Fire Management

INTRODUCTION

The Role of Fire

Fire is an ecological process—similar to wind, insects, disease, or floods—but unlike these other processes, fire is also used as a tool by the Forest Service and other agencies to manage natural resources. Therefore, land managers plan for fire use, whether it is through prescribed fire (ignited by humans), or wildland fire (ignited by lightning), to achieve management objectives. These objectives often include modifying fuels to reduce the risk of wildfires or to achieve desired vegetative conditions, treatment of fuels generated from management activities, and wildlife habitat improvement. Use of fire to achieve management objectives intentionally or unintentionally affects ecosystem processes and can mimic the effect of historical disturbances.

Forest fire management programs oversee all aspects of fire use and fire suppression. Fire suppression actions are conducted on wildfires (defined by policy as an "unwanted wildland fire"). Wildfires include fires started by humans other than agency personnel, lightning-ignited fires that are not managed for wildland fire use, or prescribed and wildland fires managed for fire use that are no longer meeting the prescriptive criteria. Fire suppression includes a full range of options, from very resource intensive (large numbers of personnel and equipment) to less intensive activities (few personnel and minimal equipment). The decision to use one or a combination of options over others depends on many factors, including threats to life, property, and investments; fuel and weather conditions; natural resource concerns; terrain; and available resources such as personnel and equipment.

Wildland-Urban Interface

Wildland-urban interface is the line, area, or zone where structures and other human developments meet or intermingle with wildland or vegetative fuel. Population growth, particularly in the West, has led to an increase in interface areas. More people are living in small communities and commuting to work in larger metropolitan areas. Isolated subdivisions adjacent to larger communities are also being developed. In recent years the number of communities threatened or affected by wildfire has increased. To address this concern, as well as concerns about effects of wildfires on natural resources, the Secretaries of Agriculture and the Interior were directed to develop a strategy to address severe wildland fires, reduce fire impacts on rural communities, and ensure effective firefighting capability in the future. This strategy—which includes national strategic and implementation goals and plans, budget requests and appropriations, and agency action plans—is known collectively as the National Fire Plan.

The presence of interface affects all fire management decisions in interface areas. While a wide range of fire management options are available by policy, these options are usually narrowed in interface zones due to the concern that the fire may move from federal to private lands. Therefore, suppression costs are often higher adjacent to interface areas, and the ability to manage vegetation, particularly vegetation that historically burned lethally, is sometimes reduced.

Additionally, the risk of human-caused fires originating from the wildland-urban interface zone and spreading to federally protected lands is increasing. These fires often occur during burning conditions that are more extreme than those associated with natural ignitions, and therefore these fires can be more destructive and more expensive to suppress. This is especially true where hazard ratings for vegetation are high to extreme.

Definition of Wildland-Urban Interface

There are many different definitions for wildland-urban interface, including those found in the National Fire Plan. In January and August 2001, a list of "Urban Wildland Interface Communities" was published in the Federal Register identifying National Fire Plan communities of concern in each state. Prior to this list, however, fire management personnel in the Ecogroup had identified sixth-level hydrologic units (subwatersheds) that had one of the following categories of characteristics:

1. Wildland/urban interface—developed areas with private residential structures where many structures border wildland on a broad front.
2. Wildland/rural interface—developed areas with private residential structures where developments are few in number, scattered over a large area surrounded by wildland.
3. Other developments not assigned above, such as administrative sites like guard stations or lookouts that are not privately owned; or privately owned structures that did not fit into categories 1 and 2 above (for example, a single structure or organization camps).
4. No structures.

Subwatersheds rather than point locations were selected for characterizing interface to provide a context for conditions at a broader scale, rather than considering only the area immediately adjacent to interface. This broader scale is important because it helps define treatment areas and strategies that facilitate wildfire suppression before fires become large and difficult to control (Agee et al. 2000, Finney 2001).

Not all subwatersheds that contained structures or that had one of the above characteristics were designated interface. Due to the variability from subwatershed to subwatershed of the number of structures, their location, and how concentrated the developments were, each subwatershed was evaluated by District personnel familiar with the area to make the final determination. In some cases, for example, subwatersheds contained private residential structures, but were not designated as interface because the structures were too far from the National Forest boundary.

The published list of National Fire Plan communities was screened to identify communities that occur within or adjacent to the Ecogroup. These communities were compared against the subwatersheds identified as interface by each Forest (Figures FM-1 through FM-3). In most cases there was good correlation between the interface subwatersheds and those National Fire Plan communities of concern to the Ecogroup. Exceptions included a few communities that occur close to the Forest boundary but where the location of the developments does not influence Forest decisions. Commonly however, more area was characterized as interface than would be identified from the point location of a National Fire Plan community. In general, the interface subwatersheds captured the greater extent of development associated with a National Fire Plan community. In addition, the subwatersheds identified areas of concern to the Forests not listed by the National Fire Plan, such as summer home tracts.

Interface subwatersheds were used in this analysis. Only Category 1 and 2 subwatersheds (listed above under *Definition of Wildland-urban Interface*) were evaluated, because the concerns regarding interface are primarily related to these characteristics.

Figure FM-1.

National Fire Plan Communities & Wildland/Urban Interface Sub-Watersheds
Boise National Forest

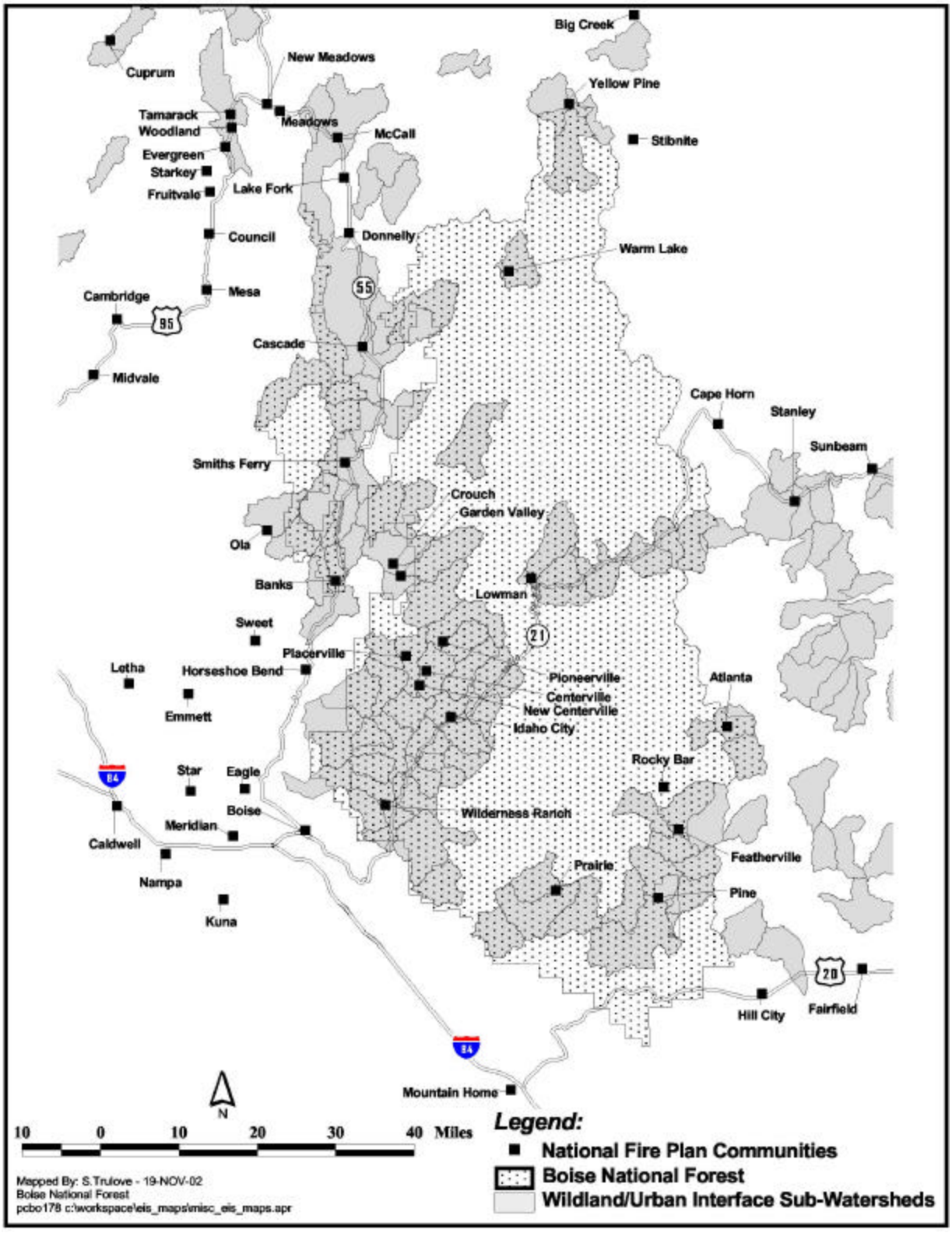


Figure FM-2.
National Fire Plan Communities and Wild land/Urban Interface Subwatersheds
Payette National Forest

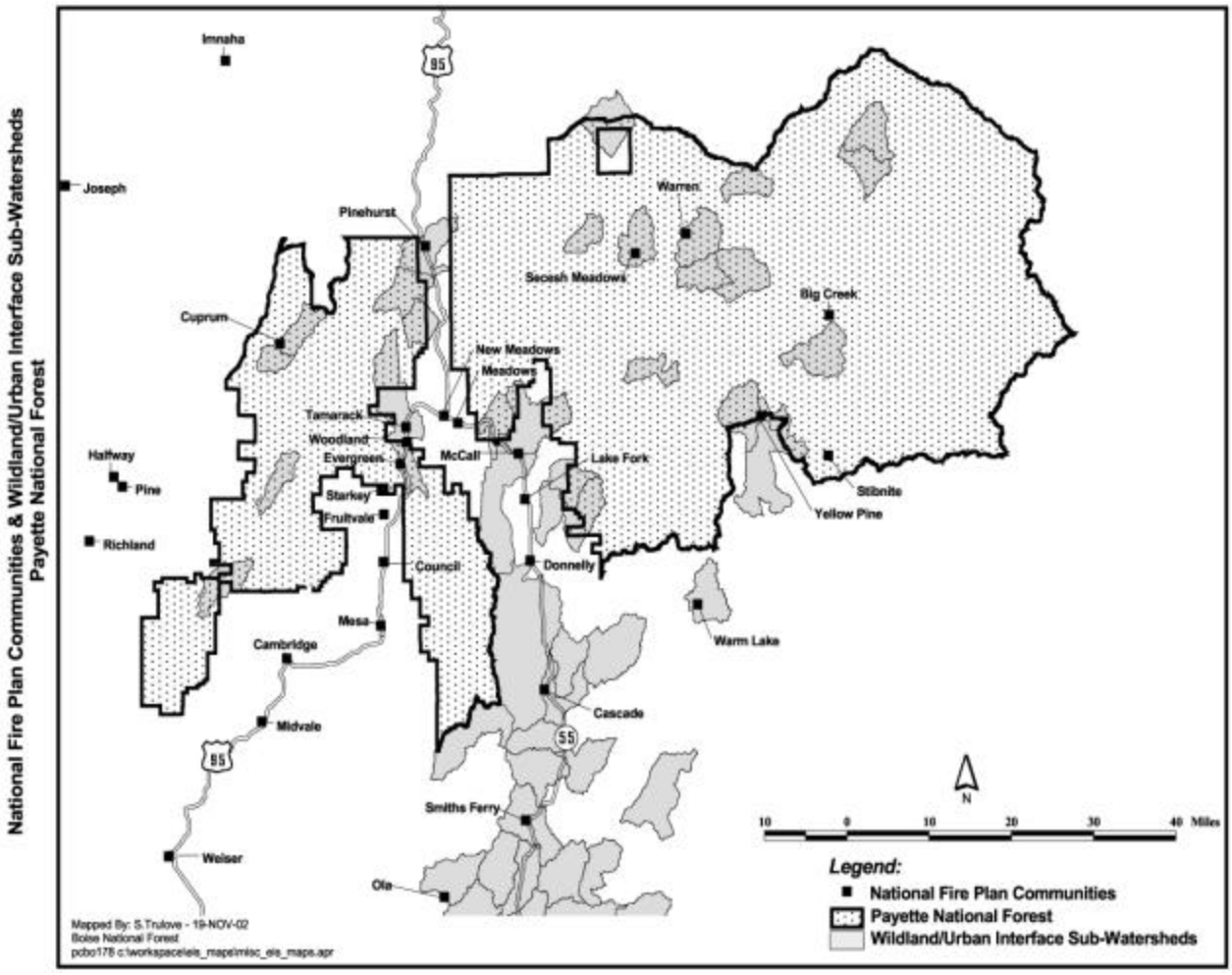
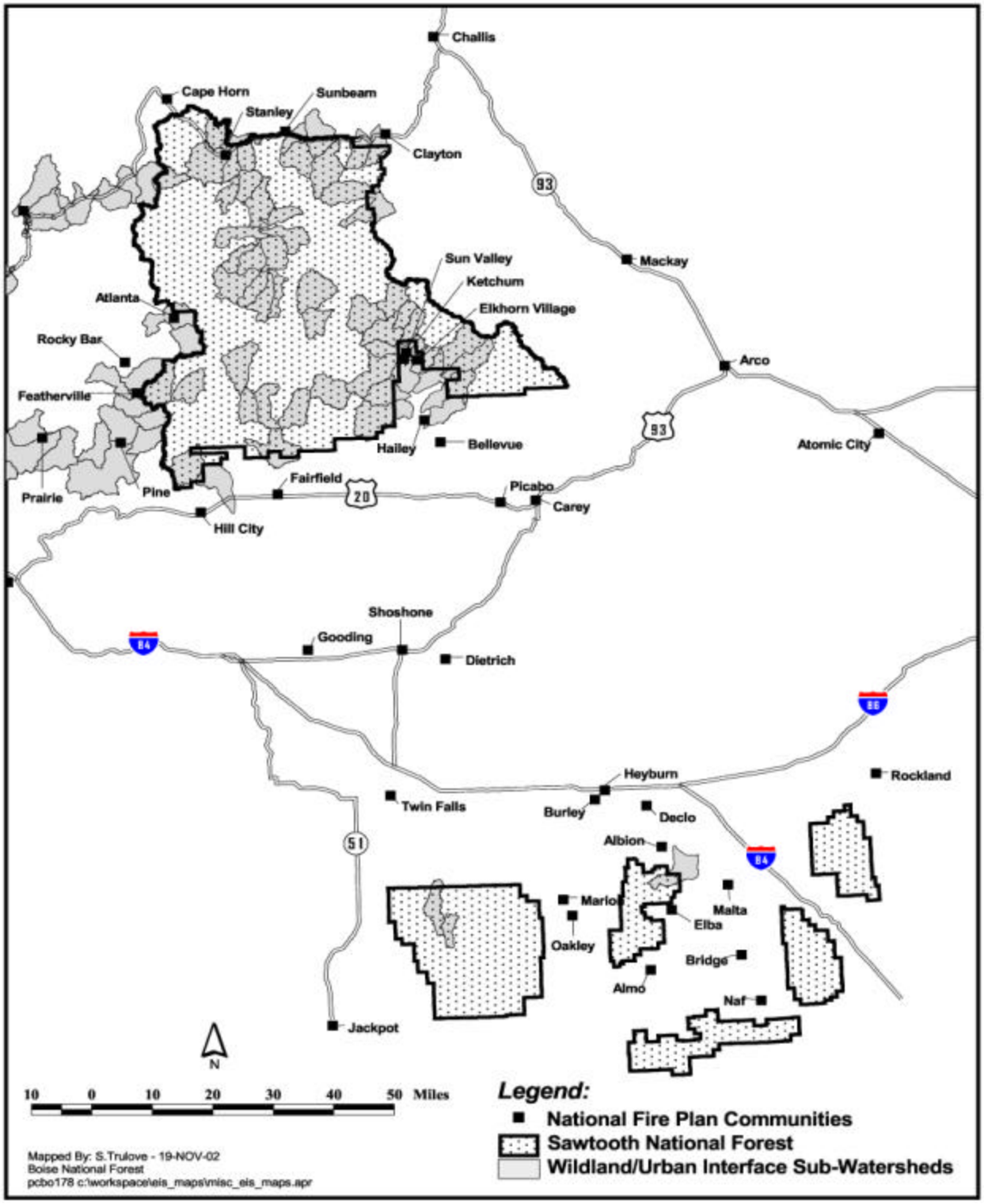


Figure FM-3.

National Fire Plan Communities & Wildland/Urban Interface Sub-Watersheds
Sawtooth National Forest



Issues and Indicators

The effects of the mix of tools on vegetative conditions by alternative are described within the *Vegetation Diversity* and *Vegetation Hazard* sections in this chapter. The effects of these tools on other resources are described in the various resource sections. This section will address the issues described below.

Issue Statement for Issue 1 - The Role of Fire: Forest Plan management strategies may affect the restoration and maintenance of the ecological role of fire on the Forests.

Background to Issue 1: Forest Service fire personnel expressed concerns about meeting the intent of the changes articulated initially in the 1995 Fire Management Policy and Program Review and subsequently in the National Fire Plan. Issues raised to date have included how past land management activities and decisions have affected the role of fire as an ecosystem process, as well as the potential for large wildfires. Generally the public agrees that there is a need to address the risk of large wildfires. However, there is strong disagreement as to what are the appropriate methods to address this concern. Research has shown that fire plays important ecological roles in ecosystem processes and functions such as landscape dynamics, nutrient cycling, and germination or regeneration of many graminoid, forb, or shrub species (Arno et al. 1993, Arno et al. 1995, Covington et al. 1997, Harrington 1996, Kauffman 1990, Lyon et al. 1978, Morgan and Murray 2001, Newland and DeLuca 2000, Romme 1982). Some members of the public felt that using fire rather than timber harvest destroyed valuable timber resulting in lost economic opportunities, reduced wildlife habitat, and increased sedimentation. Others felt that use of timber harvest rather than fire resulted in similar resource effects.

Indicator for Issue 1: The following indicator will be used to measure how well the alternatives restore or maintain the ecological role of fire in ecosystems:

Percentage of acres treated using fire compared to estimated historical acres burned, by Forest - Alternatives vary based on the Management Prescription Categories (MPCs) assigned that determine mixes of vegetation management treatments (fire, mechanical, chemical, or combinations). The interaction of MPCs, current conditions, goals, constraints, and desired conditions determines the amount of fire that may be used. In some cases, MPCs limit the use of fire to treat vegetation (e.g., MPC 5.2). In other cases, fire is the only vegetation management tool available (e.g., MPC 1.2).

Issue Statement for Issue 2 - Wildland-Urban Interface: Forest Plan management strategies may affect the amount of vegetation at risk to wildfire, and at what rate hazardous conditions are reduced in areas where there are threats to life and private property (wildland-urban interface).

Background to Issue 2: Concerns regarding interface were raised initially during the 1995 Fire Management Policy and Program Review. The review noted that while fire protection and prevention in wildland-urban interface were not new problems, fuel build-ups and population growth had increased risks. Resources available to suppress wildfires were often spread thin, jeopardizing property, natural resources, firefighter, and public safety. Property losses and expenditures to suppress wildfires were all increasing. These concerns were highlighted during

the 2000 fire season when over 8,000,000 acres burned nationally (NIFC 2003). During this fire season 2.3 times more acres burned than the annual average from 1990 through 1999. During the 2000 fire season, 861 structures were lost to wildfire. In 2001, while the acres burned nationally were similar to the 10-year average, 731 structures burned. These wildfires provided poignant examples of wildfire risks in wildland-urban interface and have generated much public concern.

The 2000 fire season resulted in the National Fire Plan, which was developed in part to address the increasing concern about the risks and impacts of wildfires on wildland-urban interface. The National Fire Plan provides a strategic framework for addressing these risks, including identifying the roles of federal, tribal, state, and private land managers and owners in risk management. The plan also provides funding for a variety of actions. These actions include fuels reductions designed to increase the chances of suppressing wildfires while they are still small and of low intensity in areas where large wildfires are a concern. Such reduction will in turn increase firefighter and public safety and decrease threats to communities.

In addition to fuels reduction, the National Fire Plan increases funding for community-based programs like "Firewise" that provide support and education to homeowners regarding the efforts they can undertake to decrease the risk of their homes burning in the event of a wildfire. Research has shown that the potential risk of a structure burning from a wildland fire is highly dependent on the structure's design and materials, and the vegetative conditions immediately surrounding it (Cohen 1999). Two separate studies cited by Cohen found that 86 and 95 percent of the structures with nonflammable roofs and a fuels clearance of 30 feet or more survived lethal fires in California.

The National Fire Plan has highlighted the need for land management agencies to clearly define their role in interface areas, and to develop clear expectations regarding wildland fire before a fire starts rather than after it is burning. Part of this effort includes considering interface during land management planning, particularly as it relates to reducing hazards. In addition, the National Fire Plan identified the need for federal land managers to work with states, counties, and private landowners to clearly identify roles and responsibilities.

Indicators for Issue 2: The following indicator will be used to determine how well alternatives reduce the risk of wildfire within the interface:

MPCs assigned to wildland-urban interface subwatersheds for each alternative and how they address the risk of wildfire (uncharacteristic and those that may result from high resistance-to-control) in forested vegetation by Forest - The current forested vegetation uncharacteristic wildfire hazard index was determined for all subwatersheds (see the *Vegetation Hazard* section for an explanation of the index). Based on the hazard index, subwatersheds were assigned a low, moderate, high, or extreme rating for uncharacteristic wildfire hazard. Hazard indexes for subwatersheds assigned to a Category 1 or 2 interface were extracted as a subset of the forest-wide subwatershed assignments. The *Vegetation Hazard* section provides an indication, by alternative, of the forest-wide changes that occur over time in conditions that contribute to uncharacteristic wildfire hazard. This includes changes in conditions within and adjacent to interface subwatersheds. In the interface subwatersheds, MPCs provide a relative indicator, by

alternative, of how much and at what rate vegetation may be treated toward achieving forest-wide reductions in hazardous conditions. This includes treating conditions that contribute to uncharacteristic wildfire hazard or high resistance-to-control.

Affected Area

Direct and indirect effects on the role of fire use and wildfire risk in wildland-urban interface are analyzed on lands administered by the three National Forests in the Southwest Idaho Ecogroup. This area represents National Forest System lands where fire management activities may take place. Cumulative effects for both issues include other land ownerships within and adjacent to lands administered by the three National Forests, particularly in areas of wildland-urban interface. This larger area is considered to incorporate concerns to and from other landowners with regard to the potential effects on or from these intermingled properties. This approach appears to be consistent with the coordination that is expected to take place between the states, counties, other federal agencies, and private landowners under the National Fire Plan.

CURRENT CONDITIONS

The Role of Fire

The total numbers of fire ignitions (lightning and human-caused) were similar for the Boise and Payette Forests; they averaged 154 and 128 per year, respectively, from 1991 through 2000 (see the *Vegetation Hazard* section, Table VH-17). Lightning accounted for 83 percent of the total number of ignitions. The total number of ignitions on the Sawtooth was much lower—an average of 47 per year for the same time period—and lightning only accounted for 55 percent of the total ignitions (21 human-caused versus 26 lightning-caused).

Forested Vegetation Fire Regime Groups

Fire regimes describe the type of fire that generally occurs in an ecosystem. Four fire regimes are defined for the Ecogroup area: nonlethal, mixed1, mixed2, and lethal. Fire regimes are used to describe the types of effects that may result from burning. The mortality, patch sizes, consumption of organics, and other changes that result from nonlethal fire are much more subtle and of smaller scale than the changes that occur from lethal fire (See the *Introduction, Table 3-2* and the Description of Fire Regimes in this section for more information). Mixed fire regimes (mixed1 and mixed2) are intermediate to the nonlethal and lethal.

Ecogroup fire regimes were compared to those defined for the National Fire Plan (Schmidt et al. 2002). National Fire Plan fire regimes are described as fire frequency (the average number of years between fires) and the effect of the fire on the dominant overstory vegetation. The relationship of the Ecogroup to National Fire Plan fire regimes is as follows:

- Nonlethal — I (0-35 year frequency, low)
- Mixed1 — III (35-100+ year frequency, mixed)
- Mixed2 — III (35-100+ year frequency, mixed)
- Lethal — V (200+ year frequency, stand-replacing).

Table FM-1 displays the percentage of total forested acres by historical fire regimes in the Ecogroup area by Forest. The number of acres in each forested fire regime group was determined by assigning Potential Vegetation Groups to fire regimes as follows:

- Nonlethal — PVG 1, PVG 2, PVG 5
- Mixed1 — PVG 3, PVG 6
- Mixed2 — PVG 4, PVG 7, PVG 11
- Lethal — PVG 8, PVG 9, PVG 10.

Table FM-1. Percentage of Total Forested Acres by Historical Fire Regimes in the Ecogroup

Area	I[1]-Nonlethal	III-Mixed1	III-Mixed2	V-Lethal
Boise NF	36	16	32	16
Payette NF outside of the Frank Church - River of No Return Wilderness	27	17	36	20
Frank Church - River of No Return Wilderness	24	7	53	16
Sawtooth NF outside of the Sawtooth Wilderness	3	4	74	19
Sawtooth Wilderness	16	1	56	27
Ecogroup	25	12	45	18

[1]I, III, and V are National Fire Plan Fire Regimes that are equivalent to Ecogroup historical fire regimes.

Assuming an average historical fire return interval for each fire regime (18 years for nonlethal, 36 years for mixed1, 85 years for mixed2, and 103 years for lethal), an estimated 26 percent of the Ecogroup area forested vegetation may have burned each decade. This includes acres that historically burned with nonlethal to lethal intensities. Since 1991, an estimated 23 percent of the forested vegetation in the Ecogroup area has burned; 2 percent from fire use (prescribed and wildland) and 21 percent from wildfire. In many areas, the effects of these wildfires were much different than what would have occurred historically. The *Vegetation Hazard* section in this chapter contains more information about the historical role of fire as it relates to uncharacteristic wildfire hazard.

Non-forested Vegetation Fire Regime Groups

A total of eleven non-forested vegetation types were identified within the Ecogroup area. Four of the eleven are found on the Mountain Home District of the Boise Forest, and all eleven occur on the Sawtooth Forest. There were not enough acres of these vegetative types on the Payette Forest or outside of the Mountain Home District on the Boise Forest to represent in the non-forested vegetation modeling. Therefore, results presented below are for the southern end of the Boise Forest and the entire Sawtooth National Forest.

Non-forested vegetation types were assigned to fire regimes as follows:

- Mixed1 — Wyoming big sagebrush
- Mixed2 — Basin big sagebrush; low sagebrush; mountain big sagebrush; mountain big sagebrush with chokecherry, serviceberry, and rose; mountain big sagebrush with snowberry; mountain big sagebrush with bitterbrush; pinyon-juniper with mountain big sagebrush; pinyon-juniper with Wyoming big sagebrush
- Lethal — Pinyon-juniper; climax aspen

Mountain big sagebrush communities made up all of the non-forested vegetation evaluated on the Boise National Forest. This included cover types where mountain big sagebrush was dominant or co-dominant. Fire regimes in these cover types were defined as mixed2 for the vegetation modeling due to the fire effects on mountain big sage. However, some of the species that occur as co-dominants resprout following burning. In this case, for the community as a whole, fire regimes can vary from mixed1 to mixed2, depending on the species mix. Historical fire frequencies in mountain big sagebrush communities ranged from 15 to 40 years (Tirmenstein 1999).

Non-forested communities on the Sawtooth National Forest are much more diverse than those found on the Boise. Historical fire regimes in non-forested communities on the Sawtooth range from mixed1 to lethal. However, mixed2 fire regimes make up the majority of the area (about 95 percent). The mixed2 fire regimes in the non-forested communities coincide with the National Fire Plan Fire Regime II (0-35+ fire frequency, stand-replacing), and the lethal regimes with Fire Regime IV (35-100+ fire frequency, stand-replacing). Assuming an average historical fire return interval for each fire regime (40 years for mixed1, 20 years for mixed2, and 60 years for lethal), an estimated 44 percent of the Ecogroup non-forested vegetation may have burned each decade.

Current fire regimes in non-forested communities are much different than historical. In the non-forested areas, changes in fire return intervals represent the extremes, from much longer to much shorter than historical. In some areas intervals have been greatly lengthened by fragmentation that has resulted from conversion of areas to croplands and urban developments, fire exclusion, and livestock grazing that removes fine fuels, a primary carrier of fire in these communities. In other areas fire return intervals have been greatly shortened, in some cases to annually, due to the introduction of exotic species like cheatgrass.

Fire Use in the Current Plans

Under the current Forest Plans, fire (prescribed and wildland) is used to meet a variety of resource objectives. Wildland fire use is allowed in some management areas (described in the current plans as either unplanned ignitions or prescribed natural fire), but to date, wildland fire use has not been implemented outside the designated wilderness areas on any of the Ecogroup Forests. Wildland fire use has been implemented in the Frank Church - River of No Return Wilderness, Sawtooth Wilderness, and Hells Canyon National Recreation Area under individual fire management plans specific to those areas. Forest Plan revision proposes no changes to fire use programs in any of these wilderness areas.

Prescribed fire is used to treat fuels generated from timber harvesting or from natural vegetative development. Fire has also been used for site preparation before planting, to improve wildlife forage, or to meet other resource objectives. In the past 5 years, the use of prescribed fire has increased, as allowed within the current plans, due in part to concerns about increased fuels and changes in vegetative conditions that contributed to large, sometimes uncharacteristic wildfires that burned within the Ecogroup area in the 1980s and 1990s.

Wildland-Urban Interface

Of the 771 subwatersheds in the Ecogroup area, 159 were defined as interface. This number does not include developed areas within designated wilderness, as these are addressed in the wilderness planning process. Of the 159 interface subwatersheds, 47 percent are on the Boise, 17 percent on the Payette, and 36 percent on the Sawtooth. Throughout the Ecogroup area, interface occurs adjacent to National Forest System lands that historically were burned by nonlethal to lethal fires. Table FM-2 shows the percent of interface subwatersheds by Forest, and proportions of the subwatershed forested vegetation that were in historically nonlethal or mixed1 fire regimes.

Table FM-2. Percent of Historically Nonlethal or Mixed1 Forested Vegetation Fire Regimes in Interface Subwatersheds

Percentage of Historically Nonlethal or Mixed1 Forested Fire Regimes within Interface Subwatersheds	Percent of Interface Subwatersheds			
	Boise NF	Payette NF	Sawtooth NF	Ecogroup Total
Greater than 75%	25	0	0	11
51 to 75%	36	23	0	20
26 to 50%	28	33	2	20
Less than 25%	11	44	98	49

Of the subwatersheds identified as wildland-urban interface, 25 percent of those on the Boise have more than 75 percent of their forested acres in vegetative communities that historically burned with nonlethal or mixed1 fire regimes; only a few interface subwatersheds have less than 25 percent of the area in historically nonlethal or mixed1 forested fire regimes. None of the Payette or Sawtooth interface subwatersheds falls into the greater than 75 percent nonlethal or mixed1 category. On the Payette, 23 percent of the interface subwatersheds have more than half of their forested acres in historically nonlethal or mixed1 forested fire regimes. However, the largest number of interface subwatersheds occur in areas with the least amount of historically nonlethal or mixed1 fire regimes. Most of the Sawtooth interface subwatersheds fall into the category where the least amount of forested vegetation historically burned under nonlethal or mixed1 fire regimes.

Uncharacteristic Wildfire Hazard and Resistance-to-Control

Subwatersheds were determined to have low, moderate, high, or extreme uncharacteristic wildfire hazard indexes based on vegetative conditions that can contribute to the risk of uncharacteristic lethal wildfire (see the *Vegetative Hazard* section, Figure VH-1). Subwatersheds with a high or extreme uncharacteristic wildfire hazard indexes generally have a

higher percentage of historically nonlethal or mixed1 fire regimes that have recently become more lethal due to alterations in stand size, canopy closure, and species composition (Graham et al. 1999). However, a subwatershed assigned to a low hazard index may still have largely lethal fire, and be rated low because this was the historical fire regime. The uncharacteristic wildfire hazard index does not include the risk of all mixed2 or lethal fires because in many areas these regimes are characteristic and therefore do not fit the definition of uncharacteristic wildfire hazard (Brown 2000). An example of this is on the Sawtooth Forest where most of the interface subwatersheds are predominately in mixed2 or lethal fire regimes. In this case, these types of fires are characteristic, but because they are in interface, they are generally undesirable. Wildfires that tend toward lethal generally have high resistance-to-control whether they are burning uncharacteristically or characteristically. Treatment strategies and goals may vary depending on the whether the vegetative conditions that contribute to the risk of wildfire are from mixed2 or lethal fires that are characteristic or uncharacteristic for the vegetative types being targeted.

The majority of the interface subwatersheds with high or extreme forested vegetation uncharacteristic wildfire hazard indexes occur on the Boise Forest (Table FM-3). Here, as well as on the Payette, the majority of the interface subwatersheds have extreme or high indexes. These indexes indicate that vegetative conditions in those interface subwatersheds are such that a wildfire today could have much different effects than fires that burned historically. This is primarily due to increases in stand density and changes in the distribution of size classes or species. In most cases, however, the majority of the uncharacteristic wildfire hazard is generated by shifts from less to more dense vegetative conditions (high canopy closures). The high and extreme hazard conditions are the most departed from historical, and they generally represent a shift from nonlethal or mixed1 fire regimes to mixed2 or lethal fire regimes.

Table FM-3. Percent of Interface Subwatersheds by Forest and Forested Vegetation Uncharacteristic Wildfire Hazard Indexes

Subwatershed Forested Vegetation Uncharacteristic Wildfire Hazard Index	Percent of Interface Subwatersheds			
	Boise NF	Payette NF	Sawtooth NF	Ecogroup Total
Low	3	20	44	22
Moderate	8	20	35	20
High	19	28	21	22
Extreme	70	32	0	36

None of the interface subwatersheds on the Sawtooth Forest have an extreme hazard index although some are high. For the Ecogroup area, the Sawtooth accounts for most of the interface subwatersheds with moderate or low uncharacteristic wildfire hazard indexes. In general, few forested areas on the Sawtooth contain much vegetation that historically burned with nonlethal or mixed1 fire regimes (Table FM-2). Here the majority of the interface subwatersheds were historically mixed2 or lethal. Current fire regimes are more similar to the historical, and

therefore, the risk of uncharacteristic wildfire is mostly low. However, this does not mean the risk of wildfire is low. In many areas, vegetative conditions are such that a mixed2 or lethal fire will likely occur in the future.

Resistance-to-control describes the vegetative conditions that, under the same weather and topography, lead to a higher likelihood of fire behavior that makes the fire difficult to suppress. This can include fires that produce uncharacteristic effects as described above, or fires that burn characteristically. However, even for those that burn characteristically, some wildland fires may still be considered wildfires because they are unwanted, due in this case to the presence of wildland-urban interface.

There are a variety of vegetative conditions that contribute to high resistance-to-control. These include high stand densities, large amounts of continuous ground fuels, multi-storied vegetative layers that connect vegetation vertically (ladder fuels), and a high number of more flammable tree species. All these conditions contribute to the risk of crown fires that are often more difficult to suppress (Scott 1998). In addition to areas with high or extreme uncharacteristic wildfire hazard, those areas with resistance-to-control increase the number of subwatersheds that are at risk to lethal wildfire. This risk is greatest for subwatersheds that have large amounts of area in the mixed2 or lethal historical fire regimes. This is the case for many of the interface subwatersheds on the Sawtooth. Here, 98 percent of the interface subwatersheds have less than 25 percent of their forested area in the nonlethal or mixed1 fire regimes (Table FM-2). This conversely means that greater than 75 percent of the forested acres are in the mixed2 and lethal historical fire regimes. On the Payette, 44 percent of the interface subwatersheds are in these historical fire regimes.

ENVIRONMENTAL CONSEQUENCES

Effects Common to All Alternatives

Issue 1 – The Role of Fire

Resource Protection Methods

Fire use, though an important ecosystem process, can have adverse effects under certain conditions. Forest Plan direction is intended to help define those situations where fire use will be limited or is not appropriate because of potential adverse resource or social-economic impacts. This is accomplished through goals and objectives to identify areas where fire use is appropriate, or through standards and guides designed to limit fire effects where it is not appropriate. Fire Management Plans identify prescriptive criteria for wildland fire use that best achieves Forest Plan desired conditions and goals, and may contain additional requirements to address local concerns. Additional planning processes, such as the Wildland Fire Situation Analysis or site-specific analysis for prescribed fire, address the potential effects and risks of fire use, including the possibility of an escaped fire. Part of the decision criteria to determine whether a lightning ignition will be managed for wildland fire use is whether the fire will benefit or negatively affect resources, or grow beyond a predetermined boundary.

Fire Use Planning Areas

Forest Plans delineate prescribed fire and wildland fire use areas (*FS Manual 5141.1*). Fire Management personnel familiar with the Forests designated fire use planning areas. The prescribed fire planning area includes all management areas in the Ecogroup. Delineation of Wildland Fire Use planning areas considered proximity to designated wilderness, area size, location of administrative boundaries, adjacency to wildland/urban interface, and other local considerations, and included parts or all of some management areas. The planning areas do not change by alternative. The Forest Plans describe which management areas, or portions thereof, that may implement wildland fire use for the selected alternative. The Fire Management Plan developed to implement the Forest Plan aggregates these areas identified at the management area level and further refines boundaries within the overall planning areas. Criteria will be developed to ensure that implementation of wildland fire use is consistent with Forest Plan direction.

General Effects

Fire contributes to a host of functions and processes in ecosystems. Fire reduces accumulations of organic material, which in turn reduces wildfire hazard (Harrington 1996). Fire recycles nutrients and alters soil chemistry, aids in decomposition, and influences soil structure and stability (Arno et al. 1995, Covington et al. 1997, Kaufmann 1990). Fire alters vegetative characteristics that contribute to coarse- and fine-scale vegetative mosaics (Arno et al. 1993, Romme 1982). Fire also modifies vegetative succession, providing early seral stages important to some wildlife species (Lyon et al. 1978). Fire effects can vary depending on fire intensity, severity, and frequency, the primary factors that define fire regimes.

The effects of not using fire are also the same across the alternatives. Acres not treated (with fire, mechanical, chemical, or combinations) will continue to advance toward climax successional stages, and understory seral species (shrubs and herbs) may decline or become more decadent. Coarse- and fine-scale landscape patterns will become more homogenous as succession advances (Hessburg et al. 2000). Ecosystem processes and functions—like nutrient cycling, in which fire was historically a primary agent—will be affected, as there is no substitute for fire in achieving these effects.

Effects by Management Prescription Category

Vegetation management activities that include fire use are the same for each alternative as defined by the Potential Vegetation Group (PVG) or non-forested cover type and the Management Prescription Category (MPC). That is, the treatments that determine fire use in PVG 2 for MPC 3.1 are the same from one alternative to the next. The PVGs and non-forested cover types were used to represent ecologically appropriate kinds of fire use (replace, reset, or maintain) based on the historical fire regimes. For example, fire in nonlethal fire regimes that burned frequently was primarily used to alter vegetative density (reset) or maintain the current vegetative conditions. Stand-replacing fire was represented only occasionally, as this was considered to occur infrequently under the historical fire regime. In contrast, stand-replacing fires were often applied in vegetative communities that were historically lethal. In addition, a small amount of nonlethal fire was represented in mixed2 and lethal fire regimes, as these kinds of fires were part of the historical fire mix.

The MPCs were used to represent a mix of vegetation treatment tools where appropriate, given the theme of the MPC. (See *Appendix B* for a more detailed description of how tools related to MPCs were represented in modeling.) The effects of fire on vegetation, soils, visuals, etc. described by one PVG or non-forested cover type-MPC combination in any alternative is the same as that combination in another alternative. The differences in fire use between the alternatives are the result of various mixes and amounts of PVG/cover type and MPC combinations.

Description of Fire Regimes

Fire Intensity and Severity in Nonlethal Fire Regimes - Nonlethal fires influence vegetation, soils, nutrients, and other resources. Vegetative compositions tend to stabilize following disturbance within the first 5 to 10 years (Morgan and Neuenschwander 1988, Stickney 1986). Generally by year 5, those species that will make up the majority of the vegetative community will have established either through buried, windblown, or other kinds of off-site seed transport, or by resprouting. Mineral soil exposure, in most cases, is a temporary effect in this fire regime. Typically, soil cover is quickly re-established either by live vegetation or litter. However, where native grasses have been reduced through fire exclusion, live vegetative cover may take more time to develop. One intent of burning in nonlethal fire regimes is to reduce duff and litter accumulations and promote graminoid cover common to these vegetative communities. Over time, the understory vegetation, particularly graminoids, should increase, providing soil covers from live vegetation and litter. Understory shrubs, including rhizomatous and early seral species that develop from seed, will also increase as stand densities decline and top-killing promotes resprouting (Arno et al. 1995, Kauffman 1990). Tree mortality in forested areas will contribute to snag and coarse wood in the years immediately following the disturbance. This may result in an increase in small coarse wood in the short term as smaller understory conifers are killed. In the long term, however, the amount of coarse wood in fine and small fuels should decline, particularly after multiple fire applications, leaving primarily the larger-diameter woody debris.

Fire Intensity and Severity in Mixed1 Fire Regimes - Effects in this fire regime are similar to the nonlethal except that mortality patches are larger and more mineral soil may be exposed. This is due to the vegetative communities that make up the mixed1 fire regime in the Ecogroup area. They contain a higher density of shrubs or are more productive than those found in the nonlethal fire regimes, and therefore can produce more fuels. In forested ecosystems, fire intensities may result in more coarse wood being produced in both the short and long term from greater tree mortality. Exposed mineral soil will likely also be greater due to the higher severity, particularly in areas with high shrub densities. However, graminoid understories are common, and many of the shrubs that maintain high coverage through succession are rhizomatous, or have other mechanisms that allow them to persist after disturbance. Such shrubs include white spirea, common snowberry, ninebark, cherries, gooseberries, and blue huckleberry (Steele et al. 1981). These shrubs can resprout quickly and can increase in density and extent (Crane et al. 1983, Lyon 1971, Owens 1982, Morgan and Neuenschwander 1988), acting to stabilize the soil and produce litter covers.

Fire Intensity and Severity in Mixed2 Fire Regimes - The effects of treating acres in this fire regime are different than the nonlethal and mixed1 fire regimes. Here, fire intensities and severities are greater. By definition, the dominant effect in the mixed2 fire regime is more

extensive areas of mortality—from less than 1 acre to almost 25,000 acres in forested ecosystems (Agee 1998)—and larger areas of higher severities. This is particularly common in areas where lodgepole pine or whitebark pine are early seral species. Therefore, these types of fires have greater temporary, short-term, and long-term effects than the nonlethal or mixed1 fire regimes. Due to shorter growing seasons or in some cases, dry conditions, vegetative communities typically take longer to re-establish than in more mesic areas. Therefore, areas of exposed soil can last longer. Also, in forested areas the flux of snags and coarse wood is more erratic than in the nonlethal or mixed1 fire regimes due to the time lag between events, the amount of mortality that occurs, fall-down rates, and even weather conditions (Stevens 1997). However, under-burning is also a component of this fire regime, both temporally and spatially. That is, some areas may be underburned by the same fire that creates a mixed2 mosaic, or one or more underburns may occur in a stand before conditions are such that a subsequent fire is larger and more lethal. The underburning events are more like the effects described for the nonlethal or mixed1 fire regimes.

Fire Intensity and Severity in Lethal Fire Regimes - This fire regime contains forested vegetative communities in which lodgepole pine, climax aspen, or juniper is a dominant landscape species. In some cases, such as PVG 10 (persistent lodgepole pine) or climax aspen, these two species are the only ones that dominate through succession. In this case, fire and sometimes insects or disease work in combination to redistribute landscape mosaics. In other forested vegetative communities included in this group, lodgepole pine is an early seral component giving way to climax species such as Engelmann spruce and subalpine fir. Pinyon-juniper communities are somewhat different in that other species such as grasses or sagebrush may be dominant for a time until excluded by juniper.

Fire intensities and severities are greatest in the lethal fire regimes. Agee (1998) reported patch sizes in this regime can exceed 10,000 acres in forested areas. As with the mixed2 fire regimes, nonlethal or mixed severity fires can also occur intermediate to the lethal events. Several factors contribute to the eventuality of a lethal fire, including the age of landscape mosaics and the species that comprise them, the development of natural fuels, endemic and epidemic insect outbreaks, and weather.

Lethal fires can have the most dramatic effects on the landscape given the high intensities that contribute to large mosaics of dead vegetation. Vegetative establishment in these communities can be slow. In forested communities where lodgepole pine dominates, this can be due to very cold conditions found in frost-pockets, or in excessively wet areas where high water tables occur. In non-forested communities establishment may be slow due to dry conditions, particularly in areas with shallow soils. Therefore, re-establishment of soil covers can take a long time, depending on the vegetative communities present before the disturbance. In some areas, herbaceous species quickly re-establish, either from plants present before the fire or from seed. In other areas, particularly where rhizomatous shrubs occur, these species can resprout, forming a dominant cover that provides soil cover from litter fall over time. In forested and woodland areas, snag and coarse wood development is similar to that described for the mixed2 fire regime but at a larger scale, with more lag time between input events.

Effects of Prescribed Fire Versus Wildland Fire Use

Prescribed fire or wildland fire is used to achieve management objectives such as those described for the fire regimes. Therefore, implementation of either will occur within certain parameters (prescriptions). However, prescribed fire and wildland fire use may be implemented at different times during the burning season and therefore have somewhat different effects. Prescribed fires are often conducted in the spring and fall within burning windows that are developed to ensure that the effects meet resource management objectives. Conversely, lightning produces the ignitions that may be managed for wildland fire use. The conditions with the greatest chance of producing an ignition are dry lightning (lightning that occurs from storms that produce little rainfall in the strike area) and low fuel moistures (Rorig and Ferguson 2002). Within the Pacific Northwest, these conditions occur most commonly in July and August. Therefore, wildland fire use may more often be implemented under drier conditions than those that take place within prescribed fire burning windows. Within a range of desirable effects, fires implemented in the spring or fall are more likely to be of lower intensity and severity than ignitions that occur in the summer. In addition, the potential extent of wildland fires, depending on the location of the ignition, is greater due to these drier conditions. Ignitions that occur in areas with few natural fuel breaks could be extensive and burn for long time periods depending on subsequent weather.

Issue 2 - Wildland-Urban Interface

Development of interface zones would be the same for all alternatives, as most growth is occurring on private lands adjacent to National Forest System lands. There are no anticipated increases in private residential structures on National Forest System lands; for example, in summer home areas. Therefore, the alternatives would have no effect on changes in interface development.

The alternatives would have no effect on suppression actions for private residential structures, as this is determined by policy and will not vary by alternative. National Forest Service policy states that interior and exterior structure fire suppression is the responsibility of the State, Tribal, or local fire departments. However in Idaho, the State does not have legislative responsibility for fire suppression. Therefore the responsible entity is the local fire department. Where a local fire department does not exist, the responsibility for structure suppression lies solely with the property owner. Within the Forest Service's protection area, the primary responsibility is to suppress wildfire before it reaches structures. The Forest Service may assist State and local fire departments in exterior structure fire protection when requested under terms of an approved cooperative agreement.

Response to wildland fire in or adjacent to wildland-urban interface subwatersheds could vary depending on management area direction. For example, an MPC of 1.2 (recommended wilderness) provides for a wider range of Appropriate Management Responses compared to an MPC of 5.2 (growth and yield). In reality, though, the presence of interface will not vary by alternative, and concerns related to threats to life and property may reduce or eliminate actual differences regarding implementation of Appropriate Management Responses, including fire suppression strategies, under any one alternative.

Resource Protection Methods

The primary protection method used in wildland-urban interface in the past has been fire suppression. The potential effectiveness of suppression varies depending on several factors, including weather, fuels, terrain, vegetative conditions, and available suppression resources. One of the goals of the National Fire Plan is to improve fire prevention and suppression efforts in order to reduce risk of loss of life, firefighter injuries, and damage to communities and the environment from wildfires. Another goal is to treat hazardous fuels. Small fires, particularly low-intensity burns in the understory, are much easier to suppress than high-intensity fires that have moved into stand crowns. Therefore, reducing hazards, both in terms of conditions that produce fires that are difficult to suppress (high or extreme resistance-to-control), as well as conditions that lead to uncharacteristic fires, can increase the likelihood of suppressing subsequent wildfires (Omi and Martinson 2002, Wagle and Eakle 1979). This strategy is particularly effective in historically nonlethal and mixed1 fire regimes, as these systems evolved with this type of disturbance, which can be maintained over time (Fulé et al. 2001, Omi and Martinson 2002).

Changing the distribution and continuity of vegetation and fuels on the landscape, particularly in historically mixed2 or lethal fire regimes, can also aid fire suppression efforts by providing fuel breaks or other kinds of conditions where fires can be suppressed (Deeming 1990, Finney 2001, Graham et al. 1999). This change is important because not all interface in the Ecogroup area occurs in areas with high risk of uncharacteristic wildfire; many are found in areas with potential for characteristic lethal fire, which makes suppression efforts more difficult because of conditions that increase resistance-to-control. Species mixes and vegetative development at the stand-level in these types tend toward lethal fire in the long term (Brown 2000, Omi and Martinson 2002). In addition, the presence of interface may reduce opportunities to use vegetation management tools, like wildland fire use, that could reduce vegetative hazard and break up vegetation and fuel continuity on the landscape in these fire regimes.

Vegetative treatments are only one aspect of reducing hazards in the wildland-urban interface. In all cases, the most effective protection methods are those conducted by property owners. These methods include building structures that are less likely to burn, using nonflammable building materials, landscaping with less flammable vegetation or modifying existing vegetation so that it is less hazardous, and developing defensible space.

The ability to meet protection objectives for wildland-urban interface will likely be most influenced by the type of vegetation adjacent to the interface area. Even though the goal is to reduce hazardous conditions and the risk of wildfire, some vegetative communities are more amenable to achieving this goal than others. Reducing the risk of lethal fire in ecosystems that were historically nonlethal emulates how these ecosystems function, and less hazardous conditions will be easier to maintain over the long term (Brown 2000, Scott 1998). In contrast, however, it will be difficult to maintain “nonlethal” or less hazardous conditions in ecosystems like lodgepole pine that were historically lethal (Brown 2000).

Effects by Management Prescription Category

How much a particular alternative reduces the conditions that may increase the risk of wildfire in part depends on the management goals (desired outcomes) and the tools used to treat vegetation. MPC-based indicators are intended to show relative differences between the alternatives rather than to represent actual number of acres treated. For the interface areas, the desired outcome, which is a reduction in hazardous conditions, is the same for all alternatives. The relative differences between the alternatives are the tools available to alter hazardous conditions. These differences can be described in terms of MPCs that use fire versus fire/mechanical treatments for vegetation management. The fire-only MPC group includes MPCs 1.1, 1.2, 3.1, 4.1a, and 4.1b. MPCs that allow a mix of fire and mechanical treatments are 3.2, 4.1c, 4.2, 4.3, 5.1, 6.1, 5.2, and 6.2. The implied difference between these groups is the amount of area that may be treated at any one time, the rate at which the vegetative conditions may be altered, and the ability to effectively change the conditions in an area, particularly one with high stand densities (Heinlein et al. 2000, Keifer et al. 2000).

In the fire only MPC group where it occurs within interface areas, prescribed fire (as opposed to wildland fire use) would be the primary fire management tool in order to control the effect and extent. Fewer acres would be treated at any one time compared to the fire and mechanical MPCs, particularly in areas with very hazardous conditions, due to the risks associated with treating this condition. The same area may require more than one treatment over time to move toward lower hazard depending on the starting conditions. Applying treatments to the same area multiple times reduces the opportunity to treat other areas, which reduces the total amount of area that can be treated over the same time period and thus the rate at which conditions can be changed. However, as stand or landscape conditions become less hazardous, fire could be used more extensively.

In areas that provide for fire and mechanical treatments, more acres may be treated at any one time compared to fire only since the use of fire and/or mechanical can be targeted to conditions where they can be most effective. This would also reduce the number of times that the same area would require re-treatment to move toward less hazardous conditions. Therefore, where fire and mechanical treatments are available in combination, more acres may be treated and conditions changed at a faster rate than in areas where fire is the primary vegetation management tool. However, an important assumption regarding the efficacy of fire/mechanical treatments is that fuels created by the mechanical activities are treated to a point where they do not result in post-treatment hazardous conditions (Brown 2000, Fulé et al. 2001, Graham et al. 1999).

Another consideration is the amount of area in different MPCs relative to the location of the interface in the subwatershed. For example, the tools provided by an MPC adjacent to an interface area in the bottom of a drainage may produce a much different treatment effect than the same amount of an MPC around an interface area situated along a ridgeline at the top of a long slope. There are also a host of other local site conditions—such as natural fuel breaks, topography, predominant local weather patterns, etc.—that can factor in to determine the actual relationship between hazard and risk (see the *Vegetation Hazard* section, Figure VH-1).

Direct and Indirect Effects by Alternative

Issue 1 - The Role of Fire

Fire use in the alternatives is defined as fire that maintains or alters the vegetation to achieve desired conditions. Fuels treatments not intended to meet vegetation management objectives were not included in the modeling. Examples of treatments that were not represented are natural fuels treatments that do not alter the vegetative conditions, or reduction of fuels produced by mechanical activities where the mechanical treatments by themselves alter the vegetation. Fire treatments included in the modeling were fire used alone or in tandem with mechanical activities to alter the density, maintain the current vegetative condition, or replace the condition to the earliest seral stage. Fire use acres are based on only the fire portion of fire/mechanical management activities that were modeled as occurring in concert over time.

Fire Use In Forested Fire Regime Groups

Frank Church - River of No Return (FC-RONR) and Sawtooth Wildernesses - Fire use in the FC-RONR and Sawtooth Wildernesses is implemented under Wilderness and Fire Management Plans specific to those areas. Since this Forest Plan revision proposes no changes to the fire use programs in these areas, one modeling scenario reflective of the current plan desired conditions and implementation was developed to determine overall effects. All fire use was modeled as wildland fire, although both plans allow for prescribed fire where boundaries, inholdings, or other resource concerns make wildland fire use infeasible. For the FC-RONR, modeled average fire use over the first five decades was 46 percent of the forested vegetation, which is an average of about 6,000 acres per year. This reflects the amount of fire use that has been implemented over the past decade. However, the extensive wildfires that burned through the Wilderness in 2000 may reduce this level of fire use over the next five decades from what was modeled. This reduction would allow for the development of more vegetative diversity through succession, as much of the Wilderness has been affected by fire over the past few decades.

Fire use in the Sawtooth Wilderness is much lower than in the FC-RONRW due to the lower ignition potential, the smaller size of the Wilderness, and the extensive natural fuel breaks in the form of rock and water. Here, fire use over the first five decades is only 4 percent of the total forested acres, or less than 100 acres per year.

Outside of Designated Wilderness - Over the first 5 decades, Alternative 4, followed by 6, treated the most forested acres on the Boise and Payette Forests, while on the Sawtooth, Alternative 7 treated the most area with fire (Table FM-4). On all three Forests Alternative 5 treated the least. Alternative percentages fell in the same order for the Boise and Payette; the order on the Sawtooth was different than the other two Forests. Desired conditions and the hazard reduction goals in Alternatives 2 through 7 are primary drivers for determining vegetative management treatments. MPCs define the mix of mechanical-fire use that occurs. These factors, in concert with each other, determine the amount of fire that results as an outcome of the modeling for each alternative.

Total acres, however, do not represent the full picture of fire use and effects. Ecosystem processes, functions, and structures have evolved under the different fire regimes described for the Ecogroup area. The impacts of where fire is or is not used are therefore most relevant within the fire regimes, as these provide the best context for evaluating effects. Therefore, the number of acres in the historical fire regime, and the number of acres treated by alternative for each fire regime can serve to compare the effects. This is described below as a percentage of the acres treated with fire for each alternative compared to the assumed historical acres burned.

Table FM-4. Percent of the Total Forested Acres Outside of Designated Wilderness Treated with Fire Use Over the First 5 Decades, by Alternative and by Forest

Forest	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Boise	21	46	47	71	14	64	42
Payette	26	36	36	57	15	49	34
Sawtooth	4	23	19	24	5	22	26

Nonlethal Fire Regimes - Alternatives 4 and 6 treat the most acres with fire in the nonlethal fire regimes in the first five decades on all three Forests (Table FM-5). The order of alternatives from most to least acres treated was similar between the Forests, with some minor differences. Alternative 5 on the Payette burned the fewest acres, whereas on the Boise and Sawtooth, Alternative 1B burned the least, and Alternative 5 was second lowest. Alternatives 2 and 3 were similar and fell between the others. The arrangement appears to be related to a combination of the number of acres in MPCs that emphasize fire use for vegetation management, the hazard reduction goals, and the desired conditions. For example, Alternatives 4 and 6 generally contain more nonlethal acres in MPCs that emphasize fire use. Conversely, in Alternative 5 the highest percentage of acres in the nonlethal fire regime on all three Forests fall into MPC 5.2. Fire use is lowest in this MPC compared to the others.

Table FM-5. Percent of the Historical Forested Nonlethal Fire Regimes Treated with Fire Use Averaged Over the First 5 Decades, by Alternative and by Forest

Forest	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Boise	27	100	110	165	30	142	79
Payette	49	92	95	159	35	128	76
Sawtooth	3	145	147	171	77	169	152

Acres in the nonlethal fire regimes were treated once or twice during the first five decades. The majority of these fire treatments were designed to reduce current stand density or to maintain an existing vegetative condition, such as large trees. Because much of the Forest's uncharacteristic wildfire hazard is located in this fire regime, these areas are a focus for hazard reduction activities. The current uncharacteristic wildfire hazard for the PVGs in this group is at least moderate, or more often greater (see the *Vegetative Hazard* section, Table VH-4).

In many cases, the first fire application that alters stand density may be conducted in the spring or fall under very moist conditions, or in combination with mechanical treatments, due to

excessive fuel build-ups from fire exclusion. Over time, as stand densities and fuels are reduced, burning may shift closer to the summer to better emulate the historical seasonality of fire in the Ecogroup area.

Mixed1 Fire Regimes - On all three Forests, the alternatives that treat the most acres in the mixed1 fire regimes are similar to that found for the nonlethal fire regimes, with a few minor differences. However, in general, fewer acres are treated. On the Boise, Alternative 4 followed by 6, would burn the most acres in the mixed1 fire regimes, and Alternative 5 would burn the fewest (Table FM-6). On the Payette and Sawtooth, Alternative 4 follows Alternative 6, although Alternative 5 again burns the least area. A combination of acres would be treated once in PVGs 3 and 6, and once or twice in PVG 5. As with the nonlethal regimes, the outcomes are related to the number of acres in MPCs that emphasize fire use to achieve the desired conditions versus those that do not. In addition, the mixed1 fire regimes contribute some uncharacteristic wildfire hazard, though not as much as the nonlethal fire regimes.

Table FM-6. Percent of the Historical Forested Mixed1 Fire Regimes Treated with Fire Use Averaged Over the First 5 Decades, by Alternative and by Forest

Forest	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Boise	7	12	9	36	0	34	10
Payette	19	23	29	43	5	49	26
Sawtooth	5	16	15	43	0	61	15

Mixed2 Fire Regimes - For the mixed2 fire regimes, alternatives that treat the most to least acres vary by Forest, though there was not as much difference between the alternatives as occurred in the nonlethal and mixed1 fire regimes. On the Boise, Alternatives 7, 1B, and 2 treat the most acres, while Alternative 5 treats the least (Table FM-7). Alternatives 3, 4 and 6 fall in between. For the Payette, Alternative 7, then 2, follows 1B. On the Sawtooth, Alternatives 7, then 2 and 4, treat the most.

Table FM-7. Percent of the Historical Forested Mixed2 Fire Regimes Treated with Fire Use Averaged Over the First 5 Decades, by Alternative and by Forest

Forest	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Boise	26	16	12	13	7	14	25
Payette	24	16	11	11	12	9	20
Sawtooth	5	16	12	16	3	15	21

In this fire regime, it appears that the outcomes from the alternatives are based on different combinations of desired conditions and/or MPCs, as this regime generates less uncharacteristic wildfire hazard than the nonlethal and mixed1 fire regimes. Alternative 5 treats the fewest acres in the mixed2 fire regime on the Boise due mainly to the MPCs. In Alternative 5, only 17 percent of the mixed2 acres fall into MPCs that emphasize fire use. Therefore, the opportunity to use fire in this fire regime is reduced in Alternative 5. Alternatives 4 and 6, which treat more

acres in the nonlethal and mixed1 fire regimes than other alternatives, treat fewer acres in the mixed2 fire regimes. In the case of Alternative 4, this may be due to the desired conditions, as this alternative and Alternative 3 have the highest large tree desired conditions compared to the other alternatives. Currently the number of acres on the Forests in the large tree size, moderate canopy closure group is far below the desired level for these two alternatives. The primary way that acres move into the desired condition for two of the PVGs in this fire regime (PVGs 7 and 11) is through succession rather than from disturbance. Therefore, disturbances that alter vegetative conditions to earlier seral stages would slow the movement toward desired conditions.

Lethal Fire Regimes - For the lethal fire regimes, the alternatives that treat the most to least acres again varied by Forest (see Table FM-8). Because this fire regime generates the least uncharacteristic wildfire hazard of any, various combinations of MPCs and desired conditions determine the arrangement. On the Boise and Payette Forests, Alternative 7 followed by 2 treats the most acres. On the Sawtooth, Alternative 2 treats the most. Alternative 5 treats the fewest acres on the Boise and Sawtooth, but falls more in the middle of the alternatives on the Payette.

Table FM-8. Percent of the Historical Forested Lethal Fire Regimes Treated with Fire Use Averaged Over the First 5 Decades, by Alternative and by Forest

Forest	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Boise	11	20	14	13	6	19	23
Payette	6	6	4	9	2	11	7
Sawtooth	0	29	22	28	0	18	23

Forest-wide Implementation of Fire Use

Implementation of fire use outside of the designated wilderness areas may be influenced by fire use occurring within the wilderness and vice versa. This could occur because of overlap of resources needed to implement fire use, air quality considerations, or other factors. As most of the fire use in the designated wilderness areas occurs from wildland fire, alternatives with MPCs that emphasize wildland fire use may more often affect or be affected by implementation in the wilderness. There is no way to determine which area might take precedence over the other because wildland fire use is initiated via an unpredictable ignition source (lightning). Conversely, alternatives with MPCs that emphasize prescribed fire may be less affected because there may not be as much overlap between the prescribed fire and wildland fire use seasons.

Fire Use in Non-forested Fire Regime Groups

As with the forested vegetation, non-forested acres treated by various vegetation management tools, including fire, reflect the mix of activities and treatment rates allowed by the MPCs applied to meet the theme for each alternative (see Appendix B). Unlike the modeling done for the forested vegetation, achievement of desired conditions was not used as a modeling objective

for the non-forested vegetation. This was due to a difference in the model used for non-forested versus forested vegetation. For the non-forested vegetation, the primary driver for the modeling was the MPCs, which represent different treatment rates.

Over the first 5 decades, Alternative 5, which emphasizes production of commodities including livestock forage, treated the most non-forested acres on the Boise and Sawtooth with fire (Table FM-9). Alternatives 3 and 1B followed 5 on the Boise. On the Sawtooth, Alternative 5 burned the most acres, and 1B was second. Though Alternative 1B contains a mix of MPCs that allow for the amount of treatment displayed in Table FM-10, currently very little treatment is being implemented on either Forest. Alternative 6, then 4, which are both oriented toward more wildland fire use, treated the fewest acres on both Forests.

Table FM-9. Percent of the Total Non-forested Acres Treated with Fire Use During the First 5 Decades, by Alternative and by Forest

Forest	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Boise	105	103	107	84	113	83	99
Sawtooth	99	93	93	80	103	70	92

The amounts by alternative represent acres treated once, or in some cases twice, over the five decades; they do not indicate that all acres were treated during this time period. This is evidenced by the number of acres that move into the high or very high canopy cover class, which can only by achieved in the model through succession without disturbance. Depending on the alternative, between 9 to 15 percent of the conditions represented by acres at the fifth decade result from succession (Table FM-10). As would be expected, the arrangement of the alternatives based on the percent of total acres that result from succession is almost inversely related to the arrangement based on fire use. That is, the alternatives with the most fire use over the first five decades have the fewest acres in the high or very high canopy cover class, and vice-versa, for both Forests.

Table FM-10. Percent of the Total Non-forested Acres in High or Very High Canopy Cover Class at the Fifth Decade, by Alternative and by Forest

Forest	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Boise	11	12	10	15	9	17	11
Sawtooth	15	15	14	17	13	21	14

Mixed1 Fire Regimes - Wyoming big sagebrush is the only community that makes up the mixed1 fire regime. Of the three dominant sages that occur on the Sawtooth, Wyoming grows on the most xeric sites. Historically, these areas produced less fuel due to these dry conditions (Winward 1985). Fires were infrequent and created small patches of mortality where fuels were more concentrated and continuous. Currently, much of the area where Wyoming sage occurs has been invaded by cheatgrass. This annual grass produces a fine, continuous litter that burns readily (Humphrey and Schupp 2001). Fires in areas dominated by cheatgrass are often

extensive and can occur annually. Because fire, particularly higher severity fire, can increase the spread of cheatgrass, prescribed fire was the only fire disturbance represented for this type, because more control can be exerted over burn location and timing. Wright et al. (1979) reported that cheatgrass can be suppressed by burning early in the summer.

Alternative 6 treats the least amount of area in the mixed1 fire regimes with fire over the first five decades (Table FM-11). Alternative 7, followed closely by Alternatives 3 and 4, treat the most. Alternative 6 treated the least amount of acres because it has the least amount of area in MPCs that use prescribed fire. This is conversely why Alternatives 7, 3, and 4 treat the most area. In these cases, most of the Wyoming big sagebrush occurs in MPCs that emphasize restoring conditions using prescribed fire, although the modeled rates of prescribed fire are considerably less than other sagebrush types in order to allow this type to develop toward the higher canopy cover desired conditions.

Table FM-11. Percent of the Historical Non-forested Mixed1 Fire Regime Treated with Fire Use Averaged Over the First 5 Decades, by Alternative on the Sawtooth Forest

Forest	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Sawtooth	24	30	44	43	24	5	45

Mixed2 Fire Regimes – In the mixed2 fire regimes, Alternative 6, followed by 4, treats the fewest acres on both Forests, while Alternative 5 treats the most (Table FM-12). On the Boise, Alternatives 1B, 2, and 3 treat similar amounts of area; on the Sawtooth these alternatives were the same. However, though the amount of area treated was similar for these three alternatives, acres treated in Alternatives 2 and 3 were through a combination of prescribed fire and wildland fire use, while in Alternative 1B all treatments were with prescribed fire.

Table FM-12. Percent of the Historical Non-forested Mixed2 Fire Regimes Treated with Fire Use Averaged Over the First 5 Decades, by Alternative and by Forest

Forest	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Boise	42	41	43	34	45	33	39
Sawtooth	42	42	42	36	47	31	41

Overall, as with the mixed1 fire regimes, the outcomes of the alternatives appear to be related to acres in MPCs that emphasize prescribed fire, though wildland fire use is considered a viable management option in this fire regime. For Alternative 5, all but a very small number of acres are in MPCs that provide for prescribed fire, while Alternatives 6 and 4 have the fewest. In these two alternatives, half or more of the treatment acres are from MPCs that emphasize wildland fire use.

Lethal Fire Regimes – All alternatives treat the most acres relative to historical in the lethal fire regimes (Table FM-13). Here, Alternative 2, followed by 7, treats the most area, and Alternatives 1B and 5 treat the least. In this fire regime, the arrangement is related to various

combinations of prescribed fire and wildland fire use. Alternative 1B does not provide for wildland fire use; this alternative treats the fewest acres. Also, Alternative 5 has only a small amount of area in MPCs that allow for wildland fire use. Conversely, Alternatives 2 and 7 have acres in MPCs that provide for a combination of these two fire treatments.

Table FM-13. Percent of the Historical Non-forested Lethal Fire Regimes Treated with Fire Use Averaged Over the First 5 Decades, by Alternative and by Forest

Forest	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Sawtooth	45	66	57	52	48	49	61

Issue 2 - Wildland-Urban Interface

Interface Subwatersheds with High and Extreme Hazard Indexes

Vegetation management objectives in interface subwatersheds vary depending on the historical fire regimes. In interface subwatersheds with high or extreme uncharacteristic wildfire hazard indexes, treatments that reduce the current hazard toward conditions that are more in concert with the historical nonlethal or mixed1 fire regime should increase the likelihood of suppressing fire starts. In areas with historically mixed2 or lethal fires, vegetative manipulations that produce vegetative mosaics, fuel breaks, or other less lethal conditions in key locations can provide defensible areas from which to suppress wildfires (Quigley and Arbelbide, 1997, Vol. II). Fires that start in areas with hazardous vegetative conditions often move into the crowns, making them more difficult to suppress. Altering the vegetation to less hazardous conditions where fires burn as underburns rather than crown fire increases the chances that a fire will be quickly suppressed while small, or will be easier to control in certain areas (Deeming 1990, Finney 2001).

Alternative 5 on all three Forests would provide the greatest opportunity to alter hazardous vegetative conditions in interface subwatersheds in the short term, and to maintain them in the long term, because all interface subwatershed areas are in MPCs that allow fire and mechanical to treat vegetation (Table FM-14).

Table FM-14. Percent Of Total Interface Subwatershed Area in MPCs that Allow Fire Only Versus Fire/Mechanical Vegetation Management, by Alternative

Forest	Treatments Allowed	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Boise	Fire Only	11	12	2	29	0	63	1
	Fire/Mechanical Mix	89	88	98	71	100	37	99
Payette	Fire Only	39	40	11	68	0	62	22
	Fire/Mechanical Mix	61	60	89	32	100	38	78
Sawtooth	Fire Only	27	26	11	75	0	80	18
	Fire/Mechanical Mix	73	74	89	25	100	20	82
Total for Ecogroup	Fire Only	21	21	7	52	0	69	11
	Fire/Mechanical Mix	79	79	93	48	100	31	89

The majority of interface subwatershed area in Alternatives 3 and 7, followed by 1B and 2, are also in MPCs that use both tools. Alternatives 4 and 6 have the least amount of area in MPCs that provide fire and mechanical tools. In these alternatives the majority of interface subwatershed area occurs in MPCs where fire is the only management tool. In this case, more time would be required to alter vegetative conditions, and therefore the short-term risks of wildfire would remain high. Over the long term, hazard may be reduced in areas where fire is a viable vegetation management tool, given appropriate conditions. However, in some areas, conditions, particularly where the hazard is very high, may be such that fire alone would not be a viable management option. In these areas, wildfire hazard would continue to increase.

Interface Subwatersheds with Low and Moderate Hazard Indexes

The management objective in interface subwatersheds with low or moderate hazard indexes where vegetation was historically nonlethal or mixed1 could be to treat vegetation to maintain the current low hazard consistent with the desired conditions for the alternative (See the *Vegetation Hazard* section). In this case, fire only or fire and mechanical treatments may provide similar opportunities to maintain conditions in the short and long term. Most subwatersheds with low or moderate uncharacteristic wildfire hazard indexes also have a predominance of historically mixed2 and lethal fire regime areas. Though vegetative conditions in these subwatersheds are still within the historical range, in some cases the extent and pattern on the landscape creates larger areas of lethal fire than occurred in the past, increasing resistance-to-control. Even in these fire regimes, some vegetative conditions experienced underburns. One management objective in historically mixed2 and lethal subwatersheds could be to reduce the homogeneity and extent of areas that would burn lethally on the landscape, providing strategic places where fires could either be suppressed, or where effects to adjacent private or state ownerships would be acceptable. In this case, MPCs that provide for a mix of fire and mechanical can likely accomplish this objective faster than where fire only is the primary tool. In addition, fire use in mixed2 and lethal fire regimes adjacent to other land ownerships may be unpalatable because of the perceived risk.

Effects of Desired Conditions on Hazard

Though MPCs indicate opportunities to reduce hazardous conditions, in some cases the desired conditions themselves may contribute to vegetative hazard. Desired conditions define the vegetative stages that occur on the landscape and subsequently the level of hazard. The *Vegetative Hazard* section of this chapter describes the relationship between desired conditions,

and the Forest-wide uncharacteristic wildfire hazard. Desired conditions also determine the hazard associated with resistance-to-control which is generally assumed to increase with increasing density.

The potential effects of the desired conditions, and the hazard this might carry in the wildland-urban interface, vary for each interface area and alternative. Though the intent is to meet National Fire Plan goals under all alternatives, the juxtaposition of the interface relative to areas that may have more hazardous desired conditions is highly variable. For uncharacteristic wildfire hazard, alternatives that move more area into the historical range of variability—particularly toward large tree, low canopy closure—are less hazardous. Forest-wide, the desired conditions for Alternatives 3 and 4 produce the lowest uncharacteristic wildfire hazard, as the desired condition for all areas in these alternatives is within HRV (see Table VH-11 in *Vegetation Hazard*). In these cases, desired conditions Forest-wide decrease the risk of uncharacteristic wildfire, which includes interface areas. Alternative 5, followed by 1B, produces the most hazardous Forest-wide desired conditions due to the amount of area in MPC 5.2. For the PVGs that contribute the most to uncharacteristic wildfire hazard (for example PVGs1, 2, and 5), desired conditions for MPC 5.2 are outside of HRV. In the case of these alternatives, the juxtaposition and distribution of these areas relative to interface across the landscape determines the risks. On the Boise, more than half the interface subwatershed area in Alternatives 5 and 1B is assigned to MPC 5.2 (Table FM-15). On the Payette for Alternative 5, the majority of the interface subwatershed area is assigned to MPC 5.2. The ranking of the alternatives from most interface subwatershed area assigned to MPC 5.2 is the same as the ranking of area assigned overall (see *Vegetation Hazard*, Table VH-10). In descending order, Alternatives 1B, 7, 2, and 6 on the Boise and Payette provide less area with desired conditions outside of HRV. As the amount of area in HRV increases, the risk of uncharacteristic wildfires moving across the landscape decreases.

Table FM-15. Percentage of Total Interface Subwatershed Area Assigned to MPC 5.2, by Alternative by Forest

Forest	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Boise	54	17	0	0	59	9	31
Payette	27	11	0	0	76	9	14
Sawtooth	2	0	0	0	21	0	0

Even though the desired conditions within the MPC 5.2 areas for some PVGs is more hazardous than in other MPCs, wildfire risk can be mitigated in these areas using a variety of approaches. Fuel breaks, strategic placement of less hazardous conditions relative to more hazardous, the location of conditions in relation to the topography and typical fire movement patterns, all factor into determining risk (see the Resource Protection Methods discussion in this section and in *Vegetation Hazard*). In addition, there are opportunities within the MPC 5.2 desired condition range for the more hazardous PVGs to reduce hazardous conditions. This can be accomplished by providing more area at the higher end of both the large tree size class and low canopy closure range. This condition is closest to the historical range of variability for those PVGs that contribute the most to hazard. Therefore, these conditions reduce the risk of uncharacteristic

wildfire the most within the MPC 5.2 desired condition range. For resistance-to-control, treatments that move vegetation toward the higher end of the least dense canopy closure desired conditions reduce the risk of wildfires that resist control.

Cumulative Effects

Issue 1 - The Role of Fire

Other ownerships adjacent to or surrounded by lands administered by the Forest Service affect opportunities to use fire, and therefore to emulate historical fire effects, particularly over landscapes. In general, private landowners use timber harvest rather than fire to manage their vegetation. Fire may be used to treat activity fuels, but treatments are often limited in extent and effect. The proximity or inclusion of private lands affects in particular the use of wildland fire for resource benefits, because these fires can burn over large areas for long time periods depending on the vegetation, fuels, weather, and other factors. However, wildland fire use or prescribed fire could be coordinated with adjacent federal landowners such as the BLM. In this case, effects could extend beyond lands administered by the Forest Service.

Issue 2 - Wildland-Urban Interface

Wildland-urban interface includes subwatersheds in which private lands are wholly surrounded by lands administered by the Ecogroup Forests, and subwatersheds in which private lands adjoin the Ecogroup Forests as well as other ownerships (other private, state, or federal). In cases where private lands are surrounded by lands administered by the Ecogroup Forests, vegetative conditions and treatments to reduce hazard may be more strategically placed at a landscape scale. However, the risk to structures located in the interface also depends on the conditions found on those lands, including vegetation, where the structure is located relative to defensible space, the type of building materials, and other mitigations. The intent of the National Fire Plan is to develop strategies and treatments that are coordinated between various landowners, including federal agencies, to address the variety of hazards and risks that occur to reduce undesirable wildfire effects on all lands. This coordination would extend the effects of treatments beyond lands administered by the Forest Service. Ultimately however, structure protection on private property is the responsibility of the property owner.