Chapter 6

Fire Management Plan

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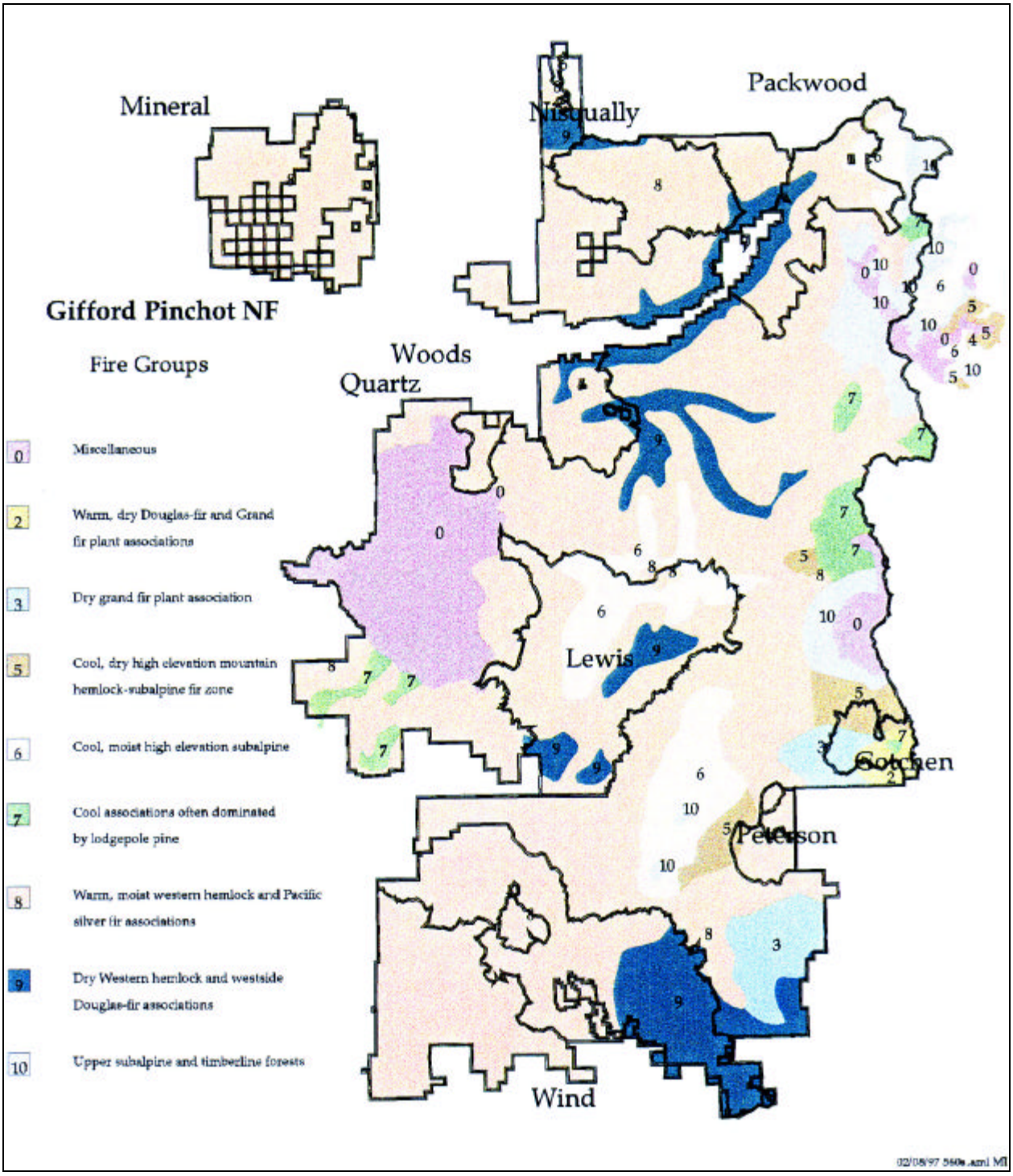


Chapter 6

Fire Management Plan

6-1 Fire History

Early History

Historical fire records document extensive fires that occurred on the Forest as early as 1764. The Cowlitz Indians refer to a big fire that occurred about 1830 which crossed over from the Lewis River. The *Oregonian* reported on large fires "northeast of Vancouver" in late August 1857. The *Oregonian* also has accounts of many large fires burning "north/northeast" of Vancouver from mid-August to the end of September 1868. A large fire swept the plateau north and northwest of Mt. Adams about 1874 or 1875 and again in 1892 (See Map 6-2 and Map 6-3).

Since 1902, about one-fourth of the Forest has been burned by six fires:

- the Yacolt Fire burned approximately 480,000 acres, on and near the Forest,
- the Lewis River Fire was approximately 30,000 acres,
- the Siouxon fire was estimated to be at least 30,000 acres, and
- the Cispus Fire burned approximately 50,000 acres.

Both Yacolt and Cispus have reburned at least once since 1902. The name "Cispus": is a name of American Indian origin meaning "vast burned over area," which implies that the Cispus watershed had been burned many years before recorded history.

Fire history of the Gifford Pinchot National Forest indicates that wildfires were frequent until approximately 1933.

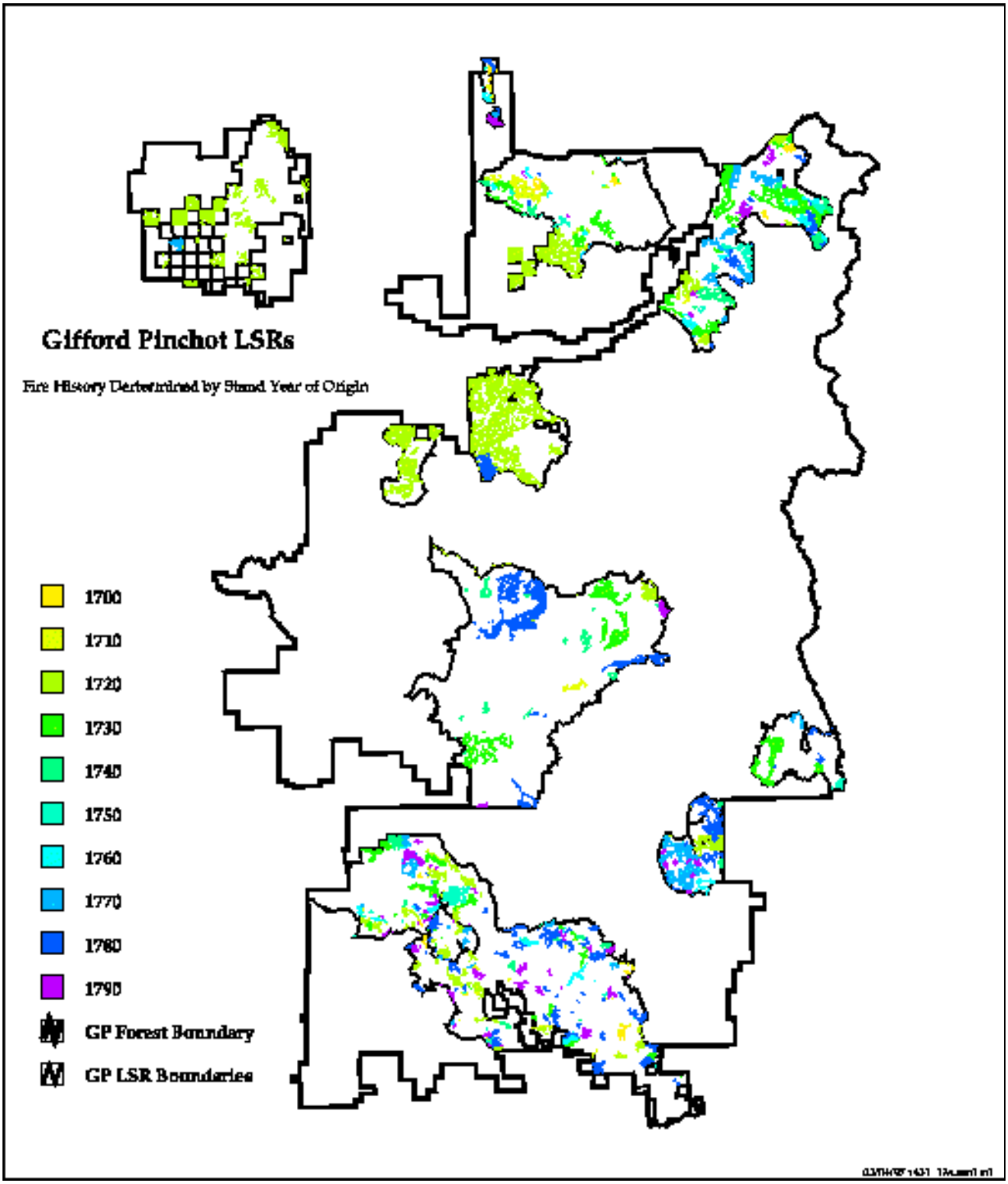
Post 1930's

Suppression efforts became more effective by the end of the 1930's. More than 25 lookouts were built on the Forest between 1913 and 1935, and fire detection was greatly improved. There was better access and more organized methods of suppression. Forest use declined in the 1940's due to the war and fire starts declined. After the war, as timber cutting expanded, slash disposal was recognized as a serious fire hazard. Throughout the 1950's and 1960's, experience was gained in controlled slash burning to reduce fire risk and aid in site preparation for reforestation.

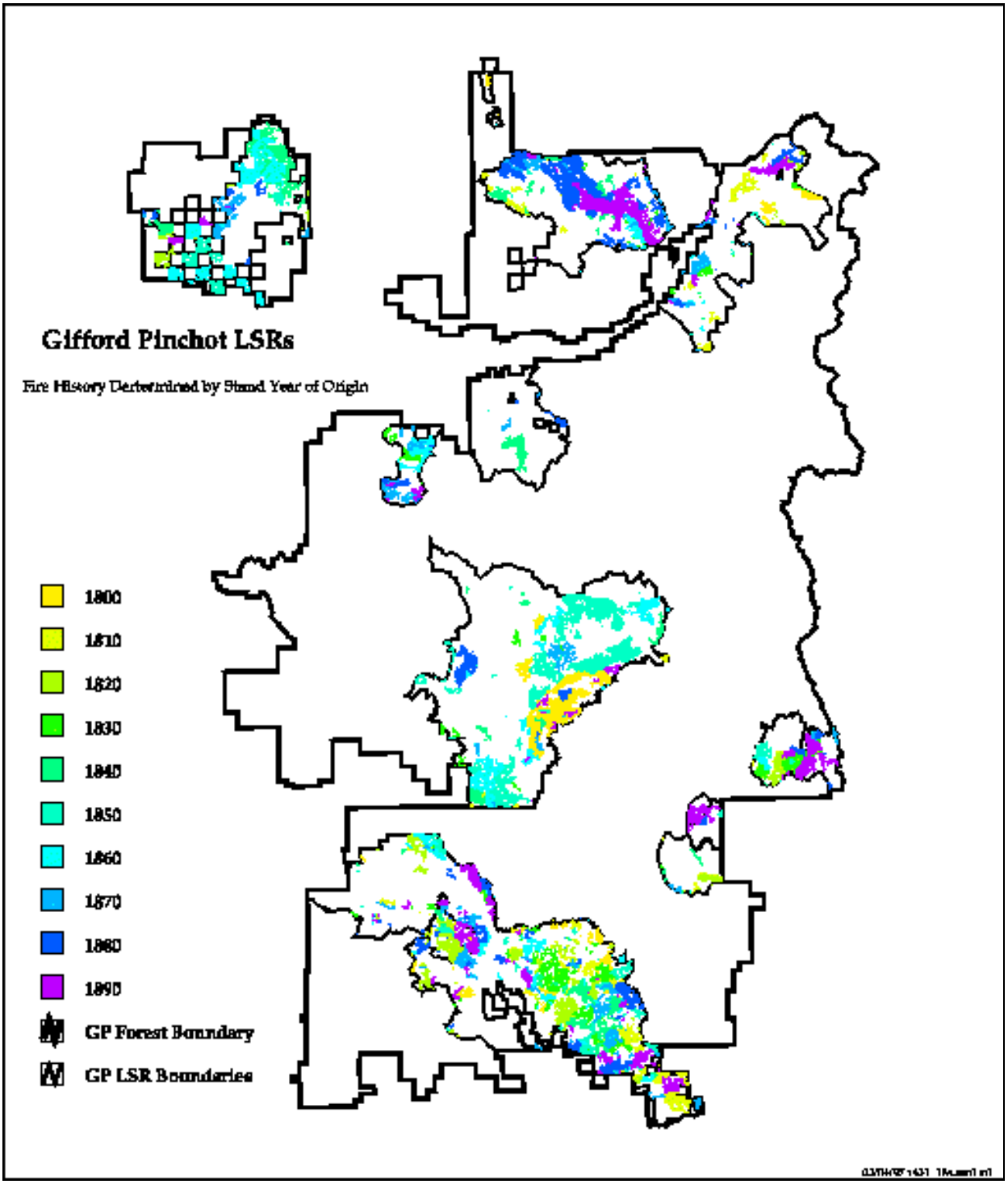
By the 1970's, fire and fuels management were becoming more sophisticated. A better understanding of how weather, topography, fuels composition and fire behavior led to prescribed fire plans and strategic/tactical plans for wildfire suppression. See Map 6-4.

The role of fire on the Gifford Pinchot has changed in the last one hundred years. Land managers today are still dealing with a landscape that has been modified by approximately 60 years of effective fire suppression. This has resulted in a change of species composition (plant and animal), their spatial distribution over the landscape, and has altered (and in some cases, created) disturbance patterns which effect insect, disease, and fire risk.

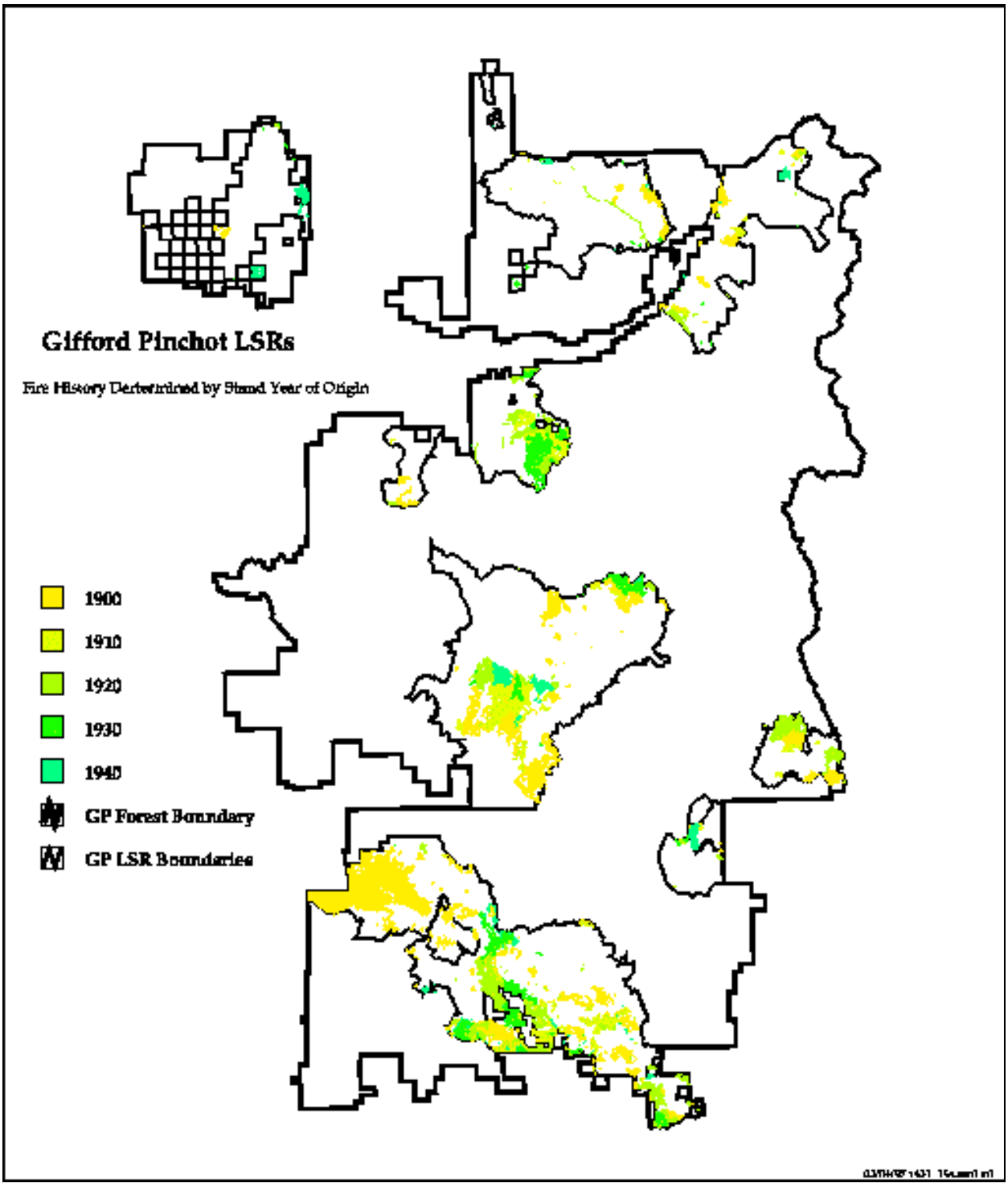
Map 6-2 Gifford Pinchot Fire History - 1700's



Map 6-3 Gifford Pinchot Fire History - 1800's



Map 6-4 Gifford Pinchot Fire History 1900's



6-2 Existing Conditions

Twelve fire groups were developed based on vegetation, its response to fire and successional pathways. Because differences in fire behavior and successional pathways can result from small differences in fuel, temperature, moisture sunlight, topography, and seed availability, it is possible for stands in the same plant association to be described by different fire groups.

Fire Group 9 - Dry Western Hemlock and Westside Douglas-fir

Fire Group 9 occurs primarily on north and south aspects of the Cowlitz, Cispus, and North Fork Cispus Rivers on the Gifford Pinchot National Forest. Typical site characteristics include rocky, gravely, or otherwise well-drained soils, steep slopes, and generally dry conditions.

Group 9 consists of dry western hemlock plant associations where Douglas fir is the major seral species. Three conifers and two hardwoods tend to dominate the overstory within this fire group - Douglas fir, western hemlock, western redcedar, big-leaf maple and Oregon white oak. White oak is not found within this zone on the Gifford Pinchot. The western redcedar tends to grow primarily in draws and other locations with deeper soils that hold more moisture. Shrubs rather than forbs, tend to dominate the most common Fire Group 9 associations found on the Gifford Pinchot.

Forest Fuels

Fuel loadings in this fire group are highly variable, depending on individual stand and site conditions. Generally, Fire Group 9 does not contain duff as deep as that found in Fire Group 8. On the Gifford Pinchot, fine fuel loadings range from 2.2 to 4.0 tons per acre with a weighted average of 3.5 tons per acre. Fuel loadings for material larger than three inches in diameter show a wide range of variability, from a low of 2.5 tons per acre to 57 tons per acre.

Fire Ecology/Fire Effects

Coast Douglas-fir is more fire resistant than many of its associates and can survive moderately intense fires. Thick, corky bark on the lower bole and roots protects the cambium from heat damage. Crown scorching from summer fires is more damaging than late summer or fall fires because more buds are killed. During late summer the buds are set and subsequent year needles are well protected. Moderately severe underburns in 50 to 60 year-old mixed and pure stands near Mount Rainier caused little cambial damage to Douglas-fir, but killed most of the thin-barked western redcedar.

Widely distributed as a canopy dominant in lower and middle elevations forests throughout the Pacific Northwest, Douglas-fir occupies forests with varied fire regimes. In general, the size and severity of natural fires tend to decrease, while fire frequency increases, southward. In western Washington, Douglas-fir is a primary component of moist forests experiencing infrequent, widespread, stand-replacing fires that occur at perhaps 400 to 500 year intervals. Where Douglas-fir is seral, its great longevity allows it to maintain itself as a canopy dominant until the next stand-replacement fire occurs.

Current Fire Behavior

Prolonged fire exclusion probably has allowed development of denser stands. Stand-replacing crown fires can develop and do not necessarily depend on the combination of prolonged drought and east wind conditions typical of Group 8. In the absence of east winds, topography and rockiness tend to control fire size and shape. In the presence of east winds, Group 9 may no longer serve as a break in fuels for crown fire spread. Most often, low to moderate rates-of-spread and fireline intensities dominate fire behavior. Because Group 9 is generally found on the lower third of slopes, fires starting within the group can potentially spread further before fuels conditions change. On the Gifford Pinchot, thick growth of salal and dwarf Oregon grape mixed with a lesser amount of grasses often significantly increases the fine fuels (litter), accelerating rates of-spread.

Fire Group 8 - Western Hemlock/ Pacific Silver Fir

Fire Group 8 includes most of the western hemlock and Pacific silver fir plant associations found in the mid-Columbia. As such, it includes a wide range of topographic positions, moisture regimes, and temperature regimes.

In general, the plant associations reflect a warm, moist climate to the west, gradually shifting to a cooler and drier climate to the east.

Forest Fuels

This group generally lacks fine fuels through most of the stand history. The sites containing devil's club and skunk cabbage may have heavy fuel buildups, but the presence of water keeps these fuels too moist to burn readily and facilitates relatively rapid decay. "Classic" old-growth stand conditions (closed canopy overstory of large diameter trees over a lush understory) are common in undisturbed areas, indicating infrequent disturbance.

Fuel loadings build rapidly once the overstory begins to die from insect and disease attack and the canopy breaks up. Conditions become drier in these canopy gaps and can easily provide a suitable fuelbed for fire starts.

Fuel loading in the 0 to 3 inch diameter fuel ranges from 1.4 to 5.0 tons per acre.

Fire Ecology/Fire Effects

Both western hemlock and Pacific silver fir are extremely fire sensitive due to thin bark, shallow roots, and highly flammable foliage.

Fire frequency tends to be low because of the cool, moist habitats that western hemlock/Pacific silver fir generally occupy. The fire regime is generally between 150 to 400 years or more.

Large fires within these plant zones generally tend to be stand replacing. Due to both species having low fire tolerance, even a light surface fire is damaging because the shallow roots are scorched.

Fire in this group serves to prepare mineral soil seedbeds, produces a mosaic of stand structures and age classes across the landscape, and affects within-stand species diversity. Fire history maps and recent wildfires suggest that most fires are either very small (less than 10 acres) or very large (greater than 1000 acres). Mid-sized fires are not unknown but appear to depend on a combination of dry conditions and light to moderate winds.

Conditions which result in large fires, prolonged drought and strong east winds, occur approximately every 30 years, based on fire history studies of the forest and similar locations in the Region (Pyne 1982). Big fires occurred on the Mt. Hood and Gifford Pinchot in 1902, 1933, 1967, and 1991 primarily within this fire group and Fire Group 6 (Cool, moist lower Subalpine).

Current Fire Behavior

Under current stand conditions stand replacement fire will dominate during a large fire (1000 acres) event. Most of the active burning occurs during one burning period, although it can occur over several burning periods. Low rates-of-spread and fireline intensities dominate; prolonged smoldering can create a high severity burn. High intensity fires depend on extreme winds, prolonged drought, or both. The highest fire danger occurs from mid-September through October.

Fire Group 7 - Cool Associations often dominated by Lodgepole Pine

Fire Group 7 occurs on higher elevation plateaus subject to frost, which are found primarily on the north and east edges of the Gifford Pinchot. The lowest elevation example lies in a natural cold pocket on the south slopes of Mt. Adams. Another large area lies on the south slopes of Mt. St. Helens. A third large area lies just north of Mt. Adams and bordering the Yakama Indian Reservation.

Most stands occur in the mountain hemlock zone although some stands appear to fall within the Pacific silver fir zone and at least one location lies in the grand fir zone.

Forest Fuels

Within this fire group, Lodgepole pine generally comprises more than 50 percent of the overstory. Other species that may be present include western white pine, subalpine fir, noble fir, Douglas-fir, Engelmann spruce, western hemlock, mountain hemlock, and Pacific silver fir. Huckleberries and beargrass dominate the understory vegetation, although trace amounts of others species typical of cold, moist conditions are present. Sites within this group lie within the subalpine zone on severe sites (frost pockets) or poor soils (coarse-textured or very thin). Some sites may occur in areas with fluctuating water tables, such that soils are saturated in the spring and very dry by fall.

Low productivity characterizes this group. These sites generally do not produce very heavy downed woody loadings or deep duff. Fuel loadings increase when the overstory of lodgepole breaks up from disease related mortality and snow breakage. When fuels do build up, fire can burn very rapidly through the area under dry conditions. Wildfire risks also increases when the climax species invade the understory and provide a fuel ladder into the overstory. However, these stands would tend to burn and replace themselves before mountain hemlock or Pacific silver fir takes over.

Fire Ecology/Fire Effects

Large, stand replacing fires probably occur every 100 to 300 years. Occasional low to moderate intensity fires may thin the stands or otherwise rejuvenate it without doing serious damage to large areas of the overstory. Fire in lodgepole pine stands has been described as an "all or nothing" proposition. That is, fires either (1) go out after a day or two or smolder in the duff for extended periods or (2) develop into rapidly spreading wildfires. Smoldering fires are common in lodgepole forests because understory fuels are sparse. Furthermore, fire spread to the crowns is difficult because they are elevated well above the forest floor. However, lodgepole pines stands become more flammable as they age because dead woody fuels accumulate on the forest floor, These fuels result from past fires, insect and disease outbreaks, and overmaturity.

Fire serves to perpetuate the dominance of lodgepole in these stands. Without periodic disturbance, mountain hemlock or Pacific silver fir would eventually replace the lodgepole pine. Lodgepole pine does not regenerate well in duff or shade. Once lodgepole pine is established, it does not favor rapid fire spread or uniform burning except under extreme burning conditions. Following a stand replacing fire shrubs and forbs dominate for a short period of time. Lodgepole seedling quickly establish and overtop the undergrowth.

Current Fire Behavior

Currently, most lodgepole pine stands that have not been harvested generally support light fuel loadings. Those that have had harvesting activity within them have variable fuel loadings and could support a low to moderate intensity fire. Many of our stands are approaching 80 to 100 years of age, and without some type stand manipulation will become more susceptible to insect and disease attacks which creates a fuel bed suitable to fire starts.

Fire Group 6 - Mountain Hemlock Zone

Fire Group 6 incorporates the wetter portion of the transition zone between eastside and westside as well as cooler sites on the westside. This fire group occurs only at the highest elevations, if at all, east of the Cascades, and at a mix of higher and mid-elevation sites west of the Cascade crest. This fire group is common in the Dark Divide roadless area in the center of the forest. It occurs on the lower slopes and northeast of the Mt. Adams Wilderness, in areas adjacent to Sleeping Beauty and Echart Mt., and within the Indian Heaven, William O. Douglas and Goat Rocks Wilderness areas, and in the northern most part of the Forest, north of the Nisqually River and west of Mt. Rainier National Park. Fire Group 6 also occurs along the two major ridgelines running north from the Dark Divide (McCoy Peak and Juniper Ridge).

The typical environment for Fire Group 6 includes heavy snowpacks, short growing seasons, frequent frost, and cold, moist soils.

Forest Fuels

A deep duff and litter layer are common within this fire group. Most down woody fuel loading is in the greater than 3 inch diameter class. Associations in Fire Group 6 are warm enough that most smaller dead woody fuel decays rapidly. The abundant shrubs also provide a very large heat sink under normal conditions, greatly reducing the rate of fire spread. During prolonged drought, the shrubs and forbs can provide a significant fuel load.

Much of the large diameter woody fuel tends to be rotten. The higher moisture holding capacity of these rotten logs also reduces fire risk through much of the year. However, once this fuel dries out, severe soil damage from prolonged heating may result if it burns. Once the canopy begins to break apart from other factors, such as insect and disease, an understory of extensive regeneration may develop. This understory combined with the high levels of lichens hanging from the boles, allows crown fires to develop and spread easily.

Fire Ecology/Fire Effects

Tree species generally found within the Mountain Hemlock zone are not fire tolerant. Generally speaking, species found within this group have relatively thin bark, shallow roots, low-hanging branches, highly flammable foliage, and a tendency to grow in dense groups making them very susceptible to fire injury. In the Pacific Northwest the estimated pre-settlement fire regime in mountain hemlock forest types is over 600 years. Fires in these cool wet forest types generally occur as infrequent crown fires. When fires do occur in mountain hemlock forests, they are often severe stand-replacing fires.

Current Fire Behavior

Recent fires on the Gifford Pinchot in Fire Group 6 have generally been crown fires with relatively limited surface fire. Aerial fuels, such as lichens, have been the main carriers of the fire, since down woody fuels are relatively light. In most cases, these fires have been wind-driven events. Once the winds died, burning became limited to snags and larger surface fuels.

Fire Group 5 - SubAlpine

Fire Group 5 occupies drier, colder sites than Fire Group 6. Generally these stands have a diverse overstory, containing Douglas-fir, noble fir, western white pine, subalpine fir, Pacific silver fir, and mountain hemlock. Subalpine fir and mountain hemlock tend to be present in all the above plant associations, and one of them dominates.

Shrubs tend to dominate the understory. Big huckleberry is the most common species in most associations.

On the Gifford Pinchot this group is found primarily on the eastern slopes of Indian Heaven Wilderness.

Forest Fuels

The fuel structure in subalpine-fir dominated stands promotes highly destructive stand-replacing fires. Fuel loads in subalpine fir stands are greater than in lower elevation montane stands because the cool, moist environment slows the decomposition of organic matter allowing fuels to accumulate more rapidly. Fuel beds tend to be irregular, with over twice as much fuel accumulating under the narrow-crowned trees as between them.

Fire Ecology/Fire Effects

Evidence indicates that these stands experience two types of fires. Low to moderate intensity fire helps maintain seral species, such as Douglas-fir, western white pine, and lodgepole pine. Often these fires consist of smoldering fires that creep through the duff. Fuel concentrations and/or low canopies favor torching of individual trees or groups of trees. Which in turn cause spot fires, smoldering and creeping until reaching another fuel concentration, and starting the cycle over again.

High intensity fires occur during prolonged drought, lasting 3 or more years. The resulting stand-replacing fire would prepare a mineral soil seedbed and favor lodgepole pine. Stand replacing fires east of the Cascade crest tend to occur in August and early September under strong west wind conditions. Similar fires west of the Cascade crest tend to occur more in October and early November under strong, dry east winds.

Relatively dry lower elevation subalpine fir habitat types have more frequent and less intense fires than moist middle and upper elevation subalpine fir habitat types. Moist, middle, and upper elevation subalpine fir habitat types generally experience high intensity stand-replacing fires at intervals of 100 years or more.

Current Fire Behavior

Under current stand conditions, most fires tend to remain either very small, less than 10 acres, or become very large, over 1000 acres. Large fire development depends on prolonged drought and high winds.

Fire Group 4 - Moist Grand Fir

Fire Group 4 lies east of the Cascade crest. This group occurs at the bottom of steep narrow canyons along perennial streams and in cool, moist air drainages. It also occurs at higher elevations having fairly moist and cold sites that receive substantial snowpacks.

Douglas-fir is the primary seral species. Other seral conifers include western larch, lodgepole pine, western white pine, and noble fir. Grand fir is climax or coclimax with Engelmann spruce, western hemlock, or western redcedar in conifer dominated riparian areas. Mountain hemlock and Pacific silver fir appear in trace amounts.

Forest Fuels

Fuel loadings in Fire Group 4 can be very high. Many stands contain numerous down logs, the result of deadfall and natural thinning. Despite these loadings, the high humidity and cooler temperatures typical of these sites and low fuel loadings in the less than 3 inch size classes significantly reduce the fire hazard. Most of the fuel load results from blowdown, insect and disease related mortality, and natural thinning and pruning. Young stands and older open-canopy stands often support a lush understory. Dense canopies allow little sunlight to reach the cool, moist forest floor.

Fire Ecology/Fire Effects

On moist grand fir habitat types, fires are infrequent with the fire return intervals ranging from 70 to 250 years. Fire can provide a mineral seedbed suitable for both seral and potential climax species. The bark of mature trees is thick and can provide protection against low to moderately severe fires. However, trees that survive a fire are very susceptible to bole rot caused by Indian paint fungus (Echinodontium tinctorium) entering the fire scars.

Prolonged drought will allow fires to burn through these stands. Severe burning conditions may result in crown fires, replacing the stand.

Current Fire Behavior

Aggressive initial attack and generally high fuel moistures keep most fires very small within the fire group. Fire starts are rare due to the moist conditions, and these fires tend to creep and smolder in the light fuels and duff. Under the right stand and weather conditions, large crown fires can develop and probably account for any large fires. This fire group faces a larger risk of crown fires that originate in drier stand sites and burn into these stands. Most fires only last for one burning period.

Fire Groups 2 & 3 - Warm, Dry Grand Fir and Douglas-fir

Fire Group 2 occurs east of the Cascade crest. Within the Gifford Pinchot it lies mostly in the White Salmon and Little White Salmon River drainages. Fire Group 3 also lies primarily east of the Cascade crest but can occur on the westside, north of the Columbia River.

Fire Group 2 consists of Douglas-fir and grand fir plant associations where ponderosa pine is the major seral species. Plant associations included within Fire Group 3 are generally more moist than those found in Fire Group 2. Common seral conifers include ponderosa pine, Douglas-fir, lodgepole pine, and western larch. Grand fir appears both in the understory and overstory. Lesser amounts of western white pine and western hemlock may appear in the grand fir/twinflower associations.

Forest Fuels

Fuel loadings in Fire Group 2 tend to be less than 10 tons per acre. The fuel loadings within Fire Group 3 will range from approximately 10 to 18 tons per acre with tonnage difference primarily related to differences in the greater than 3 inch size classes. Stand development determines fuel conditions and the associated fire hazard. Fire history and past harvest activity, in turn, influence stand development. Generally, fuel loads tend to increase with stand age due to accumulated downfall from insect and disease damage, blowdown, and natural thinning. Dwarf mistletoe can cause rapid fuel accumulation.

Dense thickets of Douglas-fir or grand fir regeneration may become established during fire-free periods. This regeneration provides a fuel ladder into the overstory, greatly increasing the probability of a stand replacing fire.

Fire Ecology/Fire Effects

Fire strongly influences grand fir's ecological role. On many Pacific Northwest sites, grand fir is able to dominate as the climax species only if fire is excluded. Grand fir is never seral on sites with frequent fires.

In relatively dry grand fir habitat types, underburns appear to have occurred at a 6 to 45 year return interval. The thick bark of mature trees can provide protection against low to moderately severe fires. However, trees that survive a fire are very susceptible to bole rot caused by Indian paint fungus entering the fire scares.

Current Fire Behavior

Fire exclusion and timber harvest practices have greatly increased the chances for a stand replacing crown fire. Stand densities have increased and species composition has changed toward the more fire sensitive grand fir. Underburning that does occur tends to be lethal since grand fir has a greater tendency to dominate both the overstory and understory. Aggressive initial attack tends to limit fires to 10 acres or less. Those not caught during the first burning period generally are wind driven events and grow to more than 1000 acres.

6-3 Risk Assessment

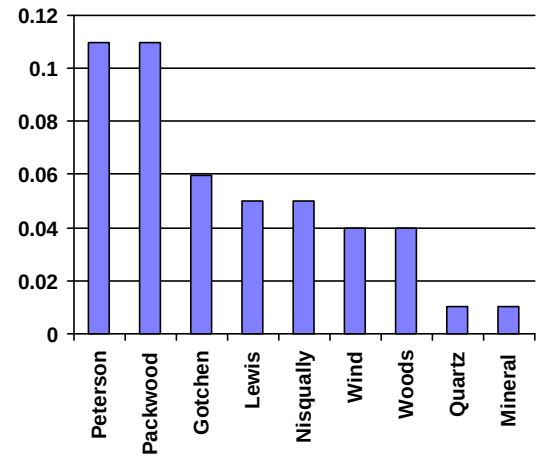
Fire occurrence and fire frequency based on fire data for 1972-1995 is displayed in Figure 6-1 and Table 6-1.

Table 6-1 Fire Frequency

LSR	No. of Fires	Acres in LSR	*Fire Occur./ Yr	**Fire Frequency
Peterson	38	15,514	1.7	0.11
Packwood	71	43,110	3.1	0.11
Gotchen	22	15,173	0.95	0.06
Lewis	140	120,642	6.1	0.05
Nisqually	53	51,360	2.3	0.05
Wind	111	125,006	4.8	0.04
Woods	25	28,244	1.1	0.04
Quartz	1	8,860	0.04	0.01
Mineral	7	37,590	0.30	0.01

*Fire Occurrence is the number of fires divided by the number of years (23).
**Fire Frequency is the number of fires per 1000 acres divided by number of years.

Figure 6-1 Fire Frequency



Levels of catastrophic risk were assessed from four natural disturbance agents in the West Cascade Subregion for Northern Spotted Owl (Agee and Edmonds 1992) as shown in Table 6-2.

Map 6-5 through Map 6-7 are the products of a specific risk assessment for fire which was determined using current vegetation classes, and assigning as NFDRS fuel model (fuel based on large scale planning area); overlaid with average slope classes (i.e., 0, 30, 60, and 90 percent) and aspect (N,S,E,W). This information was combined with the historical fire weather information (50th - average case and 90th percentile - average worst case) and a fire behavior analysis was prepared for each fuel model. Rate-of-spread and flame length was determined for each fuel model based on the historical weather parameters.

Table 6-2 Risk of Natural Disturbance

Disturbance Agent	Risk Level
Fire	Low
Wind	Moderate-Low
Insects	Low
Diseases	Low

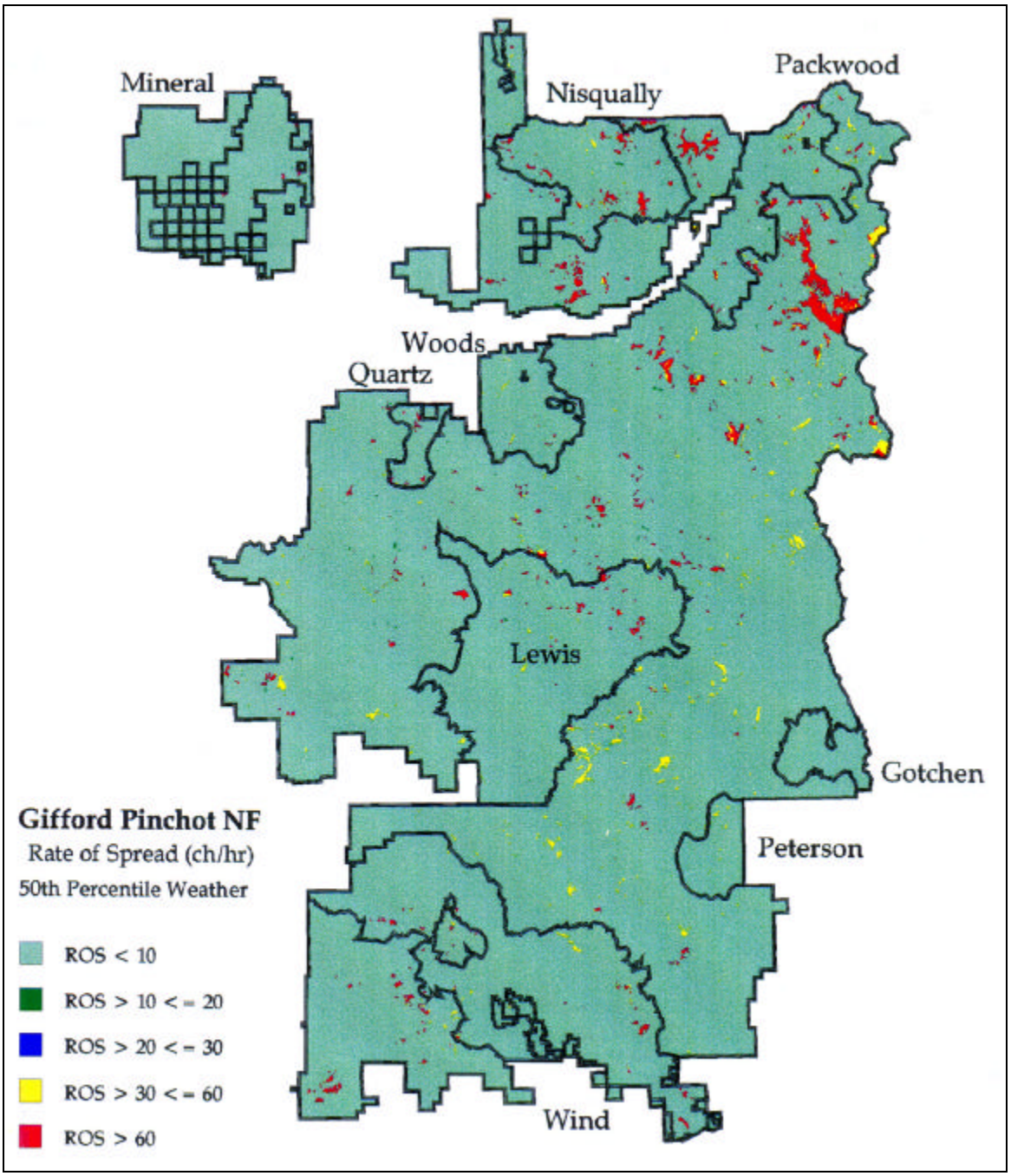
The effectiveness of fire suppression over the last 60 years has had major effects across the landscape in modifying and altering spatial distribution of species (vegetative and animal), and in disturbance pattern regimes. Fire suppression and reduction or elimination of grazing in our westside ecosystems has allowed overstocking of herbaceous, and woody (including early and mid-seral) species. On many sites, this overstocking has led to an increase in rates of spread and fire intensity. This is characteristic of many of our managed stands and the Forest in general. Wildfire and grazing used to maintain many of our meadow/grass associations which are now being encroached by invading tree species. These openings provided for natural fire breaks as well as providing for diversity of unique wildlife and plant species.

Map 6-5 and Map 6-7 depict the average conditions (50th percentile). During these average conditions, with few exceptions,

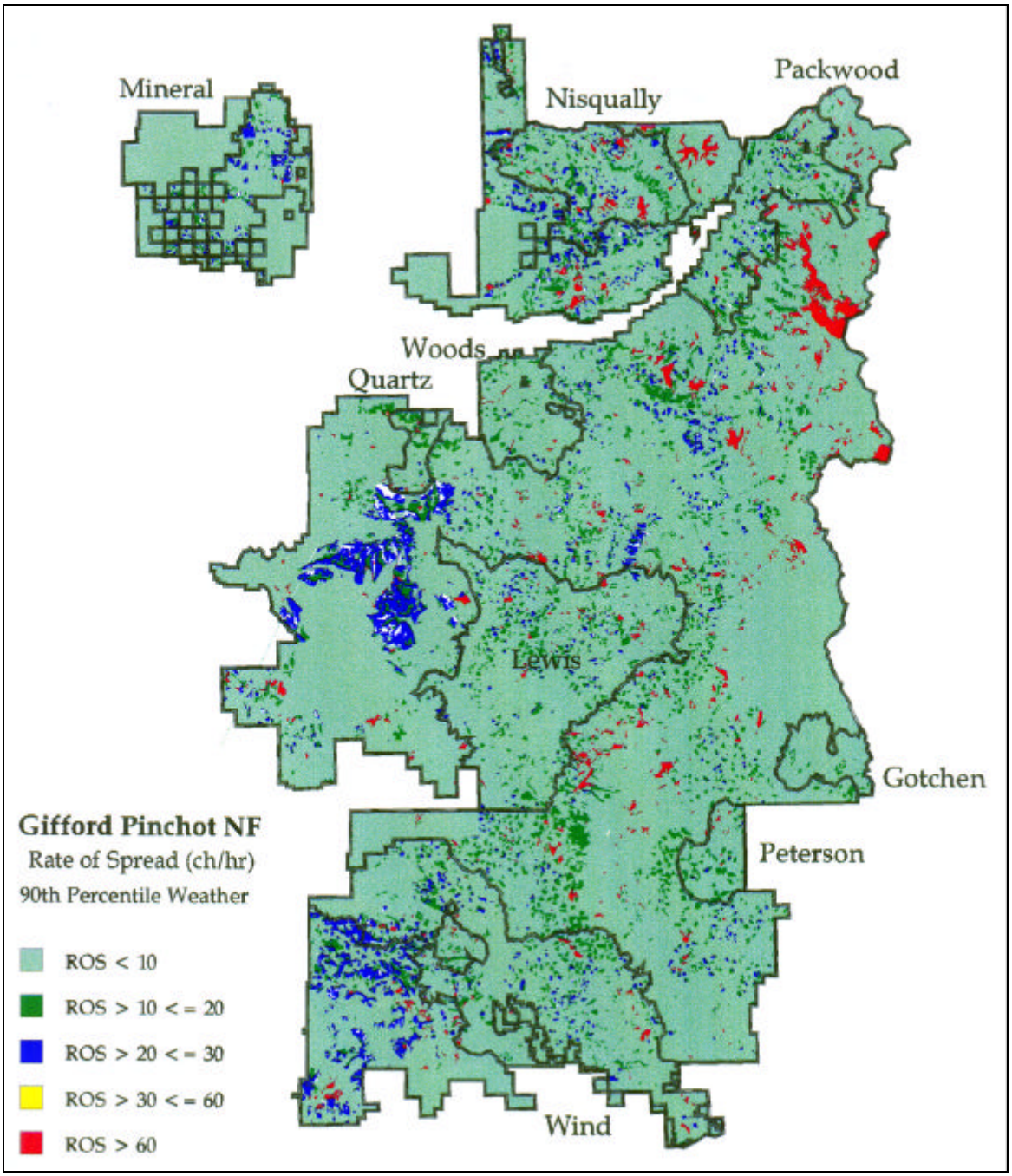
most wildfires should be able to be contained during the first burning period.

Map 6-6 and Map 6-8 depict the worst case scenarios (90 percentile). Those areas that indicate greater than 8 foot flame lengths and rates-of-spread exceeding 30 feet per minute will require that the fire management organization formulate how to provide protection to these stands and/or adjacent stands. This may include targeting these areas, or the adjacent stands, for stand manipulation to reduce possible overstocking and fuel loadings that have occurred in these high risk areas. If stand manipulation is not a viable treatment to reduce risk, there may be a need for extra-protection during high risk periods.

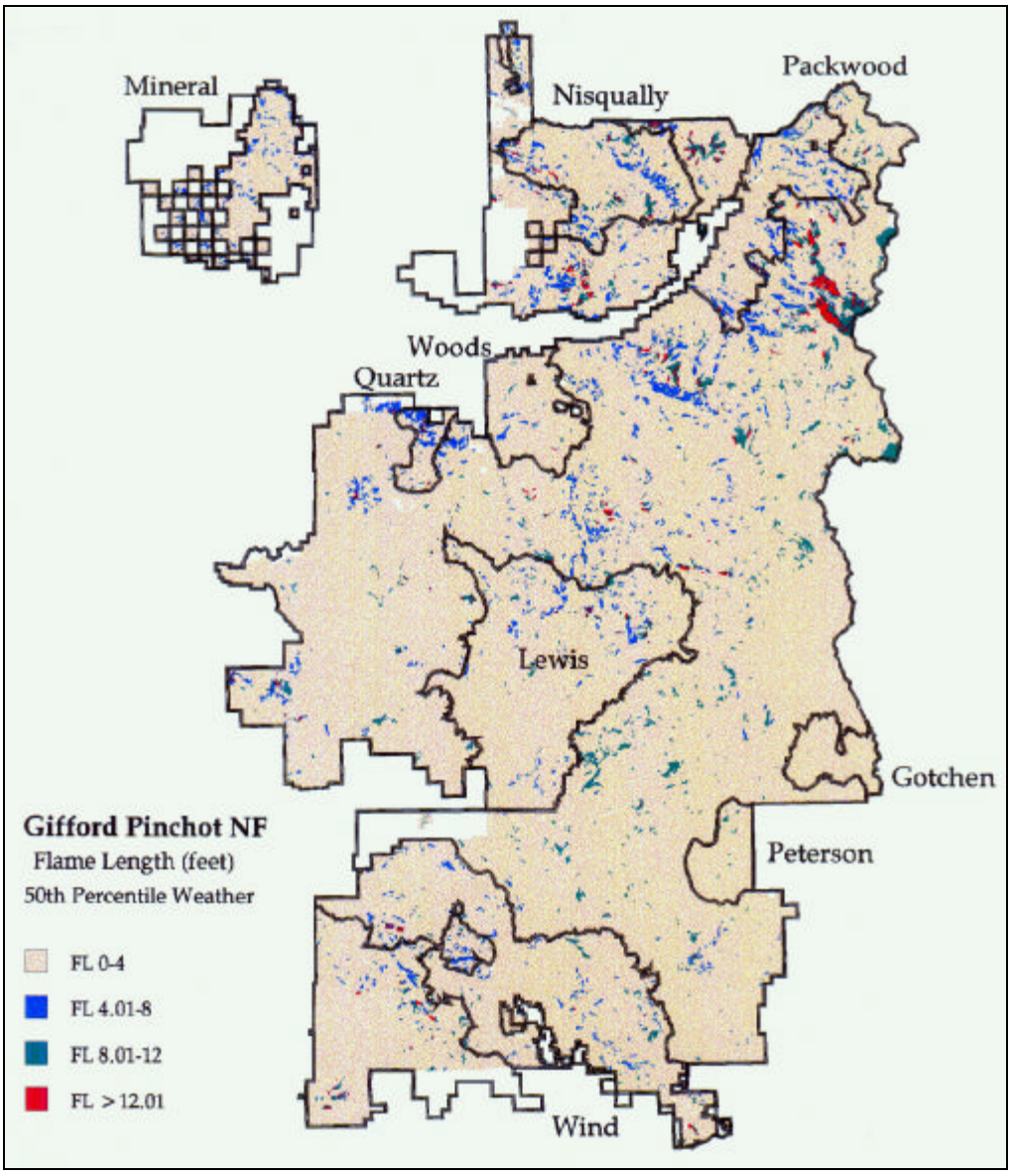
Map 6-5 Rate of Spread at 50th Percentile



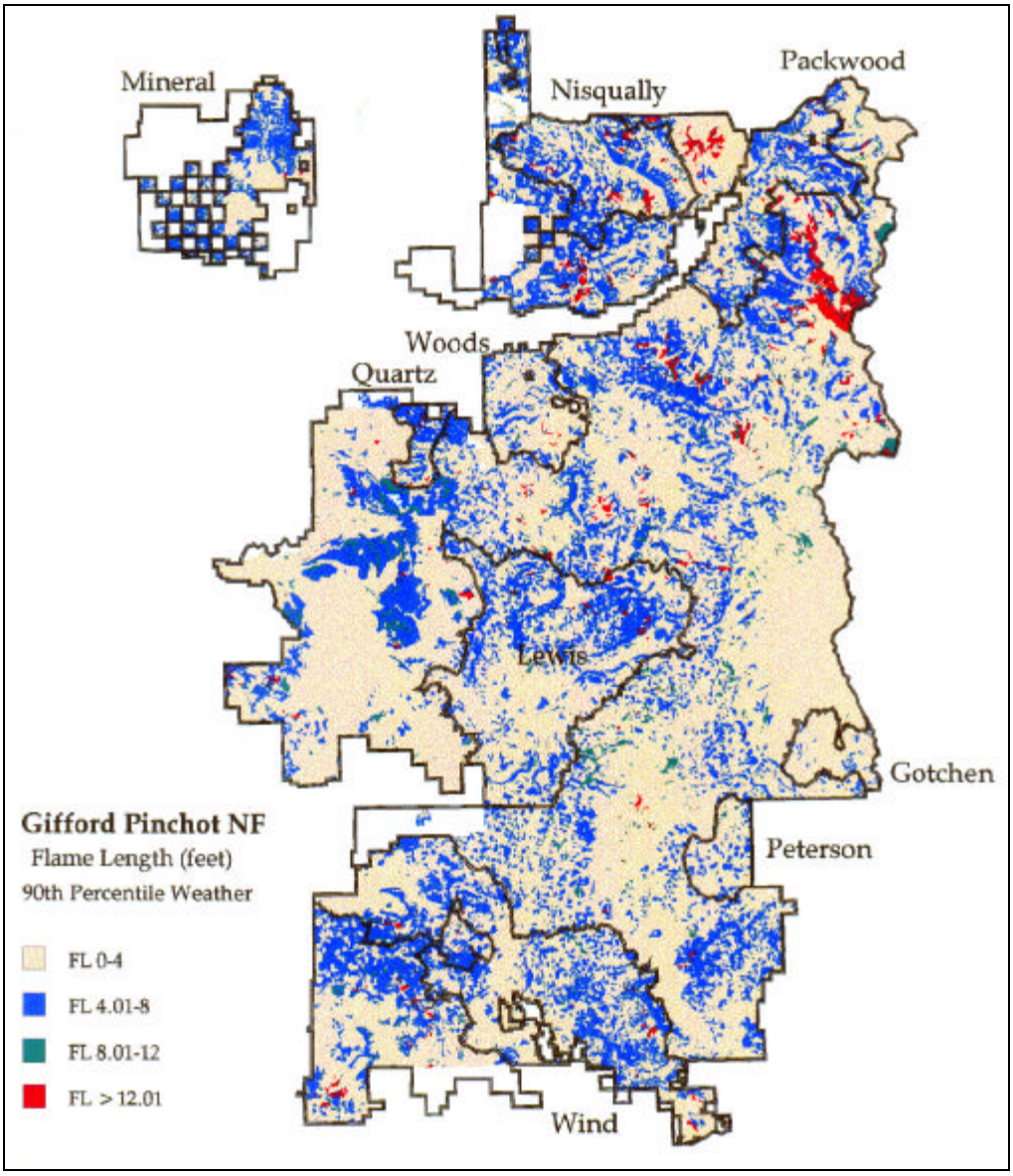
Map 6-6 Rate of Spread at 90th Percentile



Map 6-7 Flame Length at 50th Percentile



Map 6-8 Flame Length at 90th Percentile



6-4 Opportunities to Reduce Fire Risk - Treatment Alternatives

A number of viable options are available to the fire manager for wildfire hazard reduction measures which relate to proposed management activities.

Depending on stand age, stand condition and type of management activity prescribed, any of the following would be appropriate.

Risk assessments should be conducted on all proposed projects to determine wildfire hazard reduction commensurate with determined risk. Risk assessment needs to assess not only area being immediately effected by some type of treatment manipulation but also must take into account adjacent stand conditions. The goal of risk reduction treatments would be to provide protection and allow for the promotion of late-successional habitats.

Careful consideration for long-term planning needs to be done within Fire Groups 2 and 3. These are the warm, dry grand fir and Douglas-fir sites. Conditions currently are low to moderate, but the LSR (Gotchen) within these fire groups will have a higher susceptibility to insect and disease attacks creating potential pockets of high risk hazard. This LSR also has the highest potential for fire entry from outside, as it lays adjacent to private ownership which is currently experiencing an outbreak of spruce budworm. Consideration needs to be given to creating fuel breaks throughout the LSR to lessen the impact of a wildfire event.

Commercial Thin

Mechanical Treatment

Stand age 30+; minimal defect in bole wood; less than 40 percent crown ratio; minimize ground disturbance.

a. Whole tree yard - do not sever top from tree bole, do not buck tree in the woods.

b. Yard top with last log - tree may be bucked to acceptable log lengths. The top remains attached to the last log and is yarded to the landing.

Stand age 30+; defect and crown percent not a factor; minimal soil disturbance acceptable.

a. Machine pile - loader

b. Machine pile - dozer: Avoid disturbing large coarse woody debris. Dozer piling may result in excessive soil disturbance. Its use should be coordinated with the Forest soil scientist.

Prescribed Fire

Stand age 30+; Fire tolerant species (Douglas fir, ponderosa pine, western larch).

Use prescribed fire, where possible, to maintain fire climax conditions. Prescribed fire may increase viability of

Cypripedium fasciculatum
(Clustered lady's slipper),

Cyripedium montanum
(Mountain lady's slipper), and

Allotropa virgata
(Sugar stick).

Area Fire**.** Use prescribed fire over an area to reduce fine fuels (0-3 inch material). Since this treatment may have a short-term adverse impact on mycorrhizal systems, invertebrates, and small mammal populations, prescribed fire managers should consider use of a cool, spring burn to lessen impacts.

Jackpot Burning. Burn only those areas where fuel concentrations occur, generally small pockets.

Handpile and Burn. Pile concentrations of fuel residues that are generally less than 6 inches in diameter and burn during a period that would minimize risk of escape or extensive spread between piles.

Pile Burning. Determine if mechanically treated piles need to be burned. If they present little risk, they may remain on site. Piles may provide habitat for small mammals.

Lop and Scatter. Delimb boles that are to remain on the ground, and scatter limb material to avoid creating fuels concentrations.

Young Stand Thinnings

Type of hazard reduction, amount of treatment and type of treatment will vary depending upon roading and amount of human activity in proximity to young stand thinnings.

Mechanical

a. Use of smaller grapple/articulated thumb loader to create fuel breaks along adjacent skid trails, and/or roads.

b. Use of chipper - felled residue is pulled a specified distance from within the treated unit and chipped. Material may be sold or left on site. If left on site, it should be dispersed to avoid spontaneous combustion.

Other

a. Stewardship contracts - contractor may remove felled saplings, and prune remaining saplings for bough usage.

b. Lop - cut felled stems into specified length to promote faster decay of limb and bole.

c. Hand pull/pile and burn - generally applied within a given distance from road prism to create a fuel break.

d. Close access to area until wildfire risk is reduced by felled sapling decomposition and the fine fuels no longer present a fire risk.

Gap Creation, Structural Manipulation, Salvage

Due to limited harvesting within these type of activities, the fire manager needs to assess the risk, and need to treat fuels based on the fuelbed composition of adjacent areas.

Mechanical

a. Use a grapple/articulated thumb loader to pile residual slash.

Prescribed Fire

a. Use a “spring-like” underburn to reduce fine fuels and retain large, coarse woody material.

b. Jackpot burn pockets of high fuels concentrations.

c. Handpile and burn - pile residue less than 6 inches in diameter and burn.

Other

a. Lop and scatter - delimb remaining boles and scatter limbs to avoid creating fuel concentrations.

Other Treatment types

Meadow Restoration

Prescribed Fire: Use prescribed fire to retard seed/sapling reproduction and enhancement of grasses, sedges, flora and fauna related to this ecosystem.

Other: Lopping of seed/sapling to retard reproduction encroachment.

6-5 Ignition Management and Wildfire Suppression

Ignition Management

An analysis of statistical causes of ignition was completed for all the LSRs based on historical fire data for the period of 1972 - 1995 (Table 6-3). This assessment will assist the Forest and Districts in making LSR specific ignition management plans to reduce unwanted human ignitions. Ignition management plans will include specific actions to reduce these human caused ignitions (i.e., fire prevention signing and group/campground prevention programs), in conjunction with hazard risk reduction. The Ignition Manage-ment Plan is found in Chapter 20 of the *Fire Management Action Plan*.

Table 6-3 Number Of Fire Occurrences By LSR, Statistical Fire Cause And Decade.

			LSRs								
Description	**DECADE**	**Total**	**Gotchen**	**Lewis**	**Mineral**	**Nisqually**	**Packwood**	**Peterson**	**Quartz**	**Wind**	**Woods**
Arson	1972-1979	**7**		2			1			4	
Arson	1980-1989	**6**		1			1			4	
Arson	1990-1995	**3**		1		2					
Campfire	1972-1979	**52**	7	9		8	8	9		8	3
Campfire	1980-1989	**19**				5	6	2		5	1
Campfire	1990-1995	**22**		3	1	8	5	2		2	1
Children	1972-1979	**1**								1	
Children	1980-1989	**1**								1	
Children	1990-1995	**2**				1	1				
Debris Burning	1972-1979	**33**		12		4	4			13	
Debris Burning	1980-1989	**14**		7	1	1				4	1
Debris Burning	1990-1995	**4**		1			1	1		1	
Equipment Use	1972-1979	**10**	1	3	1	1		1		2	1
Equipment Use	1980-1989	**5**		1		1	1	1		1	
Equipment Use	1990-1995	**2**		1							1
Lightning	1972-1979	**100**	3	45	2	6	13	2		22	7
Lightning	1980-1989	**57**	6	12		10	6	8		15	
Lightning	1990-1995	**46**	3	29		2	5	2	1	2	2
Misc.	1972-1979	**14**		1		1	6			3	3
Misc.	1980-1989	**17**		2	2	2	3			8	
Misc.	1990-1995	**4**		1			1			1	1
Smoking	1972-1979	**21**		4			3	5		6	3
Smoking	1980-1989	**21**	2	3		1	4	3		7	1
Smoking	1990-1995	**7**		2			2	2		1	
Totals		**468**	**22**	**140**	**7**	**53**	**71**	**38**	**1**	**111**	**25**

Table 6-4 Acres Burned By LSR, Statistical Fire Cause And Decade.

Description	DECADE	Total	LSRs								
			Gotchen	Lewis	Mineral	Nisqually	Packwood	Peterson	Quartz	Wind	Woods
Arson	1972-1979	**2**		0			2			0	
Arson	1980-1989	**0**		0			0			0	
Arson	1990-1995	**0**		0		0					
Campfire	1972-1979	**0**	0	0		0	0	0		0	0
Campfire	1980-1989	**8**				8	0	0		0	0
Campfire	1990-1995	**1.7**		0.1	0.1	1.1	0.1	0.1		0.1	0.1
Children	1972-1979	**0**								0	
Children	1980-1989	**0**								0	
Children	1990-1995	**1**				0	1				
Debris Burning	1972-1979	**3678**		87		42	71			3478	
Debris Burning	1980-1989	**403**		144	0	0				259	0
Debris Burning	1990-1995	**12.1**		4			0.1	0		8	
Equipment Use	1972-1979	**0**	0	0	0	0		0		0	0
Equipment Use	1980-1989	**8**		0		7	0	1		0	
Equipment Use	1990-1995	**0**		0							0
Lightning	1972-1979	**21**	1	15	5	0	0	0		0	0
Lightning	1980-1989	**29**	2	2		3	1	0		21	
Lightning	1990-1995	**7.5**	0	1.3		0	0	0	6	0.1	0.1
Misc	1972-1979	**1**		0		0	0			1	0
Misc.	1980-1989	**18**		0	12	2	2			2	
Misc.	1990-1995	**4.1**		0			3			0.1	1
Smoking	1972-1979	**3**		1			0	0		2	0
Smoking	1980-1989	**0**	0	0		0	0	0		0	0
Smoking	1990-1995	**0.3**		0.2			0	0.1		0	
Totals		**4197.7**	**3**	**254.6**	**17.1**	**63.1**	**80.2**	**1.2**	**6**	**3771.3**	**1.2**

Wildfire Suppression

A wildfire is any wildland fire that does not meet management objectives, and therefore requires an appropriate suppression response. The appropriate suppression response on a wildfire most efficiently meets fire management direction under current and expected burning conditions. The response ranges from a strategy of prompt control at the smallest acreage possible to one of containment or confinement.

Fire as a natural disturbance agent may either set back the elements desired within the late-successional forests or have a beneficial influence on the forest's future resiliency, depending on current stand conditions and fire behavior. Our goal is to protect and promote late-successional habitat, while allowing important processes to continue.

Table 6-5 Appropriate Suppression Response Guideline (See Glossary for definition of terms)

LSR	Stand Diameter (inches)	FIRE BEHAVIOR CONDITION		
		Smoldering/Creeping	1 - 2 ft. Flame Lengths	>2 ft. Flame Lengths
Mineral	< 12	control	control	control
	> 12	confine/contain to < 5 ac.	contain/control to < 5 ac.	control
Nisqually	< 12	control	control	control
	> 12	confine/contain to < 5ac.	contain/control to < 5 ac.	control
Packwood	< 12	control	control	control
	> 12	confine/contain to < 5 ac.	contain/control to < 5ac.	control
Woods	< 12	control	control	control
	> 12	(1)confine/contain (2)confine/contain to < 5ac.	(1)confine/contain (2)contain/control to <5 ac	control
Quartz	< 12	control	control	control
	> 12	confine/contain to < 5 ac.	contain/control to < 5 ac.	control
Lewis	< 12	control	control	control
	> 12	confine/contain to < 5ac.	contain/control to < 5ac.	control
Wind	< 12	control	control	control
	> 12	confine/contain to < 5 ac.	contain/control to < 5ac.	control
Peterson	< 12	control	control	control
	> 12	(3)confine/contain (2)contain/control to < 5 ac.	(3)confine/contain (2)contain/control to <5 ac	control
Gotchen	< 12	(3)confine/contain (2)control	control	control
	> 12	(3)confine/contain (2)confine/contain to <5 ac.	(3)confine/contain (2)contain/control to <5 ac	control

(1) Those stands which are primarily even-age Douglas-fir
(2) All other stands
(3) Those stands which are primarily Ponderosa pine, Douglas-fir, Western Larch

The Appropriate Suppression Response Guideline was developed to help the Line Officer and Fire Management determine potential appropriate suppression strategy based on a current and/or expected fire behavior condition and diameter size classes within the given LSRs. First Order Fire Effects Model (FOFEM) was used to help determine effects on tree/stand mortality thresholds.

These are to be used as guidelines. The fire manager will make on-the-ground decisions based on their knowledge of current and expected conditions.

Five acres was chosen as upper acreage limit to maintain neutral or benefiting effects. This will allow for the creation of patch openings and canopy gaps.

Areas of Exception. Within all of the Late-Successional Reserves there will be areas designated high priority for suppression protection. In general, these will be older forest patches and connections with interior habitats, spotted owl/marbled murrelet activity centers, sensitive plant populations, and riparian areas in watersheds with high anadromous fish populations.

Minimum Impact Suppression Tactics (MIST)

Late-Successional Reserves standards and guidelines require the use of MIST designed to minimize the size of the wildfire while producing the least possible impact on late-successional and old-growth habitat. Elements of particular concern are late-successional and old-growth stands, snags, downed woody material, and duff. Moody and Mohr (1988) developed a guide for MIST, which is recommended for use on both wildfire suppression and mop-up of prescribed fires within LSRs and Riparian Reserve boundaries. Minimum impact tactics include such practices as:

- Minimize constructed fireline and fireline width, consider use of fireline explosives (FLE), cold-trailing, and wet line to lessen impacts from constructed line.
- Minimize bucking and felling of trees and snags in line construction.
- Remove only those limbs with potential to spread the fire beyond the fireline.
- Consider allowing trees and snags to burn out instead of felling them, provided they do pose a significant safety risk to firefighters or pose a significant risk of spotting outside the fireline.
- Limit use of bulldozers to slopes or less than 25 percent.
- Minimize bucking during mop-up; instead attempt to roll logs to extinguish the fire.
- Extinguish smoldering logs as soon as possible.

MIST guidelines may be found in the *Fire Management Action Plan*, Chapter 30.

Post Fire Rehabilitation

Needs should be quickly identified and associated work should be ecologically appropriate for the site and completed in the prescribed time frame.

6-6 Monitoring

The following monitoring questions will be used in assessing risk reduction and fire suppression activities within LSRs.

- Have the risk reduction measures and appropriate suppression response guidelines provided for firefighter and public safety?
- Have risk reduction measures been sufficient in reducing loss of habitat?
- Has the use of the appropriate suppression response guideline aided the Fire Manager in the use of strategies appropriate for the fire behavior and stand conditions encountered?
- Has the use of Minimum Impact Suppression Tactics been successful, given the constraints for LSR and Riparian Reserve management?
- Has the Escaped Fire Situation Analysis (EFSA) provided clear direction to the Incident Management Team (IMT) on meeting LSR and Riparian Reserve objectives?

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Glossary

Appropriate Suppression Response - The kind, amount and timing of suppression resource dispatch to a wildfire which minimizes cost and meets fire management direction under current and expected burning conditions. It may range from the dispatch of resources to implement suppression strategies confine, contain, or control.

Confine strategy - to utilize natural or pre-constructed barriers, or environmental conditions, to restrict fire spread within a predetermined area. Suppression action could be minimal, and may be limited to surveillance under appropriate conditions.

Contain strategy - to surround a fire, and any spot fires therefrom, with a control line as needed, which can reasonably be expected to check the fire's spread under prevailing and predicted conditions.

Control strategy - to complete the control line around a fire, any spot fires therefrom, and any interior islands to be saved; burn out any unburned area adjacent to the fire side of the control line; cool down all hot spots that are immediate threats to the control line, until the line can reasonably be expected to hold under foreseeable conditions.

Crown fire - A fire burning into the crowns of the vegetation, generally associated with an intense understory fire.

Fire frequency - The return interval of fire.

Fire intensity - Intensity will vary depending on fuel loading and distribution, and site weather and moisture conditions at the time of the fire.

Fire regime - The combination of fire frequency, predictability, intensity, seasonally, and extent characteristic of fire in an ecosystem.

Fire severity - The effect of fire on plants. For trees, severity is often measured as percentage of basal area removed.

Flame length - The distance along the slant of the flame from the midpoint of its base to its tip

Fuel size classes - Dead fuels are divided into size classes based on diameter: less than ¼ inch, ¼ to 1 inch, 1 to 3 inches, and greater than 3 inches. Fuel size is related to the rate at which moisture is gained or lost.

Prescribed fire - A fire ignited under known conditions of fuel, weather, and topography to achieve specified objectives.

Rate of spread - The rate at which a fire moves across the landscape, usually measured in feet/minute or chains/hour.