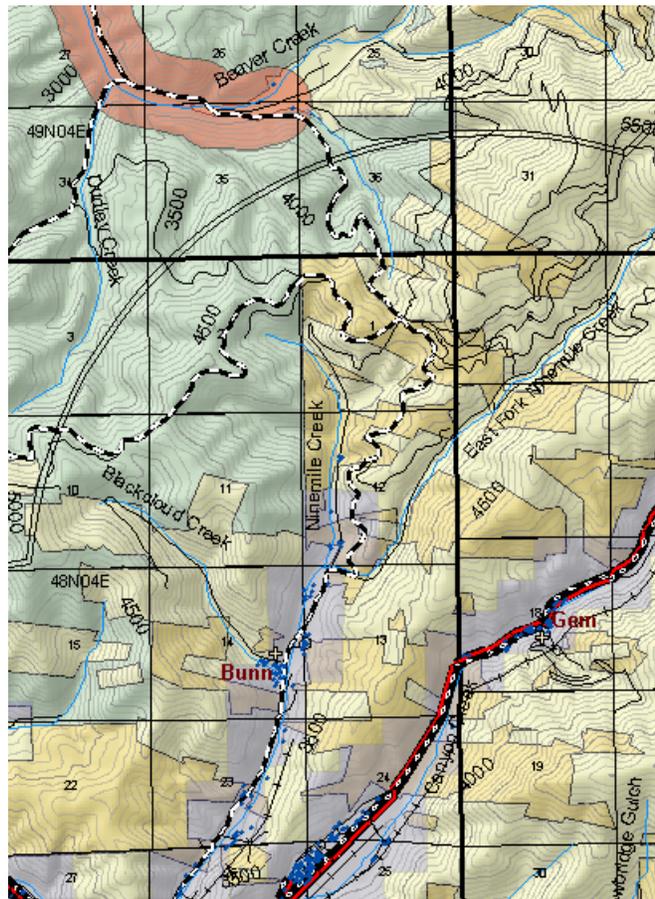
There is no significant difference between the forest conditions surrounding the home sites of this drainage and the timber found along the ridge tops. For planning purposes, the differentiation between the two can be ignored in favor of considering the creation of defensible zones around the home sites and considering fire spread potential in the river drainage.

Two escape routes for residents of this community are provided. The most immediate is to evacuate to the south (Wallace). In the event this route is blocked it would be possible to drive north over Dobson Pass to Prichard. These escape routes should be clearly marked.

**Community Risk Assessment**

Ninemile Creek drainage is located north of Wallace and has approximately 77 structures located in it. All of these structures are surrounded by the forest and are difficult to access because of the terrain. All of these structures are considered to be at high-risk to loss in the event of a wildfire.

Rural fire protection is provided by Fire District №1 with a fire station in Osburn. Wildland fire protection is provided by the Idaho Department of Lands in Cataldo.



The greatest risk for casualty loss in the Nine Mile Creek Drainage is a wildfire that starts in the vicinity of Wallace and then spreads up-canyon in the direction of Bunn and Dobson Pass. If this ignition is accompanied by northerly to northeasterly winds, the steep canyon walls may act to blow the heat, flames, and smoke of the fire up the river bottom. This “worst-case-scenario” would be difficult to access and fight. In fact, it would be a challenge to evacuate the residents of the area by exiting the drainage via the Nine Mile Creek road to the north of the drainage (into Prichard).

Defensible zones around home sites may be the key to protecting personal property. In this drainage, home protection zones should include a light thinning of trees at a distance of no less than 150 feet from home sites. The reduced protection zone distance in this drainage is a reflection of the wetter microsite conditions found here. In this 150 foot buffer zone, trees should be pruned, brush slashed, piled, and burned after the fall rains have started.

Aggressive home defensible space activities should be carried out by all homeowners as many of the homes in this drainage have wooden porches, trees overtopping roofs, firewood stacked against houses and garages, and other high-risk conditions around the home sites.

Analysis of the region indicates that forest conditions along the ridge separating Nine Mile Creek and Canyon Creek are at a high risk to fire ignition and its subsequent spread. Past forest management activities will act to mitigate this potential spread, but it is unlikely that these activities will serve to halt the fire’s potential spread. Once a fire has started in either of these two drainages, it is likely that the fire will be able to spread over the ridge top and then back down the adjoining canyon directly, or spot into the adjoining canyon, moving with the prevailing winds which are generally northeasterly. These fires that back down a slope move slowly down the hill, but tend to burn very intensely because of an ample supply of oxygen and preheating of the fuels. In both drainages, a defensible space around homes will be a key factor to saving residential property in the event of a wildfire.

Forest management activities along the ridge separating the Canyon Creek Drainage and the Nine Mile Creek Drainage may prove to be beneficial to many of the surrounding communities. The project area would include the ridge's east and west facing aspects in sections 26, 23 (SE corner), 24 (NW half), 13 (all), 12 (SE half), and section 7 (see the community map for locations). Drastic forest stand modifications are warranted in this zone. Forest fuel modifications would reduce the risk of fire spread dramatically. This entire ridge would benefit from slash treatments involving a mixture of piling and burning and/or underburning in the fall or spring. The sites to target would include those ridge locations between homes in either drainage, especially in sections 26 and 24. This would reduce the potential for loss due to wildfire in Wallace, and all communities in both the Canyon Creek Drainage and the Nine Mile Creek Drainage. The majority of these modifications will be on private and BLM forestlands.

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# Osburn

## Fuels Assessment

### Areas within the one mile of home sites:

The community of Osburn is located in the I-90 corridor between Wallace and Kellogg. Homes and businesses are generally in a concentrated cluster near the interstate, with steep hillsides rising from the community edge to the hillsides 2,000 feet above the city. Scattered mining enterprises are located in the valleys to the south of Osburn with dead-end gravel roads accessing a few hundred yards up



each hill. Forests in these areas are characteristically north facing habitat types dominated by many tree species including western red cedar, western white pine, Douglas-fir, ponderosa pine, and grand fir. Forest health is generally good, with a few pockets of dead or dying trees, but not the extent found in other areas in the county.



Forest management activities on the hillslopes south of Osburn have thinned out the forestlands to leave healthy dominant and co-dominant trees with little underbrush. While some of these areas have logging debris still on the site, prescribed burning of these units will serve to

eliminate this ground fuel risk. The remaining forestlands in this area are characterized by fire behavior fuel model 8 with deviations into model 10 and even 11, although these latter two are represented only in scattered locale on this hillside.

The slopes to the north of Osburn were not subjected to the same forest fires as those to the east nor to the same environmental challenges as those to the west, resulting in a fully forested hillside. This south aspect is dominated by ponderosa pine and Douglas-fir with scattered shrubs in the understory. Because of the hotter exposure to direct sunlight, the forest habitat is much drier than



that across the valley on north facing aspects. The fire behavior fuel model in much of this area is 2, with some areas characteristic of model 5.

### **Areas within 3 miles of the community center, but outside the one mile home zone:**

The lands beyond the one-mile buffer of Osburn home sites are federally managed forestlands that encompass the peak of the east-west running ridges in this area. The forests are characteristic of the high elevation woodlands with past evidence of fire scars, forest health challenges, and wide expanses of continuous forest cover. Most of the lands in this zone are well roaded with access provided from the I-90 corridor as well as from points to the north and south.

### **Community Risk Assessment**

The community of Osburn had 1,579 residents as of the census of 2000. Although this community is concentrated in a definable city, there are many smaller communities immediately surrounding this concentration of homes. These communities include Silverton, Terror Gulch, Sunnyslope, Big Creek, and parts of Moon Creek. There are

roughly 1,179 buildings within 3 miles of the city center (inclusive of the listed sub-communities). Out of these 1,179 structures, nearly 611 are considered to be at high-risk to wildfire. These structures are outside of the community center (averaging 0.85 miles from city center), along the edge of the community, and scattered in the river drainages and forested areas surrounding the area of Osburn.

Both Shoshone County Fire District 1 (east side) and Shoshone County Fire District 2 (west side) provide rural fire protection for structures in this area. Wildland fire protection for this area is provided by the Idaho Department of Lands in Cataldo.

### **Osburn**

The city of Osburn is a concentration of homes and businesses located mainly to the south of I-90. The southwestern perimeter of this community defines the wildland-urban interface for these residents. Unlike most communities in this county, homes and businesses are not densely concentrated along the forested slopes that rise from the valley floor. For the most part, structures in this city are set back from the forest edge providing a very defensible zone against a possible wildfire on this hillside.



This practice of maintaining the buffer zone is highly recommended and encouraged as these buffer lands between the flammable forests and structures provide a reliable protection against casualty loss in the event of a wildfire.



The exception to this is found along the city perimeter in the southwestern quarter of Section 18 (SW¼ SW¼, S18, T48N R4E) where homes are encroaching on this interface (from 1<sup>st</sup> Street to the southeast). This proximity to the forest is coupled with risky homeowner practices such as firewood stacks against wood siding (on the side of the forest), a continuous tree layer from the forest

through the home site with branches overhanging wooden decks and wood siding, and similar practices. This highest risk area is only 2,200 feet long and would benefit from the combination of (1) homeowners reducing their individual risk factors (such as those listed above) and (2) the creation of a community defensible zone that extends into the forest at a distance of 200 feet (10 acres). In this zone, the forest should be lightly thinned to remove dead and dying trees, the understory shrubs cut, tree branches pruned to a height of 15 feet or more, and the rubbish hand piled and burned, or chipped. A dirt fire line should be constructed around the perimeter of this fire break.

This area is specifically targeted for the community of Osburn for a number of reasons. First, the predominant direction of fire spread in this region is from the southwest to the northeast meaning that a fire that ignites on the south side of the ridge south of Osburn has the potential to spread in the direction of the community and threaten homes along this edge. Second, this area is



important from the standpoint of being the watershed for the city water supply. Third, a

house fire or community based fire-start near these homes has the potential to burn uphill to this hillside igniting the forest. This mitigation activity has the potential to reduce the risk of fire casualty loss.

## Silverton



Silverton is located between Osburn and Wallace on the north side of I-90. This small community is home to the historic Wallace Ranger District headquarters of the US Forest Service. It is also a community nestled into the embrace of the forest. This woodland-embrace has served to increase specific risk factors for the residents of this community as many homes are at

high risk to wildfire loss. The entire perimeter of the community, with the exception of those structures within a few hundred feet of I-90 are at risk.

Additionally, the forestlands beyond the immediate community boundary have some risk factors that include reduced forest health, limited access (and thus the only escape route for residents is to the interstate), and steep slopes which could aid forest fire rates of spread.

Within the community, residents should reduce individual home site



risk factors such as: stack firewood away from flammable structures, eliminate tall and cured grasses next to structures, remove dead and dying trees from the immediate location of structures, and thin and prune healthy trees around homes.



The entire community should have a defensible zone constructed around it that provides a fire break to prevent the movement of a fire between the forest and the homes. Although this community is rather concentrated into less than a square mile, the entire perimeter would benefit from a fire break extending at a 200 foot width for a total distance of 9,500 feet (excluding the southern boundary where the interstate is located). This would represent a total of almost 44 acres of treatment. Although this is extensive, the fire break would be able to take advantage of natural fuel breaks, openings and fields, and roadways. In addition, the fuel break would not have to be a drastic treatment as the treated area would concentrate on removing ground fuels, pruning trees, piling and disposing of the debris through chipping or burning. The outer perimeter would need a dirt fire line constructed.

Beyond the borders of the community and this community defensible zone, the federal land managers responsible for the management of these adjoining lands should consider forest management activities on the surrounding hillsides targeted at improving forest health and reducing fire risk to this community and those surrounding it.

## Sunnyslope & Terror Gulch

The community of Sunnyslope holds a singular distinction as being one of the few communities in this county built above the valley floor. Although this real estate provides scenic views of the surrounding landscape, it also provides increased risk of wildfire loss from fires igniting below the community that spread uphill. Access to this area is provided through Terror Gulch where over 40



structures are located. The access to Sunnyslope and to the homes in Terror Gulch is short (less than a mile), and not at high risk to wildfire.



However, the lands on the west side of Terror Gulch represent some degree of risk as past forest management activities in this area have left logging debris and brush fields that if ignited could provide embers and firebrands that would ignite dry fuels surrounding these homes. In addition, the private lands where the debris was created has roads that would be difficult for forest

fire fighting equipment to traverse in order to access the BLM and US Forest Service lands that are located to the west and north of this parcel. The roadway is partially eroded from inadequate drainage structures, it is narrow—suitable only for a pickup truck, and has many tight turns with limited turnouts. This road is a prime access point to fight wildfires that are located in 8 square miles to the north of I-90. Any fire in this

location would likely threaten homes in Terror Gulch and Sunnyslope. Because of these factors, it is highly recommended that the US Forest Service, the BLM, and the private landowner cooperate to improve the running surface of this road so that it can be used reliably in the case of a wildfire.

The homeowners in Terror Gulch are mostly located near the stream with access provided across single family bridges. These bridges should be evaluated and rated with weight limits posted on the bridges and kept on record at the county fire district 1 office and the IDL Cataldo office. These homes are at a low to moderate fire risk with the exception of the need for defensible zones around each home.

In the community of Sunnyslope, the risk factors are generally moderate. The forest surrounding this community is dominated by young ponderosa pine with an understory of grasses and forbs. While most of the homes are surrounded by a 'green buffer' of lawns or paved road surfaces, some are placed in a sea of branches and shrubs. A defensible



zone around this community would be created by pruning the forests surrounding the perimeter of the homes on the outer ring of the neighborhood.

The few homes surrounded by flammable materials on all sides would benefit from the obvious treatments of a defensible space, improved access, and reduced home



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## Pinehurst

### Fuels Assessment

#### **Areas within the one mile of home sites:**

Pinehurst is located just 4 miles inside the western boundary of Shoshone County. This community is one of only two that has fairly flat terrain, gentle slopes, and a dispersed neighborhood of homes (Kingston being the other). The forests in this area are a mixture of ponderosa pine, Douglas-fir, and western larch, with wetter site tree species scattered where the site has more moisture and are north or east facing. Fire behavior fuel model 2, is common in this area. These forests experience fire spread primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to litter and dead-down stemwood from the open shrubs and tree branches contribute to the intensity.

The homes in this community are concentrated around the downtown area, south of the golf course, and up pine creek. The groups of structures to the west of Pinehurst will be included in the discussions about Kingston.

#### **Areas within 3 miles of the community center, but outside the one mile home zone:**

Private, BLM, and US Forest Service owners are well represented in this region. However, unlike most of the I-90 corridor, these properties are not bounded by the high ridges common to this area. Slowly climbing river valleys dominate. The management on these parcels is highly varied with some parcels showing evidence of helicopter logging with slash on the



ground, to one particular parcel managed by the BLM that showcases exemplary management for reducing fire risk in the wildland-urban interface. This parcel located near Pine Creek (W½ NW¼, S31, T48N, R2E) was initially targeted as one of the parcels at high risk to rapid fire spread. But a thinning from below, debris removal, machine piling, and preparation of pile burning this fall (2002) has reduced the fire risk dramatically. This type of management should be considered around the county in areas where fire risk is high.



### **Community Risk Assessment**

Pinehurst reported a population of 1,722 residents during the 2000 census, earning it the distinction as the second largest community in the county. When considering an area 1.25 miles beyond the city center, there are approximately 724 structures to be found. However, the downtown area is not considered to be at-risk to wildfire. The structures along the community perimeter, and scattered in the river drainages, on the hillsides, and in the forest total 269 structures and are at high-risk to wildfire loss.

This area receives rural fire protection from Shoshone County Fire District 2 with a station in Pinehurst. Wildland fire protection is provided by the Idaho Department of Lands with an office in nearby Cataldo.

The discussions of risk abatement will address each sub-community.

## **Pinehurst–downtown area**

The downtown area of Pinehurst is complimented with many large trees, mostly ponderosa pine. Homes are concentrated into a continuous block with the outer perimeter directly flanking forest trees. While some of these trees are young, most are mature with a continuous underbrush layer. To further complicate matters, many of the outer perimeter homes show risk factors such as wooden decks, firewood stacked against the homes, cured and tall grasses near the homes, and other items.



As with many communities in the county, Pinehurst will benefit greatly from the creation of a community fire break. This fire break will be most effective along the southern

border of the community. This 1,800 foot long fire break should thin out the standing trees, prune the leave trees, and dispose of the accumulated slash in the zone for a distance of 250 feet with a dirt line firebreak along the outer perimeter (10 acres). The western side of the community is flanked by Pine Creek and has ample hardwoods and wet site shrubs to provide a suitable fire break in all except the most extreme drought years.



## **Fairview Ave**

Fairview Ave accesses a small area (including Camas St and Underwood Ave–east side of

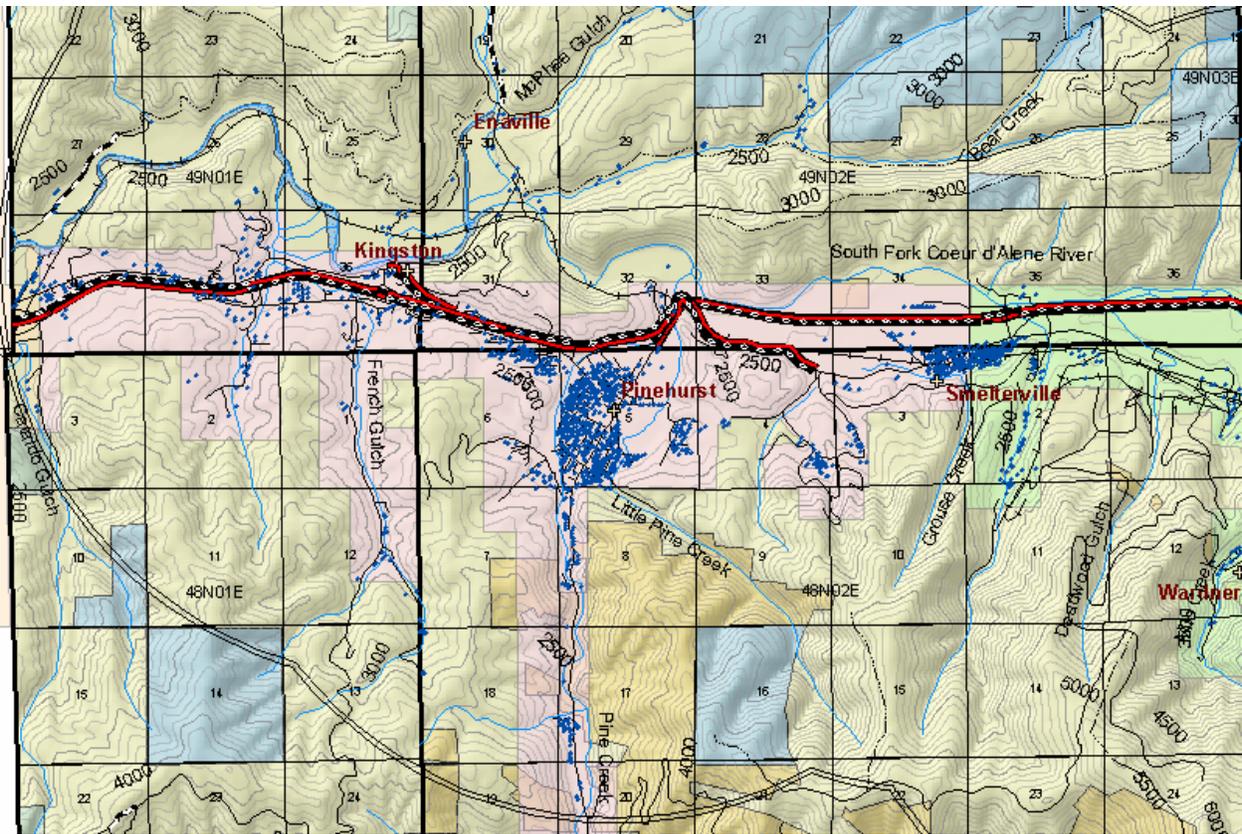
Pinehurst) where just over a dozen homes are located. These homes are surrounded by tall shrubs, forbs, and grasses, and mature trees. In addition, the majority of these homes exhibit risk factors such as firewood stacked on wooden decks against wood siding. Some have cedar shake roofs, and most are at high risk to wildfire loss. It is highly recommended that these homeowners reduce specific risk factors around their own homes and that a community fire break be created around the sub-community. The firebreak would be shaped like a horseshoe (open to the west) and be approximately 1,900 log and 200 foot wide (8.7 acres).

### **Country Club Lane**

Country Club Lane crosses Little Pine Creek to access an area with a couple dozen homes. The fire fuels within the community are generally controlled as most of the residents keep green lawns and trimmed bushes around their homes. However, it is the perimeter of this neighborhood that provides concern from a fire control standpoint. Many of the outer perimeter homes are shrouded by tall trees, thick shrubs, and at-risk factors common in other communities. Residents on the perimeter should be encouraged to reduce specific site risk factors. A community buffer zone should be created that encompasses the entire vicinity. The outer perimeter would



begin on Hilcrest Drive and continue around the homes at a distance of 250 feet for 2,800 feet ending at the eastern extent of Country Club Lane (16 acres). In this zone, trees should be pruned, forest litter piled and dead or dying trees removed. Debris should be chipped or piled and or burned. The outer perimeter of the fire break should be marked with a dirt line firebreak.



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## Prichard, Eagle, Murray

### Fuels Assessment

#### Areas within the one mile of home sites:

All communities in this area are characterized as mostly flat river bottom land which transitions to steep, timbered slopes past home sites. Forest fuels are fairly homogenous throughout the area even though topography is mixed.



Land along the river bottoms is mostly privately owned and is the location of almost all homes in the area. Fire fuels

in this area differ mostly in the amount of grasses and shrubs present. In all areas, the lighter fuels transition quickly to mature or over mature timber with a closed canopy. Where the canopy is open, ladder fuels are present to take fire into the crowns.

There seems to be two differences in the area that are apparent—where structures are located in regard to fuels and slopes. A few structures are surrounded by large

expanses of fields or grassy meadows.

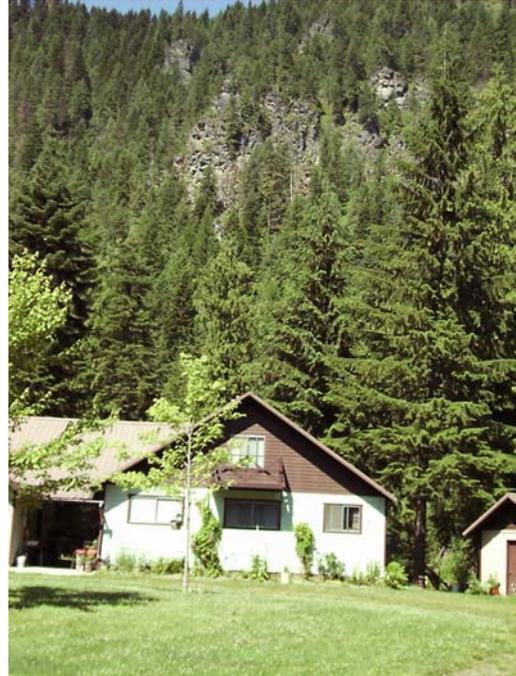
These are located in the lower most portions of the three mile radius from Prichard in the main river canyon and also in the Eagle Creek drainage.

These areas have large green belts surrounding structures and may be fairly defensible from fire. Most areas, however, have structures that are surrounded by timber or may even be



beneath the tree canopy. Structures also are built right up to or against the steep slopes. Timber throughout the area grows right down to or into the valley bottoms.

Timbered fuels almost universally are mature or over mature, close canopied mixed conifer with a heavy down component and much timber litter. On north slopes and in valley bottoms there is a cedar component as well. Only where residential or logging activity has occurred is there less fuel to support ground fire. In the few places where valley bottoms are open fields, the fire fuel model would be characterized as a 2. Fire would spread primarily through the grassy fuels as a surface fire but could provide rapid rates of spread, particularly when cured and/or in windy conditions. If not stopped quickly, fires can transition into timbered fuels. This fuel would be



characterized as a fuel model 10. This fuel supports a more intense fire and could include individual tree torching, crowning, and spotting. Because of the steepness of the canyons, structures adjacent to or within the timbered canopy would be at great risk should a crown fire occur.



The forests surrounding Murray have slightly different characteristics than the forests surrounding Eagle and Prichard. This community is located in a slightly higher elevation, with little to no open field zone. The forests have a closed canopy, with a component of dead or dying timber present. The forests immediately outside the community is steep slope Douglas-fir

forests. Some of these areas have been commercially thinned, others have not. Fire fuels models are 8 and 10, at 60% and 40% respectively.



## Community Risk Assessment

### Murray

The census of 2000 estimates that there were 100 residents living in Murray during 2000. There are approximately 65 buildings located around the community of Murray. All of these buildings are considered at high-risk to wildfire loss in the event of a wildfire. The Murray–Prichard Volunteer Fire Department has a station with 3 volunteers located in Murray to provide rural fire protection. Wildfire protection is provided by the US Forest Service.

The homes are highly concentrated in the community of Murray. The forests surrounding Murray to the north have been managed to differing degrees with a mixture of young and older forests. Forest health issues have been prevalent in this area creating a large component of dead or dying trees surrounding the community. A



community buffer zone where forest fire fuels are removed and a fire line is created will serve to greatly reduce the risk of casualty loss of homes in the event of a wildfire. This buffer zone would extend approximately 3,500 feet from the east side of the community to the west side and extend 250 feet from the main street, north (20 acres). In this zone, the removal of shrubs and ladder fuels should be a priority, with debris piled and burned. A fire line around the perimeter should be created. Because of the forest habitat type and aspect, this community buffer zone will have to be maintained into the future with periodic slashing of the shrubs and tree growth that will re-sprout after treatment. This should be evaluated every 5 years.

In addition, US Forest Service Development Road 939 begins in the center of the community and extends in a northeasterly direction into the forestlands surrounding this community. There is a locked gate preventing access to this property. In the event of a forest fire in this area access may be delayed because of this locked gate. The community should determine if access to the key to this gate is readily available in the case of an emergency.

Finally, many of the homes in this community are at high risk to fire spread because of individually created risk factors such as firewood stacked against homes, dry grasses and shrubs against structures, tires piled against homes, and needles or leaves on roofs. All of these factors and others combine to increase the chance that individual homes will ignite in the event of a wildfire that creates flying embers or spreads along the ground through cured grasses or shrubs. Individual home sites should be managed to reduce this risk.

### **Prichard & Eagle**

Although the census of 2000 reports that there were only 20 individuals living in Prichard during 2000, this number does not represent the high number of recreational homes and the many individuals that receive their mail in other locale (and were therefore attributed to a different community). The actual number of homes is considered to be many more than the census reported. There are approximately 164 structures within 3.25 miles of Prichard. These buildings are located primarily along the

Coeur d'Alene River bottom, near paved roads. However, these building sites are also surrounded by dense forests with a high propensity for fire ignition and rapid fire spread. All of these buildings are at high-risk to wildfire loss in the event of a wildfire in the region. The estimate of the number of buildings in this community includes those of Eagle. The Murray–Prichard Volunteer Fire Department has a station in Prichard and a station in Murray to provide rural fire protection. Wildfire protection is provided by the US Forest Service.



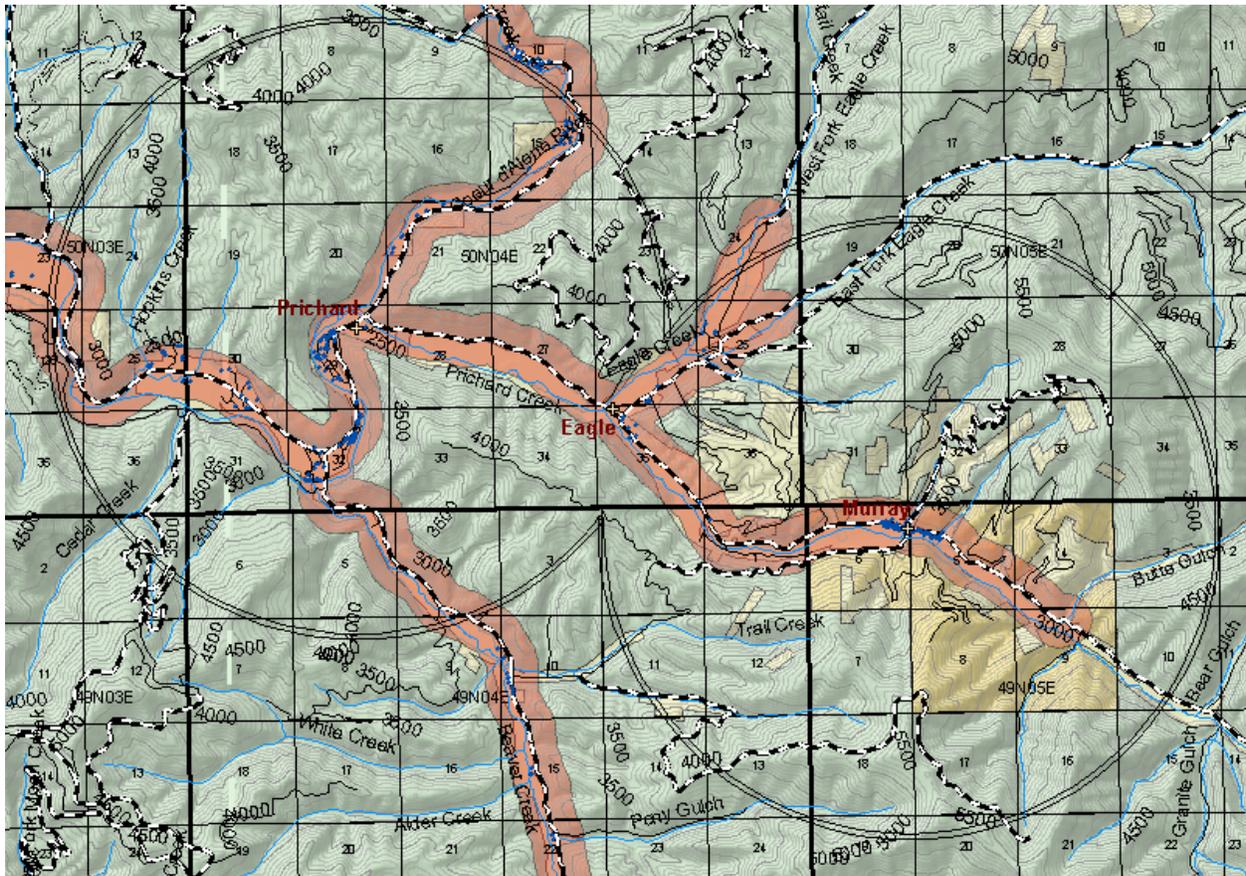
The homes of this region are at a high degree of risk because many of them are located in the forest, with tree canopies overhanging roof tops. Where homes are in openings, these openings are surrounded by forests. While the forests of this area are scenic, they are also a location surrounded by forest health issues that have created a significant component of dead and dying trees. These trees will serve to increase the fire intensity in the event of a fire ignition in the region.

It is the strong recommendation that each sub-community in this area create home defensible spaces that include the removal of understory shrubs and grasses while thinning and pruning trees within 150 feet of individual home sites. Community buffer zones will be increasingly difficult to create because of the difficult terrain and the influences of the North Fork of the Coeur d'Alene River.

Access in this area is provided by numerous paved roads that will serve as evacuation routes in all cardinal directions. However, because of the high amount of recreational use this area experiences, it is doubtful that all visitors in the area will know of these evacuation routes in the event of a wildfire, therefore, these routes should be clearly marked with signs. Access to a few homes in this area is provided by a bridge that

spans the North Fork of the Coeur d'Alene River (Section 16). The weight capacity of this bridge is unknown and should be evaluated and posted as soon as possible.

The homes in the community of Eagle have only a minor risk rating because of the cattle grazing surrounding the homes that keeps the grasses light and because of the forest management activities in this area. No modification activities are recommended in this area.



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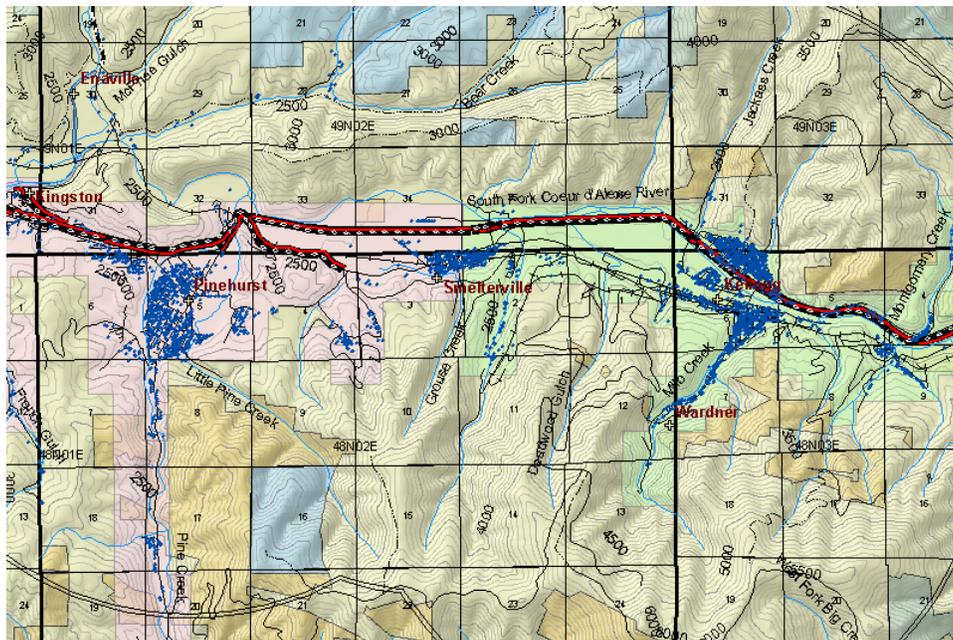
# Smelterville

## Fuels Assessment

The area around Smelterville is a superfund clean up site where forest vegetation is sparse and wildfire risk is the low.

## Community Risk Assessment

Smelterville had a population of 464 individuals reported during the 2000 census. This is a small community with a concentration of buildings near the community center, and a dispersion of structures in the surrounding hillsides, and at the airport. There are approximately 369 structures within 1.25 miles of the community center. The outlying structures (averaging 0.5 miles beyond the city center) are at moderate risk to wildfire loss. There are approximately 130 structures in this moderate-risk zone. Many of these structures are associated with mining. Rural fire protection for Smelterville is provided by Shoshone County Fire District 2 with stations in Pinehurst and Kellogg. The boundary between the two districts divides the community in half. Wildfire protection services are provided by the Idaho Department of Lands in Cataldo.



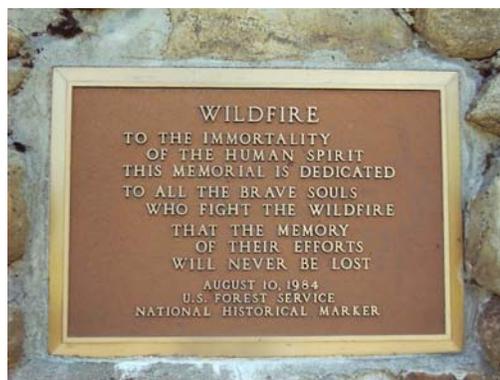
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## Wallace

### Fuels Assessment

#### Areas within the one mile of home sites:

Wallace has a long history with wildland fires. During 1910, a portion of the community fell to wildfire. Property and lives were lost; a monument to Edward Pulaski's crew and six fallen firefighters is memorialized along Placer Creek south of Wallace. Today, Wallace is the County Seat and home to over 1,000 people. However, the forests that previously provided the fuel to threaten the community have grown back to once again give cause for concern to the community's residents.



North of the South Fork of the Coeur d'Alene River valley, south-facing hillsides still bear the scars of the 1910 and subsequent wildfires. Forest vegetation has been slow to reclaim these sites leaving scattered trees, little underbrush, and only dotted evidence of a duff layer. Although this is a remainder of the catastrophe the region experienced long ago, it provides a natural buffer against a wildfire that might occur today. These areas are not at risk to wildfire spread and should receive little in the way of fuel mitigation efforts.

North and east of Wallace lay the Canyon Creek Drainage and the Nine Mile Drainage. While these areas are both within the boundary of Wallace, the fuels treatment recommendations are detailed in separate sections of this document.

The south side of the Coeur d'Alene River is forested with a diversity of tree species where the forest health is generally good with a few isolated exceptions. These forests are young, with a developing shrub layer that is not a high concern at this time for wildfire spread, except in the south-hill area of Wallace which will be detailed in the following pages.

**Areas within 3 miles of the community center, but outside the one mile home zone:**

The land south of Wallace to the 3 mile buffer perimeter is a checker-board of ownerships including the US Forest Service, the BLM, the state of Idaho, and private owners. Public access is provided on the Placer Creek road (USFS road #456). Various forest health conditions and use patterns have united to create a moderate to high fire danger in this drainage. Concerns in this area include what appears to be evidence of a wind downburst that recently ripped off tree tops in one sub-drainage, and insect and disease problems scattered through the valley. Recreational access has increased in recent decades using this access road which feeds numerous recreational trails for all terrain vehicles.



Forests in this area bare the scars of past fires with the surrounding forests dominated by Douglas-fir, ponderosa pine, western larch, grand fir, and other species. The slopes are predominately south facing from the Placer Creek Road. This area is at moderate to high risk for possible wildfire ignition and spread because of the forest fuels, the southerly aspect, the potential for lightning

strikes, and the potential for ignition from human causes. These factors are coupled with the juxtaposition of this area to the communities along the eastern side of the I-90 corridor which lie in the direction of the likely spread of a fire in this valley.

A running-fire-break extending from the Placer Creek Road at a distance of 150 feet on both sides of the road from the edge of the BLM ownership in Section 3 (T47N R4E), along the road to the summit at Moon Pass (Section 17 T47N R5E) should be created. In this zone, trees should be thinned leaving only scattered fire-resistant (less fire susceptible) mature trees (ponderosa pine & western larch). Logging debris should be piled on the roadside and then burned, shrubs and non-merchantable trees should be cut to the ground and piled for burning. The trees left on site should be pruned to a height of no less than 15 feet. This 8 mile fire break along the road will allow resource managers the ability to hold a fire that starts south of this location and threatens to race up the ridge and then into the I-90 corridor. The resulting 320 foot buffer will allow fire fighters the ability to pre-wet fuels while its presence will serve to reduce human caused ignitions.



A number of areas in this valley have burned in the past creating a mosaic of forest conditions from mature forests to brushy hillsides. The US Forest Service and the BLM should consider if re-burning these brush-fields would provide an opportunity to reforest these areas and reduce the fire risk presented. This valley has been identified as a priority area for Shoshone County because of the

existence of fuels, high amount of recreational access, and threat presented by this valley in the case that a wildfire ignites in this area, spreads to the top of the hill (northeasterly), and then into the I-90 corridor where homes would be threatened. In addition the Placer Creek drainage is a watershed area for the community of Wallace, as detailed in other sections of this document.

## Community Risk Assessment

Wallace had a population of 1,010 reported in the 2000 census. This community has approximately 394 buildings located within 1 mile of the community center. The downtown area is considered at low-risk to wildfire loss, however, the perimeter of the community, especially in the southern edge is at high-risk to loss in the event of a wildfire. Out of the nearly 400 buildings located around this community approximately 164 buildings are considered at high-risk to wildfire loss in the event of a fire in the area. The Shoshone County Fire District №1, with a station located in Wallace, provides fire protection for homes in the city. The Idaho Department of Lands in Cataldo provides wildland fire protection for most of this region.

### South Wallace Hill

The south side of town, east of Placer Creek, climbs up from the flat of the South Fork of the Coeur d'Alene River valley to a steep, forested ridge. Homes have been built on this hillside alongside thick stands of trees and herbaceous shrubs such as ninebark, ocean spray, snowberry and others. Access to this real estate is provided above these homes only at a distance of 2,500 feet in the private ground. Forest fuels are heavy in places and lighter in others with fuel model 10 dominating the prescription. Residents of this hillside are at risk to losses from a major wildfire and from another home in the community catching fire as a house fire would likely ignite the brush and timber surrounding each house in the community.



These many factors combine to create an increased risk to home safety and resident safety in the case of a wildfire. This area has: thick shrub layer, dense tree layer with branches extending to the ground, limited access provided by a few one-way streets,



tightly packed homes, and is closely situated above the downtown area of Wallace and below inaccessible forestlands. This sub-community is at risk from a structure fire starting in the immediate area of the sub-community, or any area in Wallace, as well as any forest fire starting in the vegetation along this slope. In order to reduce the risk of casualty loss in the event of a fire, this

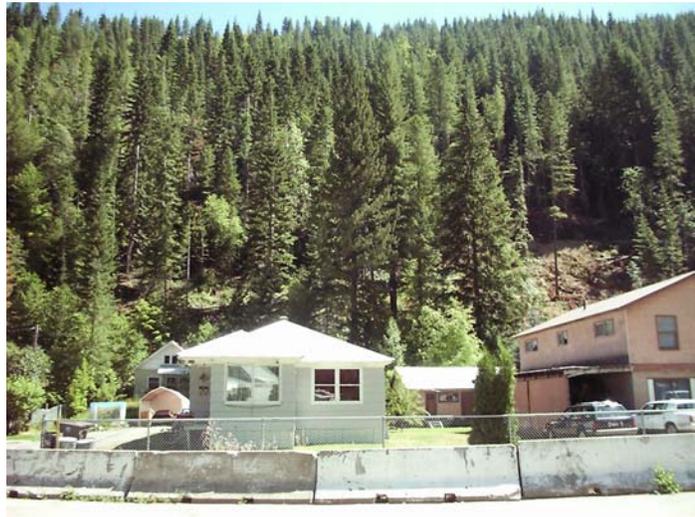
community should consider the implementing the following activities:

- Remove and chip underbrush from the area, and from around the area in a perimeter extending 200 feet up the slope above the community.
- Prune all trees in the area to a height at least 15 feet above the ground or roof tops, whichever is higher.
- Greatly reduce or eliminate parked cars along the main streets as these hinder access by fire fighting equipment.
- Limit or restrict new home construction on this hill until fire access and mitigation needs are met.
- Thin the standing trees above the community to eliminate small diameter trees, leaving about 25 larger trees per acre. Dispose of the slash and debris in this protection zone.
- Maintain this debris free zone into the future, with mitigation evaluation and activities every 5 years.

The area of this treatment is approximately 1,800 east to west and 450 from the north end to the south end, or 18.6 acres. It is the opinion of the evaluation team that this area has homes at the highest risk to potential casualty loss in the event of a house fire or a wildfire, in the entire county.

## Placer Creek area of Wallace

Placer Creek gained notoriety as the locale that Edward Pulaski and his 45 man crew evaded the 1910 wildfire by seeking refuge in a mine shaft until the fire had passed. Although six members of that crew perished, the tale of the leadership that Pulaski exhibited is legendary. Placer creek is important today for a variety of reasons including the location of the Wallace watershed, access to Moon



Pass and other backcountry backdrops, and as a home for many residents of Wallace (near the community).

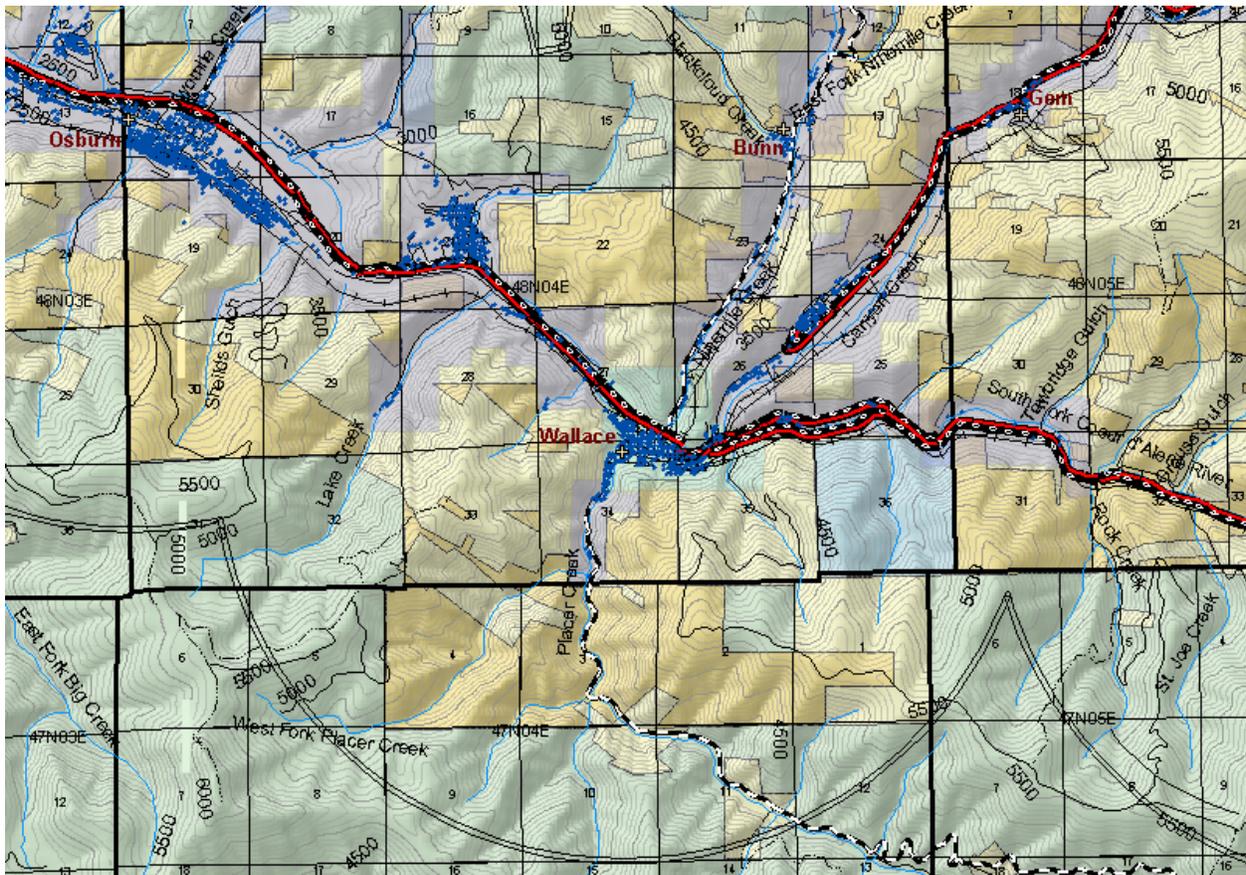
Where Placer Creek and the community of Wallace intersect, many of the homes are afforded excellent access although some are accessed only through bridges. As with the other places in the county, these bridges should be evaluated for weight loads, posted, and information kept on record at the Shoshone County Fire District №1 office.

Limited timber harvesting activities on the east side of Placer Creek, just beyond homes, have removed forest fuels during a logging operation. Logging slash and debris has been left on-site, and at the time of preparing this document it has been learned that the logging slash left on-site will not be treated. This combination of events places the adjoining homes at a very high risk over the next 5 years because of the deep logging slash. In addition, the juxtaposition of this logging debris to the South Hill homes in Wallace places this entire area at very high risk. The evaluation team strongly recommends that the logging slash created during the helicopter logging prior to this evaluation be treated with a broadcast burn in the fall of 2002 or spring of 2003.

This management will accent a sub-community defensible space that we recommend be built around the homes along Placer Creek in Wallace. This sub-community

defensible space should extend from Pearl Street, south and southwesterly 1,400 feet along Placer Creek road to the end of the home sites. The buffer should be 150 feet beyond each home site and include a fire line along the perimeter of the zone. The total area of this zone is approximately 10.5 acres.

The areas adjacent to Placer Creek in the northwestern reaches of Wallace appear to be only at slight to moderate risk to loss from wildfire but would benefit from homeowners along the perimeter of this area creating a community buffer perimeter along the west side of the community extending 150 feet from the outer row of homes.



## **Broad Landscape Level Recommendations**

### **Forest Management Activities:**

While our recommendations for specific communities and neighborhoods will reduce the risk of casualty loss, it must be combined with aggressive, active, forest management activities in the forests that surround these communities to have a substantial impact. Specifically, historic data indicates that fires in this region have spread in a northeasterly direction from their point of ignition. Therefore, the forests southwest of each community for a distance of 5 to 10 miles should be targeted initially to reduce the potential of fire spreading with full force into populated places.

As a separate document, we have prepared a series of silvicultural prescriptions with photographs detailing our recommendations for the managers of rural lands to consider when managing forestlands outside of the rural-urban interface. This region evolved with forest fires. Although the Shoshone County has not experienced a large landscape level fire (20,000+ acres) in the past 70 years, surrounding regions have. The lack of landscape level fires is a credit to the fire fighting agencies in the county. However, it is likely that unless the remote forestlands of this region are aggressively managed to reduce fire risk, that they will burn and take homes with it. We urge the state and federal land managers in this region to address this risk and implement the recommendations in the areas identified.

A large fire ignited south of the Silver Valley would spread by frontal winds toward the valley from the south, like it did in 1910. Landscape treatments south of the Valley could help slow the spread of a large fire and help protect communities. Although the primary threat to the Silver Valley would be from south of I-90, the communities of Prichard, Murray, and Eagle could be threatened by a large fire spread by frontal winds that started north of the Silver Valley. The Beaver Creek and Prichard Creek drainages would be the secondary areas to implement these aggressive landscape treatments.

We feel that the restoration of dry sites that supported ponderosa pine as a seral species should be encouraged on the remote forestlands surrounding the populated

places detailed earlier. Because of 70 years worth of fire suppression efforts, these sites have become overcrowded with tree regeneration and thick shrubs, much of which is of commercial size now. These areas could be returned to a stand structure that would support the low intensity, frequent fire interval that they evolved with. Many of these sites are now outside their historic range of variability, and would support intense crown fires that could threaten homes, no matter how much home defensibility space has been created. Prime areas for this kind of work would be on the north side of the Silver Valley (the south facing slope), and Pine Creek (aptly named).

### **Municipal Watersheds**

The threat of severe fire in the municipal watersheds of the county must to be considered as well. Approximately 7,000 people get their water from the drainages near of the Silver Valley (at Big Creek, McFarren Gulch, Placer Creek, Boulder Creek, and Milo Gulch). Maps of the municipal water supplies in the county have been created showing the locations of ground water and surface water collection points. Beyond the surface water points exist watersheds that contribute to the supply of community drinking water. These are the watersheds that are of highest risk to damage in the event of a wildfire.

A large, severe fire could have major adverse impacts to the water quality in these watersheds, and render the water undrinkable for a period of time. Active management aimed at reducing the potential severity of a fire (taking the fire out of the crowns) could serve as a measure of protection for these watersheds. These treatments could also be placed on the landscape in such a manner to retard the spread of a large fire coming out of the St. Joe River valley.

It is the strong recommendation of this analysis team that the major forestland managers in Shoshone County (US Forest Service, Bureau of Land Management, Idaho Department of Lands) implement aggressive forest management activities in the watersheds they manage that supply domestic water to the communities of this region. These watersheds represent community sustainability. For the part of the communities,

it is recommended that each city in the Silver Valley explore the possibility of diversifying water supplies through the creation of wells such as Pinehurst has done.

Data does not exist currently on the size of the surface watersheds contributing to these points although a cursory look at the areas upstream of the collection points indicates that the areas are large and have fire risk ratings that contain property in the highest categories of risk. We recommend that each surface water collection point used for community distribution have a resource assessment and management plan written. These plans should determine accurately the size and scope of each watershed and specifically assess the fire risk of the forests in these zones using the region's existing growth models and the Fire and Fuels Extension discussed in the next section. This analysis will require a detailed forest inventory and management plan. Once this baseline is established predictions can be made of fire spread rates and crowning potential, and forest management activities can be developed that reduce the potential for a crown fire while maintaining water quality and even improving the timing of the summer water flows. A separate plan for each surface watershed should be developed starting with the East Shoshone County Water District's (Wallace) Placer Creek. Additional watershed management plans should be selected based on the population served (Central Shoshone County Water District collection points next). These plans can play an instrumental role in the overall risk reduction of the region as many of these watersheds are in the zone that a fire would cross to threaten the communities of the county.

The following table details each of the wells and surface water collection points in Shoshone County that are used for public consumption and corresponds to the maps in the document. Data for this information was obtained from the Idaho Department of Water Resources. That office continues to update information and is currently developing new GIS data that will estimate the extent of each watershed used for public consumption. As this project is developed new data from this state office should be sought.

## Ground Water and Surface Water Points in Shoshone County Used for Community Consumption

PWSNO	NAME	SYS_TYPE	SRCE_NAME	SRCE_TYPE	LATITUDE	LONGITUDE	POP
1400005	BABINS TRAILER COURT	Non-community Transient	WELL #1	Groundwater	47.63617	-115.98215	30
1400012	CATALDO WATER DIST	Community	WELL #1	Groundwater	47.55004	-116.323	600
1400016	E SHOSHONE COUNTY WATER DIST BURKE	Community	SAWMILL CREEK	Surface Water	47.52679	-115.79412	100
1400017	E SHOSHONE COUNTY WATER DIST MULLAN	Community	BOULDER CREEK	Surface Water	47.46004	-115.79563	821
1400017	E SHOSHONE COUNTY WATER DIST MULLAN EAST SHOSHONE COUNTY WATER DIST	Community	MILL CREEK	Surface Water	47.48584	-115.79985	821
1400019	WALLACE	Community	PLACER CREEK	Surface Water	47.4457	-115.93537	2040
1400021	CLARKIA WATER AND SEWER DIST	Community	WELL #1	Groundwater	47.00419	-116.25774	75
1400024	GENE DAY PARK SHOSHONE COUNTY	Non-community Transient	WELL	Groundwater	47.51521	-116.03261	25
1400032	LEISURE ACRES TRAILER COURT	Community	WELL #1	Groundwater	47.51233	-116.02978	180
1400035	M AND H TRAILER PARK	Community	WELL #1	Groundwater	47.49265	-115.9642	45
1400036	MARBLE CREEK SERVICE	Non-community Transient	WELL #1	Groundwater	47.2505	-116.02669	50
1400039	MURRAY WATER WORKS	Community	ALDER CREEK	Surface Water	47.6365	-115.85191	34
1400039	MURRAY WATER WORKS	Community	WELL	Groundwater	47.62755	-115.85875	34
1400041	PINEHURST WATER DIST	Community	WELL #1	Groundwater	47.53312	-116.23851	2000
1400041	PINEHURST WATER DIST	Community	WELL #2	Groundwater	47.53312	-116.23851	2000
1400042	PRICHARD TAVERN	Non-community Transient	WELL #1	Groundwater	47.65636	-115.97033	25
1400047	SUNNY ACRES	Community	WELL #1	Groundwater	47.50452	-116.0813	25
1400049	SUNNYSLOPE SUBD	Community	WELL #1	Groundwater	47.51116	-116.01877	150
1400050	SUNSHINE PRECIOUS METALS INC	Non-community Non-transient	BIG CREEK #1	Surface Water	47.49247	-116.06984	320
1400059	USFS BIG HANK CAMPGROUND EAST	Non-community Transient	WELL #1	Groundwater	47.82382	-116.10086	25
1400089	CENTRAL SHOSHONE COUNTY WATER DIST	Community	MILO CREEK	Surface Water	47.51013	-116.14327	4052
1400089	CENTRAL SHOSHONE COUNTY WATER DIST	Community	SHIELDS CREEK	Surface Water	47.54158	-116.04931	4052
1400089	CENTRAL SHOSHONE COUNTY WATER DIST	Community	ENAVILLE WELL	GWUDI	47.55868	-116.25731	4052
1400089	CENTRAL SHOSHONE COUNTY WATER DIST	Community	BIG CREEK	Surface Water	47.48745	-116.06391	4052
1400091	USFS MARBLE CREEK INTERPRETATIVE SITE	Non-community Transient	WELL	Groundwater	47.24932	-116.02121	54

See attached maps for point locations

## **Fire Behavior:**

During a forest fire, the fire can be maintained at two levels: a ground fire, and a crown fire. Ground fires are easier to control because the heat of the fire is concentrated at ground level, burning slash, debris, and trees within ten feet of the ground. Ground fires are generally low intensity fires which cause less resource damage. Fire breaks and water can often times control this type of fire while the fire is still relatively small. A crown fire occurs when winds blow the fire into ladder fuels that are able to carry a ground fire into low branches of trees, up the crowns to taller trees, and into the crowns of the overstory. Once in the crowns of the dominant trees the fire moves rapidly through a stand, up slopes, and engulfs entire watersheds. Crown fires are moderate to high intensity fires generally causing significant resource damage and loss. These are the fire scenes played on the evening news with 100 foot flame lengths that destroy communities and forests in their path. These fires are the most dangerous because fire suppression activities have minimal effect in controlling the fire.

In order for a ground fire to make the transition to a crown fire, many conditions must be present: ground fuels to carry the heat of the fire and ladder fuels to carry the fire into the crown. Heavy fuel loading both vertically and horizontally is provided by a continuous canopy of fuel, dead standing trees or snags provide an added fuel source, while dry conditions and wind all combine to make conditions prime for an intense wildfire. Many of these conditions are present in the forests of Shoshone County during the summer season.

Fiedler *et al.* (2001) from the University of Montana recently published findings of research completed on the forests of Montana where they assessed the fire hazard of that state as a function of wind speed using an extension to the Forest Vegetation Simulator. Potential fire hazard can be analyzed using the Fire and Fuels Extension (FFE; Beukema *et al.* 2002, Scott and Reinhardt 2001) to the Forest Vegetation Simulator (FVS; Stage 1973, Crookston 1990, Van Dyck 2000). This model (extension) estimates crown fire hazard based on tree, stand, and site characteristics, and expresses fire hazard/effects in terms of Crowning Index, Torching Index, and Basal Area Mortality.

Crowning Index, defined as the wind speed necessary for a fire that reaches the canopy to continue as a crown fire, is the primary variable used to report hazard in the high risk areas defined earlier. The highest-hazard forest conditions possess a Crowning Index less than 25 mph of wind speed, moderate hazard from 25 to 50 mph, and low hazard as those stands which can withstand a 50 mph wind during a fire and still not spread through the crowns. The Crowning Index should be calculated for each high risk area, and sorted by various combinations of forest type, density, structure, region, and ownership to display fire hazard by the categories of interest. In addition, the FVS model can be used to project forest conditions every 10 years for 30 years into the future (i.e., from 2002 to 2032) to allow managers to determine the longevity of fire risk mitigation efforts.

By manipulating stand conditions through selective thinning, we will be able to determine which trees should be removed in order to improve forest health while reducing the risk that a ground fire will spread into a crown fire and continue to spread in the crowns of trees. Once the management prescriptions are determined on a stand-by-stand basis, they can be implemented on the forest site in an effort to reduce the risk in these fire prone areas. This analysis should be conducted on those forestlands beyond the 1-mile building buffer zone to a distance of 10 miles where fire spread risks are the greatest. Using this data, detailed and targeted fuels management prescriptions can be refined.

### **Access and Escape:**

In some areas, neither fuels management nor stand management will significantly affect the potential that an area will burn during a wildfire. In all areas of the county we recommend improving access where it is limiting through road widening, creating access loops and turnouts for fire fighting equipment, building fire breaks along strategic landscape features, and in some cases building new roads or opening closed roads. These efforts should be coupled with defining better escape routes for residents for the affected communities and working with wildland fire fighting agencies to identify these highest risk areas.

All communities should have an escape route identified and well marked. These signs should clearly indicate where local residents should flee in the event of an emergency where the primary escape route is compromised. Printed escape route maps should be created and made available to local residents through the libraries, at the fire departments (rural and wildland), and even mailed to local citizens with other county mail.

Bridges in the county have been addressed in the discussions of the communities. In summary, all of the bridges that may be crossed by heavy fire fighting equipment (full tanks full of water) should be evaluated for maximum load limits. These bridges should be posted with the results kept on file at the rural fire fighting offices and the wildland fire fighting offices. Residents living behind limiting structures should be notified of deficiencies. Efforts to improve or replace defective crossings should be evaluated.



The same recommendation is given for cattle guards. Some of the structures observed in the county could not support a wildland fire truck heavy with water, while some of the others were too narrow to allow wide vehicles to pass. These structures should be evaluated, the results posted on the structure,



delivered to the landowner, and kept on file at the fire department offices (rural and wildland).

### **Community Education & County Administration**

Leadership for organizing community education and county policy in matters regarding fire mitigation should be administered by the County Commissioners office. That office has demonstrated outstanding leadership in the development of this plan and efforts relating to implementing recommendations. We believe that it is in the best interest of the county to integrate many efforts together in order to make a real impact on reducing the potential for casualty loss in the wildland–urban interface. Specifically, we recommend the following activities:

- Maintain strong fire prevention programs
- Sponsor homeowner “Firewise” and “Landscaping for Fire Prevention” education workshops
- Ensure all agencies and districts are prepared for a wildland-urban fire incident, with proper training, equipment, communications and pre-planning
- Develop a bridge inspection and signing program; require signing of the bridge capacity
- Encourage utility companies to install underground lines and actively maintain overhead lines
- Develop a county-wide incident plan that covers evacuation routes, safe zones, inter-agency responsibilities, possible Incident Command Post locations, etc.
- Encourage or legislate the use of fire safe building materials
- Coordinate mitigation efforts between landowners (private and government)

Education of people about risk factors in the wildland–urban interface can be coordinated with the University of Idaho Cooperative Extension System. Although the U of I CES does not have an office in Shoshone County, the Area Extension Educator–Forestry, located in Coeur d’Alene does landowner education in natural resources in Shoshone County and surrounding counties. The 2002–2003 stewardship education program published by the U of I CES offers “Landscaping for Fire Prevention” workshops on a request basis (as part of the Forest Stewardship program). The materials and training offered as part of this 2-3 hour program are appropriate for beginning the process of working with homeowners in Shoshone County. In addition, this type of training is consistent with the rural homeowner survey results indicating that approximately 70% of the households would be interested in attending a free, or low cost, one-day training seminar designed to teach homeowners in the rural–urban interface how to improve the defensible space surrounding their home and adjacent outbuildings. Requests for this training should be made to:

Chris Schnepf  
Area Extension Educator–Forestry  
Kootenai County Cooperative Extension Office  
106 E. Dalton Avenue  
Coeur d’Alene, ID 83815-7333  
(208) 667-6426

In addition, the county should consider a closer relationship with the Student Conservation Association, Fire Education Corps. This group was located in Coeur d’Alene during the summer of 2002 and made site visits in Shoshone County. Their work is perfectly in line with the recommendations of this document and should be sought in 2003 and beyond.

## **Summary of Risk & Project Areas**

Although each specific community in the county has been assessed for fire risk and recommendations have been made on specific projects to implement, it will be useful to reference this summary table of potential project locations. Individual maps of project areas have been created with an ID number printed in it to identify the project number. Refer to the following table for details on that project and Refer to the documents in the appendix titled “DESCRIPTION OF FUELS MANAGEMENT SERVICES FOR TREATING VEGETATION TO REDUCE THE RISK OF WILDLAND FIRES” for treatment descriptions and cost information. This information is a summary of activities and will need refining as the actual projects are implemented.

## Fire Mitigation Project Locations

ID	Risk Factor	Loss Potential	Perimeter (meters)	Acres	Hectares	Township Range Section(s)	Project Types
1	High	Low	26,831.1	301.6	122.0	T50NR03ES23, 24, 25, 26 T50NR04ES19, 29, 30, 31,	F3, M11-M16
2	High	Moderate	35,125.9	709.1	287.0	32	E5, H3, J3-J4, N4-N8
3	High	High	12,037.3	172.0	69.6	T50NR04ES29	E5, H3, J3-J4, N4-N8
4	Moderate	Moderate	15,889.4	292.1	118.2	T50NR04ES15	E4-E5, H1, J3-J4, N2
5	High	Moderate	15,108.6	272.1	110.1	T50NR04ES10	E4-E5, H1, J3-J4, N2
6	High	High	15,423.8	162.7	65.9	T49NR05ES5, 6	E4-E5, H1, J3-J4, N2
7	High	High	3,296.8	13.7	5.5	T48NR05ES35	D3, E5, F2, H2, J3, N2
8	Moderate	High	3,785.7	15.2	6.2	T48NR05ES34	E4-E5, H1, J3-J4, N2
9	High	High	3,589.9	17.6	7.1	T48NR05ES34	D3, E5, F2, H2, J3, N2
10	Moderate	Moderate	7,883.0	32.4	13.1	T48NR05ES34, 35	E4, H3, N3
11	High	High	13,059.6	113.4	45.9	T49NR04ES34, 35	D2-D3, E3, F3, H4, J4, N9, R8
12	High	Moderate	8,675.1	94.8	38.4	T49NR04ES34 47N4ES3,10-	E4, H2, N2
13	High	Moderate	52,769.2	442.0	178.9	13,5ES7,16,17	E4, F3, H2, N2
14	Moderate	High	21,364.8	125.0	50.6	T48NR04ES21	E4, H2, N2
15	Moderate	High	4,874.7	12.2	4.9	T48NR04ES18	E4, H2, N2
16	High	High	12,891.7	90.3	36.5	T48NR03ES12, 13	E4, H2, N2 E4, H2, N2 and various stand modifications
17	High	High	55,039.4	1,950.9	789.5	T48NR004E & T48NR05E	
18	Moderate	Moderate	4,563.6	9.3	3.8	T48NR02ES5	E4, H2, N2
19	Moderate	High	13,738.5	112.8	45.6	T48NR02ES8	E4, F3, H2, N2
20	Moderate	High	13,377.7	71.8	29.0	T48NR02ES4, 5	E4, H2, N2
21	High	High	7,544.0	42.1	17.1	T45NR05ES15	D2-D3, E3, F3, H4, J4, N9, R8

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# **Appendix I**

## **Resident Survey**

July 1, 2002

<Name>  
<Address>  
<City>, <State> <Zip>  
<Telephone>

Dear Shoshone County Resident:

Thank you for taking ten minutes of your time to read and respond to this short inquiry. We are working with the Shoshone County Commissioner's Office and organizations in Shoshone County to develop a wildland fire mitigation plan in your area. As an individual who owns rural land in Shoshone County, you know that the urban-rural interface is at very high risk to casualty loss due to forest fires. We all witnessed the fires in 2000 that ravaged western Montana and Central Idaho. This year's fire season started aggressively in Colorado, Arizona, and New Mexico. We will all be watching Northern Idaho closely as the season progresses.

However, we are doing more than watching for fires this year, we are taking a proactive role in reducing fire starts and mitigating wildland fire caused casualty loss in your area. We are inviting you to take a proactive role as well.

We are developing improved predictive models of where fires are likely to ignite, locating and identifying high risk landscape characteristics, advancing improved forest management practices to reduce fire rate-of-spread on federal, state, and private lands, and working with rural landowners to create defensible zones around homes and buildings so that fires are controlled BEFORE they take your valuable possessions. It is the last of these goals that we need your help with.

We would like you to complete the attached survey about your home's defensible space in the case of forest fire. Your responses will be kept completely confidential and released only in aggregated form. This questionnaire will allow us to identify key criteria that may place your home and the homes of your neighbors at the greatest risk. We will use this information to develop mitigation activities that may lead to saving your home and the community you live in.

We have sent this letter and survey to only a select number of people in Shoshone County. Because of this, your response is very important to our efforts and the application of our findings to your home, your community, and Shoshone County. Please take a few minutes to complete the enclosed survey and return it to us in the self addressed envelope.

If you would like to learn more about this project, you can log on to our Internet site at <http://www.Shoshone-fire-plan.org/>.

We would like to thank you for your assistance on this project with a small token of appreciation. During the development of this project, we are completing some very advanced mapping of Shoshone County. We have created detailed maps showing roads, rivers, elevation, property ownership categories, fire risk areas, potential fire ignition locations, plant cover characteristics, and even ortho-photo coverage (black and white images taken from space) with features over them. These maps are printed at 8.5 x 11 sizes. If you give us your property's legal land description, we will make a high resolution map of your property and send it to you. When you complete your survey, please mark which map coverage you would like, and we will custom color print this map for you and send it at no charge. It is our way of thanking you for your input to this very important project.

We will be holding a series of public meetings in Shoshone County this summer and will invite you specifically to attend one closest to your home. By the end of the summer, we will have a wildland fire mitigation plan written for Shoshone County. Copies of the draft plan, and by the end of the project, the final plan, will be made available for review on the Internet site referenced above.

Thank you for your assistance on this project, I hope we will have a chance to meet face-to-face very soon. If you have any questions about this project or this survey please contact me at the Northwest Management, Inc., office in Moscow, Idaho, at 208-883-4488.

Sincerely,

William E. Schlosser, Ph.D.  
Project Manager, Shoshone County Fire Mitigation Plan  
Northwest Management, Inc.

## Wildland Fire Mitigation Plan

### Public Survey

1. How many acres of land do you own in Shoshone County? \_\_\_\_\_
2. How many acres of this land are covered with trees (forested)? \_\_\_\_\_
3. What type of roof does your home have (please mark one):
  - Composite
  - Wooden shake (shingles)
  - Ceramic tiles
  - Aluminum or other metal
  - Other (please indicate: \_\_\_\_\_)
4. How many trees are within 250 feet of your home?
  - None
  - less than 10
  - Between 10 and 25
  - More than 25
5. How many trees are within 75 feet of your home?
  - None
  - less than 10
  - Between 10 and 25
  - More than 25
6. Do you have a lawn surrounding your home?
  - No
  - Yes, if yes is it kept green and trimmed all summer?
    - No
    - Yes
7. How long is your driveway, from the main road to your parking area? Please indicate distance units in feet or miles.  
\_\_\_\_\_
8. If your driveway is over ½ mile long, does it have turnouts that would allow two trucks to pass each other?
  - No
  - Yes

9. Please indicate which of the following items you have available at or near your home that could be used in fighting a wildland fire that threatens your home (mark all that apply)
- Hand tools (shovel, pualski, etc.)
  - Portable water tank with a fuel powered water pump and hose
  - Stationery water tank with gravity feed pressure and hose
  - Portable water tank with a fuel powered water pump and hose
  - Pond or lake water supply, with a fuel powered water pump and hose
  - Pond or lake water supply without pumps and hoses
  - Equipment suitable for creating fire breaks (bulldozer, cat, skidder, etc.)
10. Has anyone in your household been trained in basic wildland fire fighting?
- No
  - Yes
11. Has anyone in your household been trained in basic structural fire fighting?
- No
  - Yes
12. Do you conduct a periodic fuels reduction program near your home site such as grass or brush burning?
- No
  - Yes
13. How would you rate your home site's defensibility in the case of a wildfire that threatens your home and adjacent buildings?
- Excellent; very defensible
  - Good; some minor risks
  - Acceptable; if we had time, we could save it
  - Poor; many risks, even with time it would be difficult to save
  - Inadequate; multiple ways for fire to spread across the landscape and burn our home or adjacent buildings in a short time
14. If offered in your area, would members of your household attend a free, or low cost, one-day training seminar designed to teach homeowners in the rural–urban interface how to improve the defensible space surrounding your home and adjacent outbuildings?
- No
  - Yes
15. Would you be interested in participating in a cost share program that would pay a portion of the costs of implementing fire risk projects on your property?
- No
  - Yes

Thank you very much for completing this survey and sending it back to us. This information will be combined with other data to assess the greatest threats to defending homes and adjacent buildings in the rural–urban interface where forest fires are common.

Please verify that your name, address, and telephone number:

**Our records indicate:**

**Please enter corrections here:**

<Name>

<Address>

<City>, <State> <Zip>

<Telephone>

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## Order Your Property Map FREE

As a token of appreciation for completing and returning this survey, we would like to send you a detailed map of your property and surrounding area. Complete this form and return it to us with your survey and we will custom print a color map of your property and send it to you.

What is the legal land description of the property you want mapped (must be in Shoshone County).

\_\_\_\_\_ T \_\_\_\_\_ N, R \_\_\_\_\_ E., Boise Meridian

How many acres is this ownership? \_\_\_\_\_ acres

What would you like printed as the title of the map? (Five or less words, please print)

\_\_\_\_\_

Please select which coverage (only one per map) you would like as the primary theme:

- Color coded elevation
- Color coded owner category (private, USFS, BLM, state of Idaho, etc.)
- Color coded plant cover category
- Ortho-photo image (black and white image with color overlays)

All maps include:

- Roads
- Streams & rivers
- Community locations
- Building locations (where available)
- Railroads
- Township, Range, and Sections (property lines are not included)
- Hillshade relief placed in the background to provide representation of slope and elevation.

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Additional maps of your property can be created at a cost of \$8.50 per 8.5"x11" sheet, printed on premium quality photo paper (resolution of 1440 dpi), including shipping. Larger scale maps are available at a size of up to 34" wide and 60" long (additional charges apply—please contact us for details). Please indicate below which additional maps you would like created and included with your complimentary property map. Please include payment for additional maps in the form of check or money order to Northwest Management, Inc. Please do not send cash.

## Appendix II

### Idaho Vegetation and Land Cover Classification System

Vegetation coverage determined to be high risk for fire spread included:

- Vegetation cover equal to class numbers:
  - 3300 - 3316
  - 4202, 4206, 4212, 4215, 4216, 4222, 4223, 4224, 4225, 4226, 4228, 4229
  - 4301

## Idaho Vegetation and Land Cover Classification System

Modified from Redmond et al. (1997) and Homer et al. (1998)

### 1000 Urban or Developed Land

#### 1000 Urban

Description: Towns and cities

Extent: North Idaho

#### 1001 High Intensity Urban

Description: Towns and cities with populations > 1,000

Extent: South Idaho

#### 1002 Low Intensity Urban

Description: Towns and cities with populations < 1,000

Extent: South Idaho

#### 1101 Disturbed, High

Description: Large mines, airports, and golf courses that are separated from urban areas

Extent: South Idaho

#### 1102 Disturbed, Low

Description: Small mines, gravel pits, and airplane landing strips.

Extent: South Idaho

### 2000 Agricultural

#### 2000 Agricultural land

Description: Row crops, irrigated pasture and hay fields, dry farm crops and fallow fields

Extent: North and South Idaho

### 3000 Non-Forested Lands

#### 31xx - Grasslands

#### 3101 Foothills Grassland

Description: Grass and forb co-dominated dry meadows and ridges associated with species such as sagebrush, cinquefoil, snowberry and willow.

Principal Species: *Agropyron* spp., Needle and Thread Grass, Bluegrasses, Idaho Fescue. Also containing Cinquefoil, Lupine, Arrowleaf Balsamroot

Extent: North and South Idaho

#### 3102 Disturbed Grassland

Description: Grassland dominated by noxious weeds and other exotic species such as; Cheatgrass, Knapweed, St. Johns-wort, Japanese Brome, Thistle. Greater than 30% exotic cover.

Extent: North Idaho

#### 3103 Herbaceous Clearcut

Description: Grass or forb dominated recent clearcuts

Extent: North and South Idaho

#### 3104 Montane Parklands and Subalpine Meadow

Description: Grassland ridges, forest openings and meadows dominated or co-dominated by native perennial montane or subalpine grass species. Bluebunch

Wheatgrass, Idaho Fescue, Bluegrasses (*Poa* spp.), Sedges (*Carex* spp.), Timothy. May include: yarrow, arnica, arrowleaf balsamroot, fireweed, etc.

Extent: North and South Idaho

**3105 Wet Meadow**

Description: Grass and forb co-dominated mountain meadows where soil moisture is abundant North and South the growing season.

Principal Species: Reedgrass, sedges (*Carex* spp.), hairgrass (*Deschampsia cespitosa*), Timothy, rushes (*Juncus* spp.), bluegrasses (*Poa* spp.)

Extent: South Idaho

**3106 Herbaceous Burn**

Description: Grass or forb dominated recent burn

Extent: South Idaho

**3107 Shrub/Steppe Annual Grass-Forb**

Description: Grasslands dominated or co-dominated by cheatgrass, medusahead, *Agropyron* spp., *Poa* spp., *Stipa* spp. or Idaho Fescue associated with Western and Rocky Mountain Juniper

Extent: South Idaho

**3109 Perennial Grassland**

Description: Grassland dominated by seeded crested wheatgrass and other common seeded grass species. Associated with Curleaf Mountain Mahogany and Juniper

Principal Species: *Agropyron* spp., Cheatgrass, Idaho Fescue, *Poa* spp., *Stipa* spp.

Extent: South Idaho

**3110 Perennial Grass Slope**

Description: Grasslands dominated or co-dominated by native perennial grass species such as bluebunch wheatgrass, Idaho fescue, junegrass, and mutton bluegrass on foothill and canyon slopes above 15 degrees. Associated with Curleaf Mountain Mahogany, Juniper and Ponderosa Pine.

Extent: South Idaho

**32xx – Mesic Shrublands**

**3201 Mesic Upland Shrubs**

Description: upland deciduous shrub communities

Principal species: Alder, Maple, Bearberry, Hawthorn, Ceanothus, Buffloberry, chokecherry, Prince's Pine, Huckleberry, Whortleberry, Ocean Spray, Raspberry, Rose, Spiraea

Extent: North Idaho

**3202 Warm Mesic Shrubs**

Description: upland shrublands, naturally occurring or initiated by fire or clearcutting.

Principal Species: Alder, Serviceberry, Oregon Grape, Snowberry, Ceanothus, ninebark, chokecherry, rose, ceanothus, currant, willow, elderberry, spiraea

Extent: North and South Idaho

**3203 Cold Mesic Shrubs**

Description: subalpine shrublands dominated by *Salix* spp. and *Vaccinium* spp.

Principal Species: *Salix* spp. and *Vaccinium* spp., Labrador Tea, Mountain Heath, Alder

Extent: North and South Idaho

### 33xx – Xeric Shrublands

**3301 Curleaf Mountain Mahogany**

**3302 Description: Forest dominated by Mountain Mahogany at canopies greater than 59%**

Principal Species: Mountain Mahogany, *Artemisia* spp., Juniper, serviceberry, oregon grape, ceanothus, chokecherry, snowberry

Extent: North and South Idaho

**3304 Bitterbrush**

Description: Shrublands dominated by bitterbrush

Principal Species: Bitterbrush, mountain mahogany, juniper, sagebrush, chokecherry, snowberry, Idaho fescue, Bluebunch Wheatgrass, Ponderosa Pine, Douglas-fir, Aspen

Extent: North and South Idaho

**3305 Mountain Big Sagebrush**

Description: Shrubland dominated by mountain big sagebrush (*Artemisia tridentata vaseyana*)

Principal Species: Grand Fir, Subalpine Fir, Mountain Mahogany, Lodgepole Pine, Ponderosa Pine, Douglas-fir, bearberry, *Artemisia* spp., Ceanothus, ninebark, chokecherry, snowberry, bluebunch wheatgrass

Extent: South Idaho

**3306 Wyoming Big Sagebrush**

Description: Shrubland dominated by *Artemisia tridentata wyomingensis*

Extent: North Idaho

**3307 Basin & Wyoming Big Sagebrush**

Description: Shrubland co-dominated by basin big sagebrush (*Artemisia tridentata*) and Wyoming big sagebrush (*Artemisia tridentata wyomingensis*)

Principal species: Mountain Mahogany, Juniper, Ponderosa Pine, *Atriplex* spp., *Artemisia* spp., snowberry, chokecherry, etc.

Extent: South Idaho

**3308 Black Sagebrush Steppe**

Description: Shrublands dominated by Black Sagebrush (*Artemisia nova*)

Principal Species: Black Sagebrush, Three-tip sage (*Artemisia tripartita*), Sand sagebrush (*Artemisia filifolia*)

Extent: North Idaho

**3309 Silver Sage**

Description: Shrubland principally dominated by silver sage (*Artemisia cana*)

Principal Species: *Artemisia* spp., *Potentilla fruticosa*, currant, snowberry

Extent: South Idaho

**3310 Salt-desert Shrub**

Description: Shrubland principally dominated or co-dominated by *Artemisia spinescens*, Shadcale (*Atriplex confertifolia*), 4-wing saltbush (*Atriplex spinosa*) and greasewood (*Sarcobatus vermiculatus*).

Principal Species: *Artemisia* spp.

Extent: South Idaho

**3312 Rabbitbrush**

Description: Shrubland dominated by rubber rabbitbrush (*Chrysothamnus nauseosus*) or low rabbitbrush (*C. viscidiflorus*)

Principal Species: *Artemisia* spp., *Atriplex*, spp., bitterbrush, greasewood

Extent: North and South Idaho

**3315 Low Sagebrush**

Description: shrubland principally dominated by low sagebrushes (*Artemisia arbuscula*, *A. frigida*, *A. longiloba*, *A. nova*)

Principal Species: Mountain Mahogany, Juniper, Pinyon Pine, Ponderosa Pine, *Artemisia* spp., *Atriplex* spp., bitterbrush, snowberry

Extent: South Idaho

**3316 Mountain Low Sagebrush**

Description: shrubland dominated by Mountain Low Sagebrush (*Artemisia arbuscula*)

Principal Species: Mountain Mahogany, Whitebark Pine, Lodgepole Pine, Limber Pine, Ponderosa Pine, Douglas-fir, bearberry, *Artemisia* spp., Ceanothus, ninebark, snowberry, chokecherry

Extent: South Idaho

**4000 Forest Uplands**

**41xx – Broadleaf Forest**

**4101 Aspen**

Description: Woodland principally dominated by aspen

Principal Species: Subalpine fir, Englemann Spruce, Ponderosa Pine, Lodgepole Pine, Douglas-fir, Serviceberry, *Artemisia* spp., Oregon Grape, Ceanothus, chokecherry

Extent: South Idaho

**4102 Cottonwood**

Description: Woodland dominated principally by Black Cottonwood (*Populus trichocarpa*) and alder

Principal species: Black cottonwood, Paper birch, Box elder, red alder

Extent: North Idaho

**4103 Maple**

Description: Forest principally dominated by maple (*Acer glabrum*)

Principal Species: Mountain Mahogany, Juniper, Aspen, Douglas-fir, Serviceberry, *Artemisia* spp., Oregon grape, ceanothus, chokecherry, bitterbrush, currant, rose, snowberry

Extent: South Idaho

**42xx – Needleleaf Forest**

**4201 Englemann Spruce**

**4202 Description: Conifer forest dominated by Englemann Spruce**

Principal Species: subalpine fir, grand fir, lodgepole pine, whitebark pine, aspen, douglas-fir, serviceberry, maple, currant, huckleberry

Extent: North and South Idaho

**4203 Lodgepole Pine**

Description: Coniferous woodland principally dominated by lodgepole pine

Principal Species: subalpine fir, Englemann spruce, whitebark pine, aspen, douglas-fir, *Artemisia* spp., currant, *Vaccinium* spp.

Extent: North and South Idaho

**4205 Limber Pine**

Description: Conifer forest principally dominated by Limber Pine

Principal Species: maple, *Artemisia* spp. juniper, spiraea, bluebunch wheatgrass, cheatgrass, Idaho fescue, arrowleaf balsamroot

Extent: North Idaho

- 4206 Ponderosa Pine**  
 Description: Conifer forest dominated by Ponderosa Pine  
 Principal Species: Juniper, lodgepole pine, Douglas-fir, bearberry, currant, *Rosa* spp., snowberry  
 Extent: North and South Idaho
- 4207 Grand Fir**  
 Description: Conifer forest dominated by grand fir  
 Principal Species: Douglas-fir, western red cedar, western hemlock, mountain larch, ponderosa pine, lodgepole pine, serviceberry, Oregon grape, ninebark, snowberry, choke cherry, spiraea, huckleberry, maple  
 Extent: North and South Idaho
- 4208 Subalpine Fir**  
 Description: Conifer woodland principally dominated by subalpine fir  
 Principal species: Englemann spruce, whitebark pine, limber pine, Douglas-fir, western white pine, mountain hemlock, alder, mountain heath, juniper, *Artemisia* spp., snowberry, *Vaccinium* spp.  
 Extent: North and South Idaho
- 4210 Western Red Cedar**  
 Description: Conifer forest dominated by western red cedar  
 Principal Species: grand fir, western white pine, Douglas-fir, maple, twin flower, thimbleberry, pacific blackberry, snowberry  
 Extent: North Idaho
- 4211 Western Hemlock**  
 Description: Conifer forest dominated by western hemlock  
 Principal Species: grand fir, Douglis-fir, western red cedar, maple, sitka alder, Utah honeysuckle, huckleberry  
 Extent: North Idaho
- 4212 Douglas-fir**  
 Description: Conifer forest dominated by Douglas-fir  
 Principal Species: grand fir, lodgepole pine, ponderosa pine, Englemann spruce, limber pine, sbalpine fir, aspen, serviceberry, *Artemisia* spp., ninebark, snowberry, chokecherry, Oregon grape, spiraea  
 Extent: North and South Idaho
- 4215 Western Larch**  
 Description: Conifer forest dominated by western larch  
 Principal Species: grand fir, lodgepole pine, ponderosa pine, maple, bearberry, twin flower, ninebark, thimbleberry, huckleberry  
 Extent: North Idaho
- 4216 Douglas-fir/Limber Pine**  
 Description: Conifer forest principally co-dominated by Douglas-fir and limber pine  
 Principal Species: subalpine fir, mountain hemlock, Englemann spruce, lodgepole pine, aspen, serviceberry, nineberk, chokecherry, bitterbrush, snowberry  
 Extent: South Idaho
- 4217 Subalpine Pine**  
 Description: Conifer forest dominated either by whitebark pine or limber pine  
 Principal species: Subalpine fir, Englemann spruce, lodgepole pine, Douglas-fir, serviceberry, juniper, sagebrush, currant, snowberry, huckleberry  
 Extent: North and South Idaho

- 4218 Subalpine fir/Whitebark Pine**  
 Description: Conifer woodland principally dominated by subalpine fir and whitebark pine  
 Principal Species: Englemann spruce, limber pine, lodgepole pine, Douglas-fir, *Artemisia tridentata*, snowberry, huckleberry  
 Extent: South Idaho
- 4219 Mixed Whitebark Pine Forest**  
 Description: Conifer forest dominated by whitebark pine, codominant species is alpine larch  
 Principal Species: subalpine fir, Englemann spruce, lodgepole pine, common juniper, mountain heath, dwarf huckleberry, whortleberry  
 Extent: North Idaho
- 4220 Mixed Subalpine Forest**  
 Description: Conifer forest dominated by subalpine fir with Douglas-fir, lodgepole pine, and Englemann spruce as a significant component  
 Principal species: whitebark pine, aspen, limber pine, sitka alder, Utah honeysuckle, menziesia, huckleberry, snowberry, *Artemisia tridentata*, serviceberry  
 Extent: North and South Idaho
- 4221 Mixed Mesic Forest**  
 Description: Conifer forest dominated by western red cedar, grand fir, western larch and western hemlock  
 Principal Species: subalpine fir, western white pine, Douglas-fir, maple, prince's pine, twin flower, thimbleberry, huckleberry  
 Extent: North Idaho
- 4222 Mixed Xeric Forest**  
 Description: Conifer forest dominated by ponderosa pine and Douglas-fir  
 Principal Species: Lodgepole Pine, Black Cottonwood, serviceberry, Oregon grape, ninebark, chokecherry, currant, willow, spiraea  
 Extent: North and South Idaho
- 4223 Douglas-fir/Lodgepole Pine**  
 Description: Conifer forest co-dominated by Douglas-fir and lodgepole pine  
 Principal Species: grand fir, western white pine, western larch, subalpine fir, lodgepole pine, aspen, serviceberry, Oregon grape, syringa, ninebark, spiraea, snowberry, chokecherry, huckleberry  
 Extent: North and South Idaho
- 4224 Standing Burnt or Dead Timber**  
 Extent: North Idaho
- 4225 Douglas-fir/Grand Fir**  
 Description: Conifer forest co-dominated by Douglas-fir and grand fir  
 Principal Species: western larch, western white pine, western red cedar, Englemann spruce, ponderosa pine, lodgepole pine, subalpine fir, serviceberry, ninebark, Oregon grape, syringa, spiraea, chokecherry, snowberry, huckleberry, thimbleberry, ocean spray  
 Extent: North and South Idaho
- 4226 Western Red Cedar/Grand Fir Forest**  
**4227 Description: Conifer forest co-dominated by western red cedar and grand fir**  
 Principal Species: western larch, Douglas-fir, western hemlock, maple, twin flower, ninebark, thimbleberry, huckleberry  
 Extent: North Idaho

**4228 Western Red Cedar/Western Hemlock**

Description: Conifer forest dominated by western red cedar and western hemlock  
Principal Species: grand fir, western white pine, Douglas-fir, maple, prince's pine, twin flower, sticky currant, big huckleberry

Extent: North Idaho

**4229 Western Larch/Lodgepole Pine**

Description: Conifer forest dominated by western larch and lodgepole pine  
Principal Species: grand fir, subalpine fir, Douglas-fir, sitka alder, bearberry, twin flower, mountain ash, spiraea, huckleberry

Extent: North Idaho

**4230 Western Larch/Douglas-fir**

Description: Conifer forest dominated by western larch and Douglas-fir  
Principal Species: grand fir, lodgepole pine, ponderosa pine, maple, bearberry, Oregon grape, twin flower, spiraea, snowberry, huckleberry

Extent: North Idaho

**4231 Utah Juniper**

Description: Conifer forest principally dominated by Utah juniper  
Principal Species: Mountain mahogany, pinyon pine, serviceberry, *Artemisia* spp., bitterbrush, chokecherry, snowberry

Extent: South Idaho

**4231 Western Juniper**

Description: Conifer forest dominated principally by western juniper  
Principal Species: mountain mahogany, serviceberry, *Artemisia* spp., bitterbrush, snowberry

Extent: South Idaho

**4232 Pinyon Pine/Juniper**

Description: Conifer forest principally dominated by singleleaf pinyon pine and Utah juniper

Principal Species: mountain mahogany, serviceberry, *Artemisia* spp., bitterbrush, chokecherry, snowberry

Extent: South Idaho

**43xx – Mixed Needleleaf/Broadleaf Forest**

**4301 Mixed Needleleaf/Broadleaf Forest**

Description: Forest principally dominated by aspen and Douglas-fir, subalpine fir, lodgepole pine

Principal Species: Englemann Spruce, Ponderosa Pine, serviceberry, *Artemisia* spp., Oregon grape, ceanothus, chokecherry, rose, snowberry, bitterbrush, red-osier dogwood, willow, spiraea

Extent: North and South Idaho

**5000 Water**

**6000 Riparian and Wetland Areas**

**61xx – Forested Riparian**

**6101 Needleleaf Dominated Riparian**

Description: A mixed riparian class dominated by conifer species and shrubs  
Principal Species: Douglas-fir, Western Red Cedar, Englemann Spruce, Subalpine fir, Maple, Lodgepole Pine, Aspen, Cottonwood

Extent: North and South Idaho

- 6102 Broadleaf Dominated Riparian**  
 Description: Riparian forests dominated or co-dominated by black cottonwood and narrowleaf cottonwood  
 Principal Species: Aspen, Green Ash, Box Elder, Maple, Ader, Paper Birch, chokecherry, willow  
 Extent: North and South Idaho
- 6103 Needleleaf/Broadleaf Dominated Riparian**  
 Description: Riparian forests co-dominated by broadleaf (> 25% and < 66% cover) and conifer (> 25% and < 66%) species  
 Extent: North Idaho
- 6104 Mixed Riparian (Forest and Non-forest)**  
 Description: Riparian areas co-dominated by forest and non-forest  
 Extent: North Idaho

**62xx – Non-forested Riparian**

- 6201 Graminoid or Forb Dominated Riparian**  
 Description: Herbaceous riparian consists of various sedge, rush and forb species  
 Principal Species: *Carex* spp., *Juncas* spp., *Festuca* spp., *Poa* spp., tufted hairgrass, common reed, cattail  
 Extent: North and South Idaho
- 6202 Shrub Dominated Riparian**  
 Description: Shrub riparian is dominated by *Salix* spp.  
 Principal Species: Twinberry, Utah Honeysuckle, Black Hawthorne, Red-osier dogwood, Sitka Alder, Rose, Currant, thimbleberry, buffaloberry, maple, chokecherry  
 Extent: North and South Idaho
- 6203 Mixed Non-forest Riparian**  
 Description: Riparian areas co-dominated by shrubs and graminoid/forbs  
 Extent: North Idaho

**63xx Wetlands**

- 6301 Deep Marsh**  
 Description: Marsh permanently flooded, dominated or co-dominated by bulrush (*Scirpus* spp.) and cattail (*Typha* spp.)  
 Extent: South Idaho
- 6302 Shallow Marsh**  
 Description: Marsh semi-permanently flooded, dominated or co-dominated by bulrush, cattail, spikerush (*Eleocharis* spp.) baltic rush (*Juncus balticus* var. *montanus*) and sedges  
 Extent: South Idaho
- 6303 Aquatic Bed**  
 Description: Aquatic beds dominated or co-dominated by pondweed (*Potamogeton* spp.), duckweed (*Lemna* spp.), and water smartweed (*Polygonum amphibium* var. *emersum*)  
 Extent: South Idaho
- 6304 Mud Flat**  
 Description: Mud and Saline flats seasonally flooded with less than 5% vegetative cover that are adjacent to wetlands.  
 Extent: South Idaho

## **7000 Barren Land**

### **7201 Sand Dune**

#### **7202 Description: sand dunes with less than 5% vegetative cover**

Extent: South Idaho

### **7203 Vegetated Sand Dune**

Description: sand dunes with greater than 5% vegetative cover

### **7300 Exposed Rock**

Description: Exposed rock, rock outcrops, talus or scree slopes with less than 5% vegetative cover

Extent: North and South Idaho

### **7301 Lava**

Description: Lava rock with less than 5% vegetative cover

Extent: South Idaho

### **7302 Vegetated Lava**

Description: Lava with greater than 5% total vegetative cover, with plants occurring as islands or pockets in the lava flow

Extent: South Idaho

### **7800 Mixed Barren Land**

Description: Barren land and exposed soil with less than 5% total vegetative cover

Extent: North and South Idaho

### **7900 Shoreline and Stream Gravel Bars**

Extent: North Idaho

## **8000 Alpine Meadow**

### **8100 Alpine Meadow**

Description: Alpine vegetation consisting of a combination of forbs, grasses and sedges

Principal Species: *Antennaria rosea*, *Arenaria congesta*, *Astragalus spp.*, *Erigeron spp.*, *Geum spp.*, *Lupinus argenteus*, *Phlox spp.*, *Saxifraga spp.*, *Trifolium spp.*, *Artemisia spp.*, *Salix spp.*, *Vaccinium spp.*, Englemann Spruce, whitebark pine, limber pine

Extent: North and South Idaho

## **9000 Snow, Ice, Cloud or Cloud Shadow**

### **9100 Perennial Ice or Snow**

Extent: North and South Idaho

## **Appendix III**

### **GIS Data and Programs**

## GIS Data and Programs

GIS data used in this analysis has been derived from publicly available data sets and from data sets created by Northwest Management, Inc. All GIS derived data (information created during analysis and GIS processing) was created by Northwest Management, Inc. Dr. William E. Schlosser was responsible for gathering all GIS data and coordinating GIS processing.

Specifically the following GIS layers were most useful:

- Digital Elevation Models in 200 meter resolution
- Digital Elevation Models in 30 meter resolution
- Digital Elevation Models in 10 meter resolution
- Census of the state of Idaho-2000 by County with county boundaries
- Hydrology of the State of Idaho
- Digital-ortho quadrangle photos of Shoshone County
- Land Cover Classifications of the State of Idaho
- Road Networks in Idaho and Shoshone County
- Land Ownership of Idaho
- Precipitation levels in Idaho
- Railroad lines in Idaho
- Soil types of Idaho
- Solar Radiation estimates for Idaho
- High temperature measurements in Idaho
- Wind speed and direction measurements in Idaho
- Aspect map of Shoshone County
- Hillshade map of Shoshone County
- Slope map of Shoshone County
- Building locations in Shoshone County
- Community locations in Shoshone County
- Fire Districts' coverage in Shoshone County
- Community buffer zones

- Home site density indexes
- Home site distribution with buffer zones
- Fire ignition probability maps
- Fire spread potential probability maps
- Riparian zone maps
- Target areas for fire mitigation efforts

All of these GIS layers have been made available for downloading or ordering from a project Internet web site at <http://www.shoshone-fire-plan.org/> (Appendix IV). The data is made available for anyone to download at no charge for data. A small fee is collected for creating CD ROM and mailing them to those who request it.

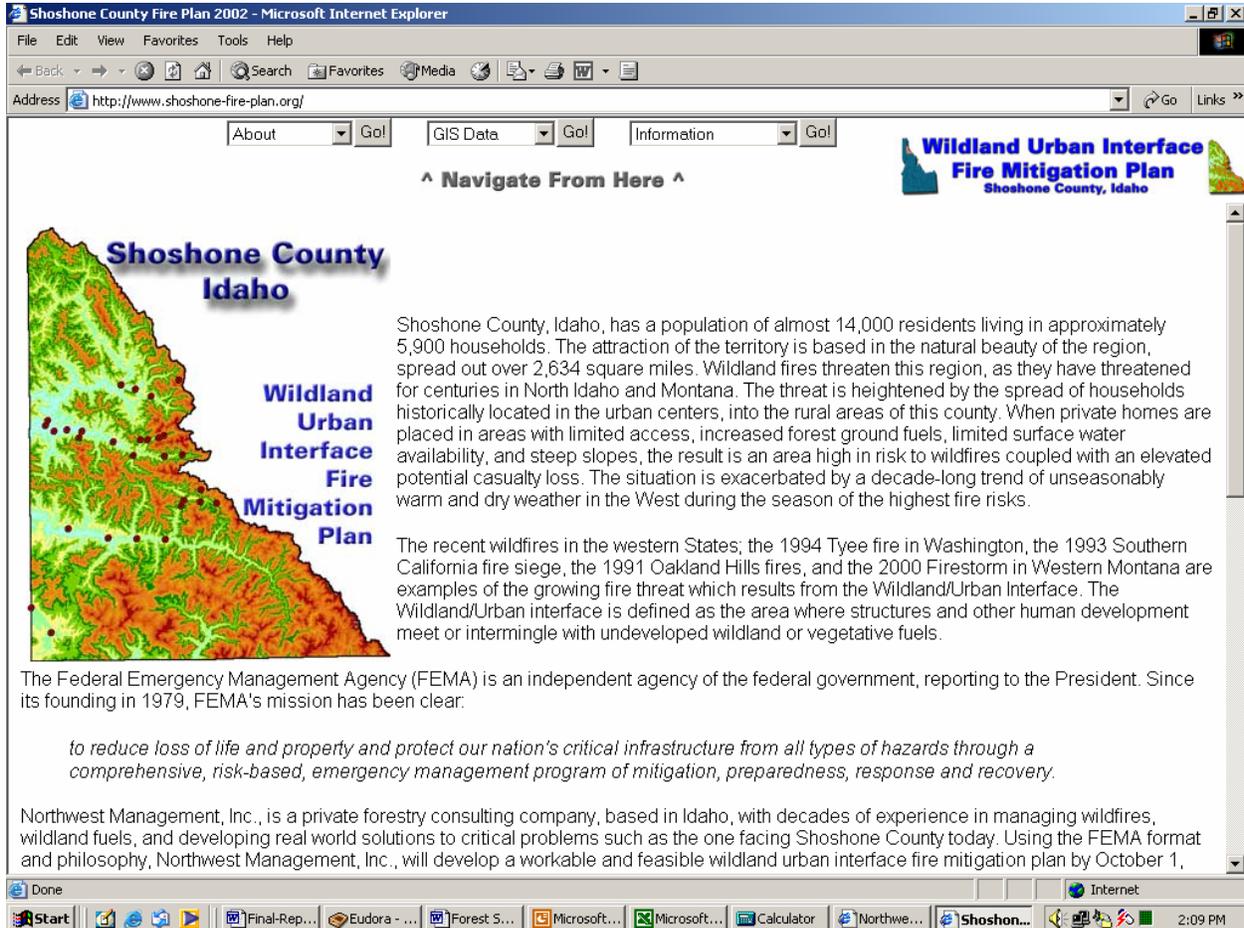
GIS data processing has been completed on computers using the Windows98 and Windows2000 Professional operating systems. The primary GIS processing computer uses an Athalon G7 series motherboard with dual 2000 Mhz processors, 2 Gigabytes of RAM, and high-speed-striped high-volume storage devices. Two GIS platforms have been used; ESRI ArcVIEW 3.3 and ESRI ArcGIS 8.2. All data used and created during this analysis is compatible with both GIS systems.

Forest growth modeling and stand suitability analysis has been completed using the Landscape Management System (LMS) version 2.0.45 software. This software uses the North Idaho variant of the Forest Vegetation Simulator (FVS) for growth modeling, the Stand Visualization System (SVS) for stand visualization, and the USFS program EnVision for landscape visualizations. The Fire Fuels Extension (Beukema *et. al* 2002) was used to evaluate fire risk based on stand inventories.

# Appendix IV

## Project Internet Web Site

<http://www.Shoshone-Fire-Plan.org/>



## **Appendix V**

### **Forest Fire Fuel Models**

## FUEL MODEL DESCRIPTIONS

### Grass Group

#### Fire Behavior Fuel Model 1

Fire spread is governed by the fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through the cured grass and associated material. Very little shrub or timber is present, generally less than one-third of the area.

Grasslands and savanna are represented along with stubble, grass-tundra, and grass-shrub combinations that met the above area constraint. Annual and perennial grasses are included in this fuel model.

This fuel model correlates to 1978 NFDRS fuel models A, L, and S.

#### Fuel model values for estimating fire behavior

Total fuel load, < 3-inch dead and alive, tons/acre	0.74
Dead fuel load, ¼-inch, tons/acre	.74
Live fuel load, foliage, tons/acre	0
Fuel bed depth, feet	1.0

#### Fire Behavior Fuel Model 2

Fire is spread primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to litter and dead-down stemwood from the open shrub or timber overstory, contribute to the fire intensity. Open shrub lands and pine stands or scrub oak stands that cover one-third to two-thirds

of the area may generally fit this model; such stands may include clumps of fuels that generate higher intensities than that may produce firebrands. Some pinyon-juniper may be in this model.

This fuel model correlates to 1978 NFDRS fuel models C and T.

### **Fuel model values for estimating fire behavior**

Total fuel load, < 3-inch dead and alive, tons/acre	4.0
Dead fuel load, 1/4-inch, tons/acre	2.0
Live fuel load, foliage, tons/acre	0.5
Fuel bed depth, feet	1.0

### **Fire Behavior Fuel Model 3**

Fires in this fuel are the most intense of the grass group and display high rates of spread under the influence of wind. Wind may drive fire into the upper heights of the grass and across standing water. Stands are tall, averaging about 3 feet (1 m), but considerable variation may occur. Approximately one-third or more of the stand is considered dead or cured and maintains the fire. Wild or cultivated grains that have not been harvested can be considered similar to tall prairie and marshland grasses.

This fuel correlates to 1978 NFDRS fuel model N.

### **Fuel model values for estimating fire behavior**

Total fuel load, < 3-inch dead and live, tons/acre	3.0
Dead fuel load, 1/4-inch, tons/acre	3.0
Live fuel load, foliage tons/acre	0
Fuel bed depth, feet	2.5

### **Shrub Group**

#### **Fire Behavior Fuel Model 4**

Fire intensity and fast-spreading fires involve the foliage and live and dead fine woody material in the crowns of a nearly continuous secondary overstory. Stands of mature shrubs, 6 or more feet tall, such as California mixed chaparral, the high pocosin along the east coast, the pinebarrens of New Jersey, or the closed jack pine stands of the north-central States are typical candidates. Besides flammable foliage, dead woody material in the stands significantly contributes to the fire intensity. Height of stand qualifying for this model depends on local conditions. A deep litter layer may also hamper suppression efforts.

This fuel model represents 1978 NFDRS fuel models B and O; fire behavior estimates are more severe than obtained by Models B or O.

### **Fuel model values for estimating fire behavior**

Total fuel load, <3-inch dead and live, tons/acre	13.0
Dead fuel load, 1/4-inch, tons/acre	5.0
Live fuel load, foliage, tons/acre	5.0
Fuel bed depth, feet	6.0

## **Fire Behavior Model 5**

Fire is generally carried in the surface fuels that are made up of litter cast by the shrubs and the grasses or forbs in the understory. The fires are generally not very intense because surface fuel loads are light, the shrubs are young with little dead material, and the foliage contains little volatile material. Usually shrubs are short and almost totally cover the area. Young, green stands with no dead wood would qualify: laurel, vine maple, alder, or even chaparral, manzanita, or chamise.

No 1978 NFDRS fuel model is represented, but model 5 can be considered as second choice for NFDRS model D or as third choice for NFDRS model T. Young green stands may be up to 6 feet (2m ) high but have poor burning properties because of live vegetation.

### **Fuel model values for estimating fire behavior**

Total fuel load, <3-inch dead and live, tons/acre	3.5
Dead fuel load, ¼-inch, tons/acre	1.0
Live fuel load, foliage, tons/acre	2.0
Fuel bed depth, feet	2.0

## **Fire Behavior Fuel Model 6**

Fires carry through the shrub layer where the foliage is more flammable than fuel model 5, but this requires moderate winds, greater than 8 mi/h (13 km/h) at mid-flame height. Fire will drop to the ground at low wind speeds or at openings in the stand. The shrubs are older, but not as tall as shrub types of model 4, nor do they contain as much fuel as model 4. A broad range of shrub conditions is covered by this model. Fuel situations to be considered include intermediate stands of chamise, chaparral, oak brush, low

pocosin, Alaskan spruce taiga, and shrub tundra. Even hardwood slash that has cured can be considered. Pinyon-juniper shrublands may be represented but may over-predict rate of spread except at high winds, like 20 mi/h (32 km/h) at the 20-foot level.

The 1978 NFDRS fuel models F and Q are represented by this fuel model. It can be considered a second choice for models T and D and a third choice for model S.

### **Fuel model values for estimating fire behavior**

Total fuel load, <3-inch dead and live, tons/acres	6.0
Dead fuel load, 1/4 –inch, tons/acre	1.5
Live fuel load, foliage, tons/acre	0
Fuel bed depth, feet	2.5

### **Fire Behavior Fuel Model 7**

Fires burn through the surface and shrub strata with equal ease and can occur at higher dead fuel moisture contents because of the flammability of live foliage and other live material. Stands of shrubs are generally between 2 and 6 feet (0.6 and 1.8 m) high. Palmetto-gallberry understory-pine overstory sites are typical and low pocosins may be represented. Black spruce-shrub combinations in Alaska may also be represented.

This fuel model correlates with 1978 NFDRS model D and can be a second choice for model Q.

### **Fuel model values for estimating fire behavior**

Total fuel load, <3-inch dead and live, tons/acre	4.9
Dead fuel load, ¼-inch, tons/acre	1.1
Live fuel load, foliage, tons/acre	0.4
Fuel bed depth, feet	2.5

### **Timber Group**

#### **Fire Behavior Fuel Model 8**

Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional “jackpot” or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidities, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Representative conifer types are white pine, and lodgepole pine, spruce, fir and larch

This model can be used for 1978 NFDRS fuel models H and R.

### **Fuel model values for estimating fire behavior**

Total fuel load, <3-inch, dead and live, tons/acre	5.0
Dead fuel load, ¼-inch, tons/acre	1.5
Live fuel load, foliage, tons/acre	0
Fuel bed depth, feet	0.2

## **Fire Behavior Fuel Model 9**

Fires run through the surface litter faster than model 8 and have longer flame height. Both long-needle conifer stands and hardwood stands, especially the oak-hickory types, are typical. Fall fires in hardwoods are predictable, but high winds will actually cause higher rates of spread than predicted because of spotting caused by rolling and blowing leaves. Closed stands of long-needled pine like ponderosa, Jeffrey, and red pines, or southern pine plantations are grouped in this model. Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting, and crowning.

NFDRS fuel models E, P, and U are represented by this model. It is also a second choice for models C and S.

### **Fuel model values for estimating fire behavior**

Total fuel load, <3-inch dead and live, tons/acre	3.5
Dead fuel load, 1/4-inch, tons/acre	2.9
Live fuel load, foliage, tons/acre	0
Fuel bed depth, feet	0.2

## **Fire Behavior Fuel Model 10**

The fires burn in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3-inch (7.6 cm) or larger limbwood, resulting from overmaturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation, leading to potential fire control difficulties. Any forest type may be considered if heavy down material is present; examples are

insect- or disease-ridden stands, wind-thrown stands, overmature situations with dead fall, and aged light thinning or partial-cut slash.

The 1978 NFDRS fuel model G is represented.

### **Fuel model values for estimating fire behavior**

Total fuel load, < 3-inch dead and live, tons/acre	12.0
Dead fuel load, ¼-inch, tons/acre	3.0
Live fuel load, foliage, tons/acre	2.0
Fuel bed depth, feet	1.0

The fire intensities and spread rates of these timber litter fuel models are indicated by the following values when the dead fuel moisture content is 8 percent, live fuel moisture is 100 percent, and the effective windspeed at mid-flame height is 5 mi/h (8 km/h):

<b>Rate of Spread</b>		<b>Flame length</b>
<b>Model</b>	<b>Chains/hour</b>	<b>Feet</b>
8	1.6	1.0
9	7.5	2.6
10	7.9	4.8

Fires such as above in model 10 are at the upper limit of control by direct attack. More wind or drier conditions could lead to an escaped fire.

## Logging Slash Group

### Fire Behavior Model 11

Fires are fairly active in the slash and herbaceous material intermixed with the slash. The spacing of the rather light fuel load, shading from overstory, or the aging of the fine fuels can contribute to limiting the fire potential. Light partial cuts or thinning operations in mixed conifer stands, hardwood stands, and southern pine harvests are considered. Clearcut operations generally produce more slash than represented here. The less-than-3-inch (7.6-cm) material load is less than 12 tons per acre (5.4 t/ha). The greater-than-3-inch (7.6-cm) is represented by not more than 10 pieces, 4 inches (10.2 cm) in diameter, along a 50-foot (15 m) transect.

The 1978 NFDRS fuel model K is represented by this model.

### Fuel model values for estimating fire behavior

Total fuel load, < 3-inch, dead and live, tons/acre	11.5
Dead fuel load, ¼-inch, tons/acre	1.5
Live fuel load, foliage, tons/acre	0
Fuel bed depth, feet	1.0

### Fire Behavior Fuel Model 12

Rapidly spreading fires with high intensities capable of generating firebrands can occur. When fire starts, it is generally sustained until a fuel break or change in fuels is encountered. The visual impression is dominated by slash and much of it is less than 3 inches (7.6 cm) in diameter. The fuels total less than 35 tons per acres (15.6 t/ha) and seem well distributed. Heavily thinned conifer stands, clearcuts, and medium or heavy

partial cuts are represented. The material larger than 3 inches (7.6 cm) is represented by encountering 11 pieces, 6 inches (15.3 cm) in diameter, along a 50-foot (15-m) transect.

This model depicts 1978 NFDRS model J and may overrate slash areas when the needles have dropped and the limbwood has settled. However, in areas where limbwood breakup and general weathering have started, the fire potential can increase.

### **Fuel model values fore estimating fire behavior**

Total fuel load, < 3-inch, dead and live, tons/acre	34.6
Dead fuel load, ¼-inch, tons/acre	4.0
Live fuel load, foliage, tons/acre	0
Fuel bed depth, feet	2.3

### **Fire Behavior Fuel Model 13**

Fire is generally carried across the area by a continuous layer of slash. Large quantities of material larger than 3 inches (7.6 cm) are present. Fires spread quickly through the fine fuels and intensity builds up more slowly as the large fuels start burning. Active flaming is sustained for long periods and a wide variety of firebrands can be generated. These contribute to spotting problems as the weather conditions become more severe. Clearcuts and heavy partial-cuts in mature and overmature stands are depicted where the slash load is dominated by the greater-tayhn-3-inch (7.6-cm) diameter material. The total load may exceed 200 tons per acre (89.2 t/ha) but fuel less than 3 inches (7.6 cm) is generally only 10 percent of the total load. Situations where the slash still has “red” needles attached but the total load is lighter, more like model 12, can be represented because of the earlier high intensity and quicker area involvement.

The 1978 NFDRS fuel model I is represented. Areas most commonly fitting his model are old-growth stands west of the Cascade and Sierra Nevada Mountains. More efficient utilization standards are decreasing the amount of large material left in the field.

**Fuel model values for estimating fire behavior**

Total fuel load, < 3-inch dead and live, tons/acre	58.1
Dead fuel load, ¼-inch, tons/acre	7.0
Live fuel load, foliage, tons/acre	0
Fuel bed depth, feet	3.0

**For other slash situations:**

- Hardwood slash.....Model 6
- Heavy “red” slash.....Model 4
- Overgrown slash.....Model 10
- Southern pine clearcut slash.....Model 12

The comparative rates of spread and flame lengths for the slash models at 8 percent dead fuel moisture content and a 5 mi/h (8 km/h) mid-flame wind are:

<b>Model</b>	<b>Rate of spread Chains/hour</b>	<b>Flame length Feet</b>
11	6.0	3.5
12	13.0	8.0
13	13.5	10.5

# Appendix VI

## Maps