Wildland Urban Interface and Large Scale Hazardous Fuels Reduction

Site Inventory Strategy (SIS)

Background

The Forest Service has been directed by Congress to implement an accelerated, multi-year program of hazardous fuels reduction as one component of the National Fire Plan and in response to The Healthy Forests Restoration Act of 2003. Current, unmanaged fuel loads in many areas support large, hot, uncontrolled, and devastating wildfires that destroy life and property, including historic properties. The Healthy Forest Initiative instructs the Forests to reduce fuel loads to lessen the effects of catastrophic fires. In an effort to restore the forests to a more fire resistant and natural condition, combination of treatments such as prescribed fire, thinning and timber harvest are proposed for landscape treatments from 500-10,000 acres.

Hazardous fuels reduction treatments will also help protect historic properties from the devastating effects of catastrophic wildfires, including associated suppression activities and subsequent erosion, such as the fires experienced in Montana in the last four wildfire seasons. From our experience in the Kraft Salvage and Ft. Howe Complex fires, we found that wildfire in the Ponderosa Pine Parklands burn in a mosaic fashion often burning some of the sites intensely and other portions very lightly. The intensity is a factor of fuel loading on the sites. Fuel loading can be the result of past fire producing downed dead timber, deep undergrowth providing "fuel ladders", dense ponderosa pine forests that are encroaching into the open parkland, along with years of fire control practices. Although beneficial to historic properties over the long-term, various fuels reduction treatments have the potential to affect historic properties, particularly "fire-sensitive" sites. This SIS protocol identifies steps that will be taken to avoid and/or minimize those effects while accomplishing the objectives of the National Fire Plan, the Healthy Forest Restoration Act, and long term protection of the heritage resource.

Scope

This SIS covers all hazardous fuels reduction activities within Wildland Urban Interface (WUI) projects and other large-scale hazardous fuels reduction projects (larger than 5,000 acres). Activities covered include: hand thinning; mechanical thinning; timber sales embedded in thinning contracts; slash disposal, including lopping and scattering, chipping, pile burning, and windrow or jackpot burning; and broadcast burning

Reduction of fuels can be achieved in a variety of ways, including mechanical and manual thinning and the use of prescribed fire. Treatments in Wildland Urban Interface areas usually involve a two-fold approach. First and most urgent, in areas immediately adjacent to communities, thinning is used to create fuel breaks capable of stopping or slowing a wildfire before it reaches homes and other developments. The slash that results from thinning can either be piled and safely burned or removed for fuel wood or other uses. In the areas leading up to the fuel breaks, subsequent broadcast burning under prescribed conditions or a combination of thinning and burning can be used to reduce fuel loads in order to slow an approaching wildfire before it even reaches a fuel break. Both of these treatment strategies can help bring a crown fire to the ground, where it can be effectively and safely suppressed, thereby protecting life and property. See appendix A. for descriptions of kinds of prescriptions that may be proposed in Region 1. Appendix B. is a list of term definitions.

SIS Protocol

The SIS protocol is conducted in six stages: 1. Pre-field Research and Sample Design; 2. Field Inventory; 3. Protection of fire sensitive sites; 4. Implementation; 5. Monitor; and 6. Documentation. The following guidelines will be used to determine initial survey strategies under this SIS and site protective measures. The Forest Archaeologist shall determine or approve the level of field survey for each project.

Pre-field Research and Sample Design. The Forest archaeologists along with fuels specialist and timber staff will utilize relevant information to assess the fuel reduction project's potential to affect heritage properties and the expected nature and distribution of heritage properties that may be affected. This stage identifies "fire-sensitive" sites and the inventory sample strategy.

A review of available literature on the effects on fire on cultural resources and on the experience of FS heritage resource specialists indicates that there are two categories of fire-sensitive sites. The first consists of sites long-known to be vulnerable to the effects of even low-temperature fires and/or light fuel loads, such as sites that contain organic materials, exposed architecture, etc. Fire sensitive sites in Region 1 include historic sites with standing, or down wooden structures or other flammable features or artifacts; rock art sites; prehistoric sites with flammable architectural elements and other flammable features or artifacts such as wickiups, wooden lodges, culturally modified trees (including aspen art and peeled/scarred trees) and certain traditional cultural properties (based on consultation with tribes).

The second group includes sites that have generally been considered to have less risk for fire effects in most situations, including prehistoric and historic sites with deeply buried cultural deposits; prehistoric and historic artifact scatters; and prehistoric and historic sites with non-flammable surface features. However, depending on field conditions especially fuel loading—as well as specific site characteristics and expected fire behavior, other site types may be fire-sensitive in certain projects.

Assessment of the expected nature and severity of project impacts (this should include consideration of all planned activities and entries) will be based on:

- type and intensity of mechanical treatment
- type and intensity of prescribed burn, including fuel loading and fire prescription, expected fire behavior
- associated activities

Assessment of the expected nature and distribution of heritage resources will be based on:

- heritage GIS survey and site layers or hard copy survey and site atlases
- previous heritage reports and site forms
- cultural resource overviews and planning assessments
- information obtained through tribal consultation and public input
- information provided by other resource specialists familiar with the project area
- topographic maps, aerial photographs, ortho-photo quads
- other available GIS layers and maps including soils, vegetation type, slope

From this information a map with known sites and potential fire-sensitivity sites along with a site probability map will be constructed. The site probability map will be divided into high, medium and low

potential for heritage resources.

Field Inventory.

Any areas of intensive ground disturbance will receive 100% survey, including but not limited to:

- Intensive mechanical treatments- machine piling, windrowing, mechanical crushing, skid trails where identified (cutting units where skid trails are not defined will be surveyed 100 %.)
- mechanical fire line construction
- staging areas, constructed safety zones
- water bars and other constructed erosion control features
- Hand thinning units using mechanized equipment
- Commercial thinning, i.e. timber sales and their equivalent. Projects that affect 500 acres or less will be surveyed 100%. Projects that exceed 500 acres in size may be surveyed using the timber SIS. Additionally, any areas of ground disturbing activity will receive 100% survey, including all roads, landings, skid trails, and any other areas deemed necessary based on the sample survey.
- Fuel breaks

The prescribed burn areas will be inventoried with the following guidelines:

- Inventory of 100% high site potential areas, 75% of the moderate site potential areas, and 10% of the low site potential developed during the pre-field research
- Locate and record any sites identified during pre-field work as "fire-sensitive"
- Monitor all previously recorded sites within the APE
- Identify sites that are considered fire-sensitive based on fuel loading, fire effects, site characteristics, and expected fire behavior.

In addition to the prescribed burn area, a half mile buffer around the prescribed fire APE will be inventoried as described above for heritage resources. This half mile buffer serves as a containment area should the prescribed fire escape.

Site Treatment and Protection**.**

Prior to implementation of any of the fuel treatment projects, the forest archaeologist and fuels specialist (timber manager for commercial thinning and/or burn boss for prescribed burns) will visit all site identified as potentially "fire-sensitive" and develop treatment plans for each site to ensure that effects to historic properties (or fire-sensitive properties for prescribed fire undertakings) are avoided.

Treatments might include hand removal/clearing of brush and downed timber, and selective removal of green, dead and dying trees by mechanical methods (such as a Timbco tree harvester). Each treatment will be recorded and implemented prior to the burn/ sale, and will not involve any ground disturbance. All sites with flammable features such as homesteads will be omitted from the burn area but protective measures will still be employed. If the FS subsequently determines that adverse effects on historic properties in any phase of the project cannot be avoided, the FS will drop the site from the project area and reconfigure the boundaries of the APE to avoid the site. Various combinations of the following protection measures may be considered.

Protection for sites with flammable components or "fire sensitive" sites may include:

- Exclusion from project area

- Hand line
- Black line
- Wet line
- Foam retardant
- Structural fire shelter
- Remove heavy fuels from site by hand

For sites that are not "fire sensitive" or considered to have less risk for fire effects in low-temperature and or light fuel load conditions (such as prehistoric and historic sites with deeply buried cultural deposits, prehistoric and historic artifact scatters, and prehistoric and historic sites with non-flammable surface features) that are located within prescribed burn, thinning, hand and mechanical treatments to reduce fuels on the sites, and then burning over sites may be allowed with the following provisions:

- No ignition points within site boundaries
- No staging of equipment within site boundaries
- Allow thinning within site boundaries, provided:
    - Cutting is accomplished using hand tools only
    - Large diameter trees are felled away from all features
    - Thinned material is hand carried outside site boundary
    - Mechanized equipment such as Timbco tree harvester parked outside of site boundaries
- No use of mechanized equipment within site boundaries
- No staging of equipment within site boundaries
- No slash piles within site boundaries

The treatment plans will be included in an inventory reports and summarized in table format. The treatment plans will be reviewed by the Timber/fuels specialists, included in the burn plan, and implemented prior to prescribe burn. All treatments for commercial thinning will be included in the NEPA documentation and monitored during treatment by Forest Archaeologist and Timber staff representative.

Due to the mosaic nature of these burns, we do not anticipate 100 percent burn over the sites, but in case of future wildfire in the area, we anticipate that the treatments will, in the long run, make the sites more wild fire resistant. For the most part, sites located in open grasslands and parks will be allowed to burn, since the grass does not have the fuel loading problems as those in the timber units, and the burn is expected to be fast and cool.

<u>Post burn and Project Monitor</u>

Post burn inventory would be conducted over 30% of the high probability areas and 10% of the med to low areas. Immediately after the fire, the high and moderate probability areas will be sampled in areas

where ground visibility was poor in order to discover any new sites exposed by the fire and analyze the effects. Each site where treatment was implemented will be re-visited by the archaeologist, timber and/or "burn boss" to evaluate the effectiveness of the treatment. A final report will be produced that includes the treatment results and fire descriptions.

The purpose of post-treatment monitoring is to gather data that will be used to improve planning for protection of heritage resources in future projects. When wildfire occurs within these areas, treated sites will be monitored to discern the usefulness of fuel reduction methods over the broad landscape.

Documentation and Summary Report

A final report will be produced that include the inventory report, the treatment results, and fire descriptions. The inventory report will include a description of all planned activities, equipment to be used, and expected impacts; a discussion of fuel loading and expected fire behavior if prescribed burns are planned; a detailed discussion and rationale for the survey strategy if less than 100%, including a rationale for what is considered "fire-sensitive".

For prescribed burns, a summary of the inspection of fire-sensitive sites and any other sites to be monitored, including site-specific fuel loading; site-specific protection measures, and site-specific monitoring requirements. Where appropriate, treatment tables, survey maps, burn plans and XXXX will be included in the report.

An update and summary report of activities completed each FY will be included in the annual report for the PA under the site inventory strategy section. The report shall include a list of WUI and other large-scale hazardous fuels reduction projects as well as summaries of the results of monitoring fire-sensitive and non fire-sensitive sites in prescribed burns, including the effectiveness of the identification strategies and protection measures and any changes proposed to make these more effective.

By reducing the fuel loads on the heritage resource, the sites would not only be returned to a more natural Ponderosa Pine parkland environment, but also be made more fire resistant to wild fires when they may occur. This proposed SIS not only provides for a proactive site protection but will also provide new information on site location, condition and site typology /age. Locational information will be used during future wildfire events, and treated sites will be monitored post wildfire to evaluate, along with other resource specialists, the usefulness of fuel reduction methods over the broad landscape.

Appendix A. WILDLAND URBAN INTERFACE PROJECTS IN REGION 1

The following prescriptions were developed to guide Region One's implementation of hazardous fuels reduction treatments in the Wildland Urban Interface.

VEGETATIVE TYPE	TREATMENT ACTIONS
Spruce-fir	Thinning, pile and burn, lopping, chipping, fuel breaks.
Mixed Conifer	Thinning, pile and burn, lopping, chipping, fuel breaks, possibly broadcast burn(may not be feasible due to high mortality with Lodgepole and Spruce-fir
Ponderosa Pine	Thinning, pile and burn, lopping, chipping, fuelbreaks, broadcast burn.
Grassland	Broadcast burn (very short term treatment)
Sagebrush	Fuelbreaks, broadcast burn.

SPRUCE-FIR

Spruce-fir stands are intolerant to fire. Fire at low intensities will kill spruce and fir if even moderate amounts of slash surround the tree base or root crown, therefore treatment in spruce/fir components will be more limited in treatment options than the other vegetative types.

Mechanical treatments will most likely be preferred to provide the spacing necessary to eliminate interlocking crowns. Thinning is based on residual wind firmness for the area and the understory must be removed to eliminate the laddering effect of fire. Remaining basal area per acre may be increased above 80 square feet per acre only if the residual stand can be limbed or pruned to a height of 25 feet or more. Fire as a tool in spruce-fir forests can be utilized to create wildlife openings, diversity within stands, or enhancement of aspen. Thinning with fire in the spruce-fir type is not recommended due to the intolerance of the species to fire.

Fuelbed reduction following mechanical treatment should be accomplished through fuelwood utilization by the public, or methods other than fire to ensure protection of the residual stand.

MIXED CONIFER

Mixed conifer stands primarily contain white fir, Douglas fir, corkbark fir, limber pine, and scattered ponderosa pine. Scattered spruce will also be found in the upper transition areas, and ponderosa pine will

appear more frequently in the lower transition zones of the true mixed confer type.

Mixed conifer forests must be treated with mechanical means to reduce the current stand densities to a basal area of 40-60 square feet per acre within the areas of immediate threat. The treatment may also be feathered to increasing basal areas as distance from the immediate threat area increases. Prescribed fire may also be used initially in some areas but not in others, before some type of mechanical treatment, due to the high potential for escape.

Reducing the existing densities will most likely require multiple entries of both pre-commercial and commercial operations including the reduction of other vegetative species along with seedlings, saplings, and brush.

PONDEROSA PINE

Ponderosa pine forests will be treated with both mechanical means and prescribed fire. The recommended emphasis for fuel treatment is to reduce stand and crown densities by creating opening within the stands. Many areas will require labor intensive mechanical thinning that may be followed by piling, removing, burning, chipping, or other methods that will alter the fuels profile. Long term, continued maintenance of these treatments is essential.

Reducing the ponderosa pine densities will most likely require multiple entries of both pre-commercial and commercial operations including the reduction of other vegetative species along with seedlings, saplings, and brush.

SAGEBRUSH

Many areas can be effectively treated with prescribed fire without mechanical treatment. Fire can be used to effectively remove sagebrush from existing sites with a corresponding reduction in flame lengths on future ignitions. To maintain a site after initial treatment and where it can be safely executed, prescribed fire should continue to be utilized.

METHODS TO BE USED TO ACCOMPLISH PRESCRIPTIONS

FUELBREAKS – Fuelbreaks are created to help change the behavior of a wildland fire by modifying the

fuel structure in an area immediately adjacent to or surrounding developments and property to be protected in the wildland urban interface. Thinning for fuel reduction in fuelbreaks is more intense due to their nearness to values to be protected and strategic location for fire control. Fuelbreaks will vary in width according to the fuel profile and topography and may range up to 500' in width.

The fuelbreaks will often be "feathered" which means they will be incrementally less dense as they move toward the developed area. A distance around the fuelbreaks will also be thinned, possible up to thousands of acres, so that a fire's movement and intensity may be lessened as it approaches the main fuelbreak.

The arrangement of fuelbreaks will also differ. Some projects will have corridors of fuelbreaks, thinning within those breaks, and burning between them.

THINNING – Thinning reduces stand density by removing stems in the understory, midstory, and overstory. Thinning actions will vary between fuelbreaks and areas surrounding fuelbreaks. Guidelines used for thinning in fuelbreaks include reducing tree density to 20' spacing between crowns to 40' spacing between groups. Thinning outside fuelbreaks may include thinning to 10' to 15' spacing between crowns. Pre-commercial thinning involves hand thinning of smaller diameter materials. Commercial thinning, accomplished through timber sales, involves larger materials.

Once thinning is accomplished, the slash will be treated in several ways, including piling the material so it can be burned. Usually < 3" material will be piled, while the > 3" material will be utilized for personal fuelwood or sold for commercial fuelwood. Piles will be burned in the fall and winter season and potentially during the summer if conditions become suitable. The actual piling of the material may be accomplished by hand or machine, where equipment such as dozers and small tractors will haul the material to piles. Slash is also pushed or dragged into windrows. Some slash may be "rough-piled" or "jackpot piled" where heavier concentrations of fuel are left where they fall and are burned on site.

Material that is large enough for commercial thinning (merchantable timber), usually > 6" may be removed to a landing using a rubber-tire skidder, or tracked vehicle. Both rubber-tire skidders and tracked skidders are used, but where slopes exceed 30%, tracked skidders are used more frequently because of their maneuverability. Whole tree skidding methods move the entire tree to the landing, then remove the branches, concentrating the slash where it can be utilized as fuelwood or burned.

LOPPING AND SCATTERING - Thinned areas not piled may be "lopped" to reduce fuel slash heights and then broadcast burned. Lopping consists of cutting smaller branches off the main stem so the height of the slash layer is reduced, which in turn allows for a less intense fire if the are is broadcast burned.

CRUSHING - Crushing involves dragging a large drum with protruding spokes or spikes over the vegetation, effectively breaking the fuel into smaller pieces. Another form of crushing uses a "brush crusher" in which a piece of equipment similar to a "weed-whacker" is attached to a tractor. The "brush crusher" is able to reduce the height of vegetation from 4' to 6' down to 6" in height. Both of these pieces of equipment are pulled or transported by either rubber tire tractors, or rubber or metal track dozers. A dozer may also be used to "walk" over slash and crush it.

CHIPPING - In the chipping process, slash is forced through a chipping machine, reducing the larger pieces of slash to small chips that are spread over the site to be burned at a later date, or left on site to naturally decompose.

BROADCAST BURNING - Broadcast burning uses fire over a designated area to consume natural or activity slash that has not been piled or windrowed. Broadcast burning may be used separately or in conjunction with mechanical methods such as thinning. Broadcast burns may be ignited by hand, by "terra-torches", torches mounted on 4-wheelers or on a flat-bed truck, or with aerial ignition. Preparation for the burn may include line building, both by hand and machine.

PILE BURNING - Pile burning disposes of hand or machine-piled slash. Piling the slash and burning during cooler, wetter, or winter conditions reduces the chance of escape and lessens the potential for damage to the remaining vegetation on site. Piles are normally ignited by hand using fuses or drip torches.

Appendix B. DEFINITIONS

1. **Black Line**. A fireline created by burning the organic matter and then extinguishing the fire.

2. **Broadcast Burn**. A prescribed burn over a designated area to consume natural fuels or activity slash that has not been piled or windrowed. Broadcast burning may be used separately or in conjunction with thinning.

3. **Burn Plan**. A detailed plan for conducting a prescribed burn that identifies the burn units, fire control methods, burn prescription, fuel moisture, weather condition criteria, and contingency plans.

4. **Federal Fire Policy**. The *Federal Wildland Fire Management Policy* signed by the Secretaries of Agriculture and Interior following the 1994 wildfire season. The Federal Fire Policy guides and provides for the coordination of fire management activities of the of the Forest Service, National Park Service, Bureau of Indian Affairs, Bureau of Land Management, U.S. Fish and Wildlife Service and the the National Biological Service.

5. **Fire Prescription**. Measurable criteria that define conditions under which a prescribed fire may be ignited, set prescriptive parameters (rate of spread, intensity, flame length, etc.), guide selection of appropriate management response, and indicate other required actions.

6. **Fireline**. A narrow, linear strip, cleared of vegetation to dirt that inhibits and/or contains the spread of fire. Firelines vary in width from one foot to over 10 feet, with most being two feet in diameter or less.

7. **Fuel loading**. The nature and amount of accumulated fuels which contribute to the intensity and duration of a fire.

8. **Fuelbreak**. An area adjacent to or surrounding a Wildland Urban Interface area, where thinning and other treatments are used to substantially reduce hazardous fuels. Fuel breaks will vary in width according to the fuel profile and topography.

9. **Hazardous Fuels Reduction**. Activities to decrease fuel loading and stand density to a manageable degree to reduce fire intensity. Treatments include creation of fuel breaks, thinning, and disposal of fuelbed materials using mechanical or non-mechanical means, as described in Appendix E.

10. **National Fire Plan**. The report, *Managing the Impacts of Wildfires on Communities and the Environment, A report to the President in Response to the Wildfires of 2000*, prepared by the Secretaries of Agriculture and Interior. The report calls for action and funding in five key areas: Firefighting; Restoration and Rehabilitation of Burned Areas; Hazardous Fuels Reduction; Community Assistance; and Coordination and Monitoring.

11. **Prescribed Burn**. A prescribed fire ignited by management to meet specific objectives. A prescribed burn may involve broadcast burning over an entire area or burning of thinning slash that has been piled or windrowed. See Appendix E for a description of these techniques.

12. **Prescribed Fire**. Controlled application of fire to wildland fuels in either their natural or modified state, under specified environmental conditions that allow the fire to be confined to a predetermined area and at the same time produce the intensity of heat and rate of spread required to attain planned resource management objectives. Prescribed fire may be management-ignited (prescribed burn) or naturally-ignited (prescribed natural fire).

13. **Thinning**. Removing trees and brush to reduce stand density

14.
15. **Wetline**. A fire line constructed using water or foam, intended to prevent the advance of fire.

16. **Wildfire**. An unwanted wildland fire.

17. **Wildland fire**. Any non-structure fire, other than prescribed fire, that occurs on undeveloped land.

18. **Wildland Urban Interface**. Those areas of resident populations of imminent risk from wildfire, and human developments having special significance. These latter areas may include critical communications sites, municipal watersheds, high voltage transmission lines, observatories, church camps, scout camps, research facilities, and other structures that, if destroyed by fire, would result in hardship to communities. These areas encompass not only the sites themselves, but also the continuous slopes and fuels that lead directly to the sites, regardless of the distance involved.

Appendix C.

Duff Consumption Estimates For the Ashland Ranger District

Duff* consumption is often expressed in three ways: depth reduction, percentage depth reduction, and percentage mineral soil exposed. Each expression is appropriate to evaluating certain prescribed fire objectives. Mineral soil exposure is commonly used to define site preparation needs. Depth of duff reduction relates to the actual amount consumed and smoke production. Percentage duff reduction is useful for describing and setting objectives of prescribed fire to leave specified amounts of duff on site (Brown etal. 1985:1)
.
Consumption of duff is strongly influences by moisture content. Duff burns independently of surface fuels below a duff moisture content of about 30 percent. Prescribed burning is frequently done at duff moisture contents between 30 and 120 percent, to avoid independent duff burns.

The following table is based on field estimates and is supported by a study completed on similar cover types as those on the Ashland Ranger District. The following citation is referenced for this documentation: "Predicting Duff and Woody Fuel Consumed by Prescribed Fire in the Northern Rocky Mountains" (Brown, James K. et. al., Intermountain Forest and Range Experiment Station, Ogden, UT, INT-337, March 1985).

The information in the following table lists data collected form the Lubrecht Experimental Forest, which has similar cover types to those on the Ashland Ranger District. Based on personal experience this documented experiment is very representative of what occurs on the Ashland Ranger District.

Variable	**L^f**	**L^s**	**A^f**	**A^s**
Duff depth reduction (%)	23 to 73	14 to 35	40 to 65	20 to 40
Mineral Soil Exposure (%)	1 to 51	0 to 16	5 to 30	0 to 10
Duff Depth Reduction (in)	0.6 to 3.0	0.5 to 1.1	0.1 to 2.0	0.1 to 1.5
Pre-burn duff depth (in)	1.7 to 4.3	2.0 to 3.0	0.5 to 2.0	0.5 to 2.0
Duff Moisture Content (%)	16 to 102	28 to 106	15 to 90	15 to 90
NFDR 1,000-hr. timelag moisture content (%)	11 to 15	13 to 18	11 to 15	11 to 18
Pre-burn Tons/ Acre (0 to 3")	1.44 to 7.68	1.33 to 4.27	2.45 to 5.44	2.45 to 5.44
Pre-burn Tons/	4.84 to 47.96	9.55 to 46.92	3.35 to 27.95	3.35 to 27.95

Acre 3” plus				

Note: L^f and L^s are for the information form the Lubrecht Experimental Forest and represent a fall burn and a spring burn respectively. A^f and A^s are for the information taken form field experience on the Ashland Ranger District and represent fall burns and springs respectively.

The goal of prescribed fire on the Custer National Forest is primarily to reduce fire hazards on the Forest. By conducting burns within the parameters described by the tables, no more than 2 in of duff will be removed. Without baking and fuel loading, little effect to heritage cultural materisl would be expected. Due to the mosaic nature of the fires, however, there may be “pockets” of deeper duff burning. As a precaution, fuels specialists will monitor each site for any smoldering smokes as soon as the fire area is safe. Any sites found with smodering duff the duff will be extinguished before it can spread within the duff zone.

* Duff includes the fermentation and humus layers of forest floor, lying below the litter and above mineral soil.