MID ILLINOIS WATERSHED ANALYSIS

FIRE MANAGEMENT

Fire

Fire has always been an integral part of the forest ecosystem in southwestern Oregon, and the Siskiyou National Forest, which have had a long history of wildfire occurence (Payne 1983, Haefner 1975, Cooper 1939, Morris 1934). In the warm-temperature, dry-summer, "Mediterranean" climate of the Siskiyou Mountains, the forests are easily set afire; and fires of widely varying intensities have been fequent (Whittaker 1960). Morris (1934), reporting on written accounts of major fire occurence years in Oregon from the 1840's to the 1933 Tillamook Fire, notes fires in the southwestern Oregon area in the years 1853, 1857, 1864, 1867, 1868, and 1902. Soon after the establishment of the Siskiyou National Forest (1907), 179,000 acres burned in 1917 and 152,000 acres burned the following year. A total of 50,800 acres burned in 1938. Fires in 1987 were the third worst on record (Silver Fire 96,450 acres, Galice Fire 5,790 acres and Longwood Fire 9,916 acres).

The distribution of fire in this Forest is extremely variable. There are places where 190-year-old trees show no evidence of fire. At the other extreme, a ponderosa pine had 11 scars (from fires in 1814, 1826, 1833, 1843, 1866, 1881, 1902, 1910, 1925, and 1980). A 30 year average fire cycle for the Mixed conifer forest type was determined by Agee (1990) from forest survey work done in the 1940's by Andrews and Cowlin. Atzet and Wheeler (1982) determined fire cycles of 20 years for inland plant associations with a cycle length increasing to 60 years or more for coastal areas. For this watershed, the natural cycle is between 30 and 50 years, depending on aspect, elevation and fuel model or plant series for low to moderate intensity fires, 60 to 100 years for moderate to high intensity fires, and large stand replacement fires occuring every 100 to 200 years.

Atzet, Wheeler and Gripp (1988) described the settlement period of 1820-1910 as a period when fire was forced on the land by trappers, miners, ranchers, and settlers to eliminate vegetation, drive game, enhance forage and clear land. Many of the 70-170 year-old age class stands on the Siskiyou are sites burned by settlers and miners (Siskiyou Final EIS 1989). The intent was to burn off as much vegetation as possible. Burns were ignited during the driest, hottest weather possible, and were more frequent than natural fires.

Records from the Siskiyou National Forest give an indication of the extent of burning. Hundreds of thousands of acres burned in the early part of this century as shown in table 3.3. After 1940, when the smoke jumper base was installed at Cave Junction, significantly fewer acres burned until 1987.

Reports on the 1987 fires indicate between 12 and 27 percent of the area within the fire perimeters burned at stand replacement intensity.

Thus, fire frequency for prehistoric or pre-settlement times is a better reflection of the natural role of fire in the ecosystem than data from more recent times, due to the intensity of burning during the setlement era. Specific records for the previous century are not available, but U.S.G.S. reports indicate virtually all areas surveyed were burned (Leiberg 1900). Because little is known about the severity of pre-historic fires, reconstruction of historic proportions of seral stages is tentative. According to Native Americans, fire was used extensively for that last 10,000 years. Therefore, the recent reduction of fire is new to the ecosystem.

Fire Regime, Role, and Hazard

Fire regimes are a function of growing environment, ignition patterns, and plant species characteristics (Agee 1990). Temperature and moisture make up the growing environment. Lightning and humans cause ignition patterns. Plant species characteristics are a result of adaption to fire and fuels accumulations.

Many natural stands in the watershed have two and three multi-aged cohorts as a result of frequent surface fires. The layered understory vegetation can contribute to high-intensity fires due to waxy-leaved shrubs and trees carrying flames into the overstory. Tanoak will sprout from the roots following intense fires, and a dense canopy of tanoak will form. If Douglas-fir is mixed in the stand it will take up to 30 years or more to outgrow and dominate the tanoak. In older stands, when Douglas-fir begins to break-up, tanoak established in the understory is released. This is occuring in many stands in the watershed and tanoak will also release following partial cutting of the overstory Douglas-fir. Very high intensity fires or successive intense fires may result in nearly pure hardwood stands.

Fire has a natural role in the vegetative community in any watershed. Vegetation adaptation to fire has accounted for its persistence over time. The exclusion of fire for most of this century has created an unnatural ecosystem. Fuel has accumulated over longer periods than would occur naturally. Shrub and understory vegatation has not been "set back" as would have typically occured and now presents an abnormal fuel ladder in many stands. The artificial exclusion of fire has altered the natural fire regime. The natural fire regime would normally create a mosaic of high, moderate, and low intensity burning. A mosaic of forest patches is largely determined by length of return interval, aspect, and slope.

Exclusion of fire can also reduce the natural mosaic patttern in vegatation heights and age classes, creating larger contiguous areas of vegetation of uniform heights and uniform fuel conditions. This creates an increase in areas experiencing similar wildfire behavior and can result in a more uniform fire intensity occurance. Natural old growth forests typically have an uneven mosaic of size classes, which act as a buffer from catastrophic crown fires (Kauffman 1990). This buffer effct is lost as vegetation becomes more uniform. Species diversity is reduced when disturbance is reduced. With infrequent disturbance, species composition and stand structure tends to stabilize. Climax species dominate and pioneer species are reduced or eliminated. Nature consistently introduces disturbance which maintains a diversity of both pioneer and climax species.

Organic matter, in the form of large woody material and litter on the forest floor, are important to forest productivity. Fire plays an important role in the creation and loss of large woody material. Fire is the primary agent for the breakdown of large woody material in forests with fire frequencies of less than 50 years (Kauffman 1990). Fire also has a strong effect on the rate of input of woody Debris into the system.

A fire in late summer or early fall can consume up to 85 percent of the debris (Kauffman and Martin 1985). Wildfires burning with much higher intensities than occured naturally could drastically reduce the amounts of woody debris and affect the replacement cycle by also consuming sources of replacement material.

Organic matter, in the form of soil organic matter, litter and duff, and shrubs and trees, are important as nutrient reserves. Losses of these from fire may reduce productivity by lowering total moisture on the site and the nutrient holding capacity. A loss of 22 percent of total organic matter was reported for the Silver Fire (Silver Fire EIS 1988). Duff and litter levels on the study area are thin and most nutrients are held in the live vegatation (McNabb and Cromack 1990). Accumulations of litter increase with the exclusion of fire. This will increase nitrogen and organic matter on the forest floor. Frequent fires that burn less intensely may consume the forest floor without destroying most of the overstory or damaging the soil. Infrequent fire burns with higher intensities and volitizes a higher percentage of nutrients, above ground and in the soil. Because of this, frequent fires are considered less damaging to productivity than infrequent, more intense, conflagrations (Waring and Schlesinger 1985).

Vegetation changes from altering the fire regime include increases in the amount of tanoak,and of shade-tolerant conifer species in the understory. Species such as white fire, grand fir, and incense cedar are fire-intolerant. They change both the horizontal and vertical structure of the forest, and can change the fire behavior and intensity level by providing an increase in flammable ladder fuels in the understory. Tanoak can successfully germinate and survive under a conifer understory and has probably increased in abundance as a result of fire exclusion. This can have a similar effect of providing an increase in fuel ladder in the understory.

Using PMR (Pacific Meridian Resources) data, Seral stage structure of Pioneer, early seral, midseral, late seral, and climax vegetation condition classes these values were grouped to create a fuel model map for determining fire behavior. At one time, most of the watershed was probably a Fuel Model #2 on the West-East slopes and a Fuel Model #8 on the Northerly slopes. Seven fuel model categories are within this report. Fuel Model descriptions are listed below. (Hal Anderson, 4/82)

Fuel Model 1 (Grass Group). Fire spread is governed by the fine, very porous, and continuous herbaceous fuels that have occured or are nearly cured. fires re surface fires that move rapidly throught the cured grass and associated material. Very litle shrub or timber is present, generally less than one-third of the area. Grasslands and savanna are represented along with stubble, grass-tundra, and grass-shrub combinations that met the above area constraint. Annual and perennial grasses are included in this fuel model. Rate of spread for this model is 78 chains per hour with a 4 foot flame length.

Fuel Model 2 (Grass Group). Fire spread is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to litter and dead-down stemwood from the open shrub or timber overstory , contribute to the fire intensity. Open shrub lands and pine stands or scrub oak stands that cover one-third to two-thirds of the area may generally fit this model; such stands may include clumps of fuels that generate higher intensities and that may produce firebrands. Rate of spread for this model is 35 chains per hour with a 6 foot flame length.

Fuel Model 5 (Shrub Group). Fire is generally carried in the surface fuels that are made up of litter cast by the shrubs and the grasses or forbs in the understory. The fires are not generally very intense because surface fuels loads are light, the shrubs are young with little dead material and the foliage contains little volatile material. Usually shrubs are short and almost totally cover the area. Young, green stands with no dead wood would qualify: laurel, vine maple, alder, or manzanita. Rate of spread for this model is 18 chains per hour with a flame length of 4 feet.

Fuel Model 6 (Shrub Group). Fire will carry through the shrub layer where the foliage is more flammable than fuel model 5, but this requires moderate winds, greater than 8 miles per hour at mid flame height. Fire will drop to the ground at low wind speeds or at openings in the stand. This model covers a broad range of shrub conditions. Fuel situations to be considered include intermediate stands of oak brush and ceanothus. Even hardwood slash that has cured can be considered. Rate of spread for this model is 32 chains per hour with a flame length of 6 feet.

Fuel Model 8 (Timber Group). Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional "jackpot" or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidities, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Representative conifer types are sugar pine, white pine, lodgepole pine, spruce and fir. Rate of spread for this model is 1.6 chains per hour with a flame length of 1 foot.

Fuel Model 10 (Timber Group). The fire burns in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3-inch or larger limb-wood resulting from overmaturity of natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation, leading to potential fire control difficulties. A forest type may be considered if heavy down material is present: examples are insect- and disease-ridden stands, wind-thrown stands, overmature situations with deadfall, and aged light thinning or partial-cut slash. Rate of spread for this model is 7.9 chains per hour with a flame length of 4.8 feet.

Fuel Model 11 (Logging Slash Group). Fires are fairly active in the slash and herbaceous material intermixed with the slash. The spacing of the rather light fuel load, shading from overstory, or the aging of the fine fuels can contribute to limiting the fire potential. Light partial cuts or thinning operations in mixed conifer stands, hardwood stands, and southern pine harvests are considered. Clearcut operations generally produce more slash than represented here. The less-than-3-inch material load is less than 12 tons per acre. The greater-than-3-inch is represented by not more than 10 pieces, 4 inches in diameter, along a 50-foot transect. Rate of spread for this model is 6 chains per hour with a flame length of 3.5 feet.

Table 1 shows breakdown of fuel models/LSR's within the Middle Illinois Watershed:

(Reference Fuel Models map and Seral Stage map)

TABLE 1

FIRE BEHAVIOR FUEL MODELS

Fuel Model	PMR Type	Rate Of Spread	Flame Length	Acres
5	Pioneer	18	4	18,704
6	Shrub	32	6	6,058
8	Mid	1.6	1	17,652
9	Early	7.5	2.6	14,376
10	Late/Climax	7.9	4.8	7,414
Total				**64,204**

Fire Frequency and Risk-Current Conditions

Chared snags, charcoal in the soil, even-aged stands, and fire-scarred trees are all evidence of past fires. In most cases, the year of the burn can be estimated. Fire scars are the most acurate evidence and often reveal fire frequencies and indicate intensity. Species or age-class patterns can estimate old fire boundaries.

An analysis of fire occurence was made based on fire occurence records from the Siskiyou National Forest. This data is from all the fire reports on record for any fire within the Middle Illinois Watershed from 1941 to 1998. Six fires of 5 acres or larger were reorded from 1941 thru 1998. Most notable was the Mendenhall fire of 1994. This fire burned 6998 acres of the Siskiyou National Forest, and 160 acres of BLM lands for a total of 7158 acres. During this 57 year period, 61 fires (1.1 per year) were recorded as started in this watershed. 23 of thses fires (.40 per year) were caused by lightning, 25 fires (.44 per year) were human caused and 13 (.23 per year had no cause determination.

Table 2 shows fire history by cause for the Middle Illinois Watershed, from 1941 to 1998.

(Reference Fire History map)

TABLE 2

FIRE HISTORY (1941-1998)

Cause Of Fire	No. Of Fires	Frequency
Lightning	23	38%
Human	25	41%
Unknown	13	21%
Total	61	100%

Human caused risks associated with the Illinois River corridor from the forest boundary downstream cannot be entirely eliminated; but the risk of catastrophic fire occurence can be reduced through vegatation management and hazardous fuels reductin projects.

Private lands within the watershed have been heavily harvested from the late 40's to present times. Many areas in the last five years have experienced their first reentry. Much of this reentry is probably contributed to the declining supply of federal timber in the Illinois Valley area. Much of this private land has not had hazardous fuels reduction to the statndards set forth on forest service lands. Oregon Department of Forestry has authority through Senate Bill 360 to recommend and assist priuvate landowners with hazardous fuels reduction projects. USFS has authority under the Wyden Amendment to participate with other agencies and private landowners to perform hazardous fuels reduction off of naitonal forest lands for protection, restoration and enhancement activities. (Reference Public Law 94-148 and Cooperative funds & Deposits Act, 12/12/75)

Table 3 shows total acres burned by decade for Siskiyou National Forest from 1910-1998:

TABLE 3

NUMBER OF ACRES BURNED

(SISKIYOU NATIONAL FOREST, 1910-1998)

Decade	Acres Burned
1910-1919	410,369
1920-1929	60,813
1930-1939	153,812
1940-1949	4,157
1950-1959	5,805
1960-1969	4,601
1970-1979	2,942
1980-1989	112,822
1990-1998	10,679
Total	**766,000**

Fire Exclusion Effects

Effective fire suppression programs have, therefore, created a relatively fire-free condition during the last half of this century. Atzet and Wheeler (1988) found few scars on trees in stands less than 70 years of age. Fire suppression has reduced the occurrence and the numbers of acres burned. Thomas and Agee (1986) found that fire suppression has effectively eliminated up to five fire-cycles in the mixed conifer stands of southwestern Oregon. This has lengthened the fire-free period vegetation has previously experienced.

Desired Future Condition

A reduction in the potential for large, high intensity, wildfire is desired in order to meet anadromous fish habitat and other ecosystem function objectives. This potential can be reduced by manual vegetation manipulation and/or prescribed burning to produce conditions limiting fire spread and high intensity burns.

Vegetation manipulation would be designed to decrease fire rate of spread and reduce intensity to prevent stand replacement fire events. These efforts include stand density management, slash disposal, use of hazardous fuels reduction to reintroduce fire in natural stands, and utilization of natural and other barriers to limit fire spread. Specific examples would be:

>Thinning with removal or treatment of activity and accumulated natural downed woody fuels to reduce fuel ladders and fuel loadings, and increase fire tolerance;

>Creation and maintenance of fuel breaks along key ridge tops or water ways and along private lands;

>Mechanical understory removal or underburning to reduce ladder fuels;

>Long-term maintenance of natural fire regimes through hazardous fuels manipulation.

Fire needs to be used when the stand conditions and prescriptions are right. In some situations it is important to bring thinning and other silvicultural treatments ahead of fire use, to reduce the biomass in these fire-dependent forests before we can use hazardous fuels reduction projects at the right intensities.

Within the 81,654 acres of this watershed analysis area, 64,978 is USFS wth 31,752 acres in Late Successional Reserves (LSR). As written in the Southwestern Oregon LSR Assessement, wildfire is allowed to be managed under conditions which would provide beneficial effects for the LSR, also prescribed fire may be implemented for the purpose of hazard reduction to prevent, or reduce the probablility of a stand replacement fire.

With the high recreational use in the river corridor and limited amount of access to the remainder of the watershed due to lack of roads, there is a need to consider maintaining existing roads for fire suppression and hazardous fuels reduction access.

Native American Burning in Southwest Oregon

(Reference Keown report)

PRESCRIBED FIRE

Definition: Prescribed fire is the skillful application of fire to fuels in a definite area under precisely defined conditions including wind speed, fuel moisture, soil moisture, and other factors in order to produce the intensity of heat and rate of spread required to accomplish specific results. Prescribed fire is used to achieve a number of objectives in silviculture, wildlife management, visual quality management, grazing lands management, hazard reduction, and fire suppression. The overall goal is to use fire scientifically in obtaining the greatest benefit with the least damage and at the lowest acceptable cost. Prescribed fire may result from planned or unplanned ignitions.

USES OF HAZARDOUS FUELS REDUCTION PROJECTS

Recreation Access: Recreation opportunities and access to the landscape can often be enhanced by prescribed fire. For example, thinning a dense understory of hardwoods and brush, could open up opportunities outside of developed or dispersed recreational sites. Allowing easier ingress to visitors, horseback riding, hunting, backpacking, and fishing. Opening up the vegetative cover would allow off-road vehicles to use the areas, as well as other forms of recreation such as hiking, mountain biking, snow play, picnicking, wildflower observation, or sight-seeing by car.

Wildlife: Wildlife's dependence on fire is well documented. The key to a productive wildlife habitat is the maintenance of diversity in the environment in accordance with the needs of a species or group of species. Diversity occurs when a proportionate mix of vegetative types, age classes, and successional stages are present. Diversity can be accomplished by many methods; but fire is generally considered the most efficient, economical, and environmentally acceptable.

Fire recycles nutrients that may be "locked up" in living or dead vegetation. Recycling these nutrients and preparing a good seedbed by prescribed fire creates increased plant diversity, increased palatability, and higher nutritional value. Recycling also serves to eliminate or modify understories or shrub land communities that inhabit wildlife movement in a given area, and is a valuable tool in controlling insect and disease problems.

Silviculture: Prescribed fire can be used to manipulate vegetation, prepare the sire for regeneration, and help control insects and disease.

On sites where slash has accumulated , or where competitive densities of shrubs, grasses, or heavy duff exists, prescribed fire may be appropriate. It may be used to reduce stocking of some species to provide optimum growing space, and to control certain diseases such as dwarf mistletoe.

Stand Density Management: Reduction of vegetation (live, standing as well as dead, down materials) is one of the primary uses of hazardous fuels reduction. It is especially important in ecosystems where management of the natural fuel loading is critical to the protection of some vegetative types and to maintenance of healthy watersheds and acceptable visual quality.

RECOMMENDATIONS

1. Maintain Forest Service presence at Store Gulch Guard Station for fire prevention and quick response to fires within the river corridor.

2. Hazardous fuels reduction projects within the river corridor should be initiated to reduce the chances of conflagration type fires by reducing the present fuel loadings. Initiate hazardous fuels reduction/wildland management plan with river corridor residents in cooperation with Oregon Department of Forestry. This could be done in conjunction with stand density management projects. In the Siskiyou National Forest Wildfire prevention Analysis the Illinois River corridor is determined to be a high risk for potential human caused wildfire ignitions.

3. Reduction of hazardous fuels in the urban interface through Senate Bill 360, the Wyden Amendment and Public Law 94-148. Hazardous fuels reduction in the urban interface areas is the number one national priority for use of hazardous fuels reduction funds. (FY99 Appropriations Bill)

4. Hazardous fuels reduction projects along the eastern boundary of the Kalmiopsis Wilderness to allow wildfire for resource benefits within the wilderness. Hazardous fuels reduction around wilderness area boundaries is the number two national priority for use of hazardous fuels reduction funds (FY99 Appropriations bill) Where existing vegetation conditions permits, use of hazardous fuels reduction burning in the ultramafic soil types could be done at a low cost. Other soil type areas may require higher costs due to manual stand treatment prior to the use of hazardous fuels reduction, i.e., pruning, thinning, ladder fuels reduction, etc.

5. Hazardous fuels reduction over the remainder of the watershed is needed and could be tied in with other resource management objectives/projects, i.e., silviculture, wildlife, botany, timber, etc.

6. Keep existing road systems intact and available for fire suppression and hazardous fuels reduction activities.

7. Consider interagency cooperation with Bureau of Land Management and Oregon Department of Forestry for hazardous fuels reduction projects on adjacent lands.

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