Chapter 3

Desired Conditions

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Desired Conditions

This chapter is structured by scale of influence; Forest, plant zone, and individual Late-Successional Reserve (LSR). Desired conditions emphasize vegetative conditions and wildlife habitat. Desired conditions for vegetation are described for the relatively stable late-successional/old-growth conditions as prescribed for LSRs by the Northwest Forest Plan (NWFP). Desired conditions for younger stands are described in Chapter 5 in terms of treatments to put them on a trajectory to achieving the ultimate old-growth desired condition. Desired conditions for human uses, and facilities consistent with LSR objectives are also developed at the appropriate scale. Some components are discussed at several scales. For example, vegetative conditions will be described in general terms at the Forest scale and with increasing specificity at the scales of plant zone and LSR.

3-1 Forest Scale Desired Condition

Vegetation

The desired condition for Late-Successional Reserves is large patches of old-growth forest which provide habitat for the northern spotted owl and other old-growth dependent species. This condition may be outside the range of historical variability, at the LSR scale. Reconstruction of historical stand conditions indicates the LSRs would provide more large contiguous blocks of old-growth than was present before European settlement.

By the nature of old-growth forest, the composition of these old-growth patches is expected to be very diverse in structure. Where LSRs include eastside (grand fir zone) conditions, more structural heterogeneity may be introduced through management to reduce the risk of large scale loss of habitat from wildfire. (See Grand Fir Zone, p. 13).

Old-growth structure is characterized by trees that are large in diameter and tall. Canopies are usually deep and diverse with many broken tops and large, gnarled branches. A multi-layered canopy consisting of one to several cohorts of younger trees is established as mortality creates shifting gaps in the overstory layer. Reproduction usually consists of the more shade-tolerant tree species but in larger openings intolerant early seral species may also be present. A patchy understory consisting of shrubs and forbs is also characteristic of the old-growth stage.

Old-growth stands have numerous snags of various sizes including very large snags. Large snags are important habitats for a number of vertebrates, especially cavity nesters, and many invertebrates. Snags also serve as a future source for down wood.

On the forest floor are many, often large, down logs. The large size of these down logs, allows them to persist for many decades, even centuries. Large down logs provide habitat for many species and are important for erosion protection, nitrogen fixation, and mycorrhizal function. Down logs also serve as a seedbed for certain species and are a source of moisture during summer drought. Down logs are critical components of small to medium sized streams - supplying energy and nutrients and creating dams, pools, and gravel deposits.

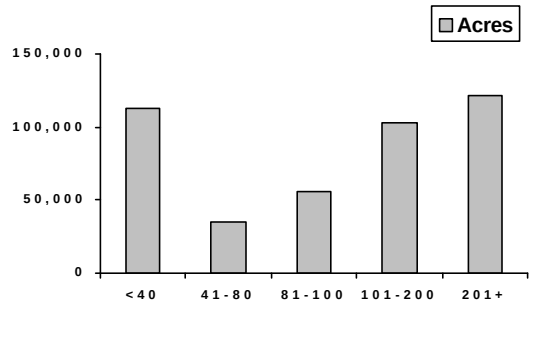
Old-growth structure provides for ecosystem function by cycling and conserving nutrients (rates of erosion are very low), absorbing water and releasing it to streams through groundwater flow (providing base flow for periods of summer drought) and acting as cover and a source of food for small mammals, insects, and other organisms. It also helps to create a moderate microclimate, buffered against climatic extremes, and supplies additional moisture by intercepting fog. Old-growth stands are characterized by high accumulations of fungi, lichens and bryophytes (ROD p. B-5).

All of these characteristics provide a diversity of forest structure and a wide array of habitats for many, often specialized, forest organisms.

Early and mid-seral forest habitats are expected to be a minor component of the LSR network. Small-scale natural disturbances by fire, wind, insects, and diseases will generate early and mid-seral forest habitat within the LSRs by creating forest canopy gaps of varying sizes. Such canopy gaps are considered important components of old-growth forest characteristics. Wildlife species that are dependent on early and mid-seral forest habitats will continue to utilize LSRs because of the creation of canopy gaps. However, Matrix land allocations are expected to provide the majority of early and mid-seral forest habitat for these wildlife species.

Habitat complexity in all LSRs derives from two sources; existing conditions and small-scale disturbances. Because of the extreme diversity of seral stages present (see Figure 3-2), the LSRs will remain very diverse for at least 150-200 years as young stands develop and mature. However, we expect that in 200 years they will be predominantly in the old-growth stage. With absence of large scale disturbance (aided by fuels management as described in Chapter 6), older stands will also evolve. Although the desired condition for these areas is old-growth forest, in practice, they will not likely be large contiguous blocks of old-growth forest for several hundred years, if ever. Natural disturbances due to insects, diseases, windthrow, and fire will continue provide stand diversity into the future.

Figure 3-1 LSR Acres by Age Class



In the long-run, natural non-forest areas will continue to contribute to habitat complexity within LSRs. Meadows, wetlands and rock outcrops are unique non-forest habitats providing micro-climates sought by many species of plants, birds, amphibians, mollusks and small mammals, some of which may not be old-growth dependent species but whose coexistence is compatible with LSR objectives. These natural openings should be free of non-native species.

Because we are directed to manage these areas to prevent large scale disturbances and to create late-successional forest conditions (ROD p. C-12), the expected diversity of stand structure and landscape patterns is different than would occur under natural conditions at the scale of the LSRs. However, by providing large blocks of late-successional and old-growth vegetation these reserves will contribute to bringing the stand composition at the river basin scale

within the range of historic range of variability. Across all ownerships, the amount of late-successional forest at the basin scale is presently well below the historic range of variability. (USDA 1993).

Plants and Fungi

Late-Successional Reserves provide critical habitat to vascular plants, bryophytes, lichens, and fungi associated with late-successional and old-growth forests. Most species of bryophytes do not become established in stands until 100 years, and they are best developed in stands 400 years or older. It may take over 200 years for late-successional lichens to become established. Old-growth associated vascular plants and fungi are often involved in complex mycorrhizal relationships that may require old-growth associated animals for dispersal and pollination. The desired future condition of LSRs for plants and fungi is to provide a network that will contribute to the maintenance of viable populations of these species and their functions in the ecosystem.

Unmapped Managed Late-successional Areas result from the application of Protection Buffers established to maintain viable populations of non-vascular plants. These were species afforded special protection in the Scientific Analysis Team Report (Mitigation Step 5-Standards and Guidelines for Rare and Locally Endemic Species, USDA 1993), and the standards and guidelines were carried forward in the Northwest Forest Plan (ROD). The Protection Buffer species documented from LSRs include (*Buxbaumia viridis, Tetraphis geniculata, Ulota megalospora, Polyozellus multiplex,* and *Sarcosoma mexicana*). The desired condition for these LSRs is that they are inhabited by viable, reproducing populations of the Protection Buffer species.

The desired future condition of vegetation includes a decline of noxious weeds and introduced plants to thresholds that do not adversely affect native plants and animals. Noxious weeds introductions will be prevented and controlled.

Wildlife Habitat

Late-Successional Associated Species

In the future, LSRs are intended to be large, contiguous blocks of late-successional habitat that can sustain populations or sub-populations of those species associated with late-successional forests. Each LSR is part of a network of LSRs connected by habitat in the Matrix that allows for dispersal of animals between LSRs (ROD p. B-1, 4).

Those species using late-successional habitat include species such as the spotted owl that appear to be dependent on older forest, species that rely on snags and down wood, and generalists that use older forests as well as other habitats. All these species are expected to use habitat in LSRs.

Some late-successional species are negatively affected by fragmentation and associated edge effects. As young forests in LSRs mature, the effects of fragmentation will diminish, providing higher quality habitat for these species. As stands mature, the processes of death and decay produce defective trees, large snags, and down logs. These structural components of late-successional forests provide important habitat for a number of wildlife species. Late-successional stands are multi-species and multi-layered providing a diversity of habitats for many species. Canopy gaps and understory vegetation provide shrubby habitat for songbirds and small mammals.

Riparian associated species

Healthy, functioning riparian habitats will occur across the landscape. These areas will

provide protected microclimates, large coarse woody debris, and cold, clear water for fish, amphibians, and other riparian dependent species.

Threatened, Endangered, Extirpated, and Sensitive Species

All threatened, endangered and sensitive species currently occurring in LSRs should be present in the future. Northern spotted owls and marbled murrelets will directly benefit from the expansion of late-successional habitat provided by LSRs. Reduced fragmentation in the LSRs should reduce the number of great horned owls and their predation on spotted owls in LSRs (Johnson 1993).

Gray wolf and grizzly bear (currently extirpated) will benefit from anticipated reduction of permanent road density in most LSRs. Both species are sensitive to human disturbance associated with roads. Reduced road densities will increase the probability of grizzly bear repopulating the LSRs. Those LSRs nearest Mt. Rainier National Park have the highest likelihood of grizzly bears becoming reestablished.

Introduced species

House sparrow and starling competition with native species for nest cavities should be reduced as availability of early seral habitat decreases. Bullfrogs may still be present in lower elevation wetlands. Wild turkeys will still be present as they readily use late-successional habitats and down wood. Other introduced species are habitat generalists associated with human habitation and are expected to occur in areas where LSRs are adjacent to human habitation. Examples are the Virginia opossum and Norway rat, which are predators on eggs of ground nesting birds.

The effect that future conditions of LSRs will have on barred owls, and their competition with spotted owls, is uncertain. It is not known what has caused the range extension of barred owls. Thus, changes in management practices in LSRs may or may not impact barred owl range expansion. (Thomas et al. 1993).

Open habitat species

Open habitats will still occur in LSRs but in lesser amounts than are currently available. Species associated with these habitats will primarily occur in Matrix lands. Some open habitat species will utilize small gaps formed by windthrow, insects and disease. Fire suppression will limit disturbance caused by fire but some open habitat patches will probably still be produced by fires. Meadows and other natural openings will still be present in LSRs.

Habitat for “contrast” species - those species associated with late-successional habitats for part of their life history requirements and with open habitats for other parts of their life history requirements - will be limited in LSRs. These species include elk, great horned owls, and red-tail hawks. Fragmented habitats are more of a benefit to these species than contiguous blocks of late-successional habitat.

Deer and Elk Winter Range

Habitat for deer and elk is a concern in LSRs. Optimal cover will be plentiful but foraging habitat for deer and elk will be restricted to natural openings and small forest gaps created naturally or by silvicultural treatment. This is especially of concern within biological winter range (BWR) because BWR is critical for maintaining deer and elk populations when snows bury upper elevational ranges. The LSRs contain 56 percent of the classified BWR found on the Forest. As a result, deer and elk populations on the Forest are expected to decline. Amount of habitat on private land is uncertain. For the short-term, structural stages on private land may not provide adequate forage and thermal cover to maintain existing populations.

Connectivity

Connectivity provides the following ecological functions: 1) animals are able to travel and migrate; 2) plants are able to propagate and disperse; 3) genetic interchange occurs; 4) movement in response to environmental changes and natural disasters; and 5) recolonization of habitats from which populations have been locally extirpated (Beier and Loe 1992).

Large, contiguous blocks of late-successional habitat provide connectivity within LSRs. LSRs are situated close enough together to allow for mobile species to disperse between them and interact with at least an occasional genetic interchange. The Matrix is designed to provide connectivity between LSRs (ROD p. B-1). The combination of Riparian Reserves, green tree retention, small blocks of late-successional habitat (e.g. owl activity centers) and younger forested stands provides dispersal habitat.

Riparian Reserves are designed to provide connectivity corridors of contiguous late-successional habitat. "Riparian Reserves are used to improve travel and dispersal corridors of many terrestrial animals and plants, and provide for greater connectivity of the watershed. The Riparian Reserves will also serve as connectivity corridors among the Late-Successional Reserves" (ROD p. B-13).

The Matrix is designed to include small blocks of late-successional habitat to provide both "stepping stones" for species to move between LSRs and refugia for immobile species. "Isolated remnant old-growth patches are ecologically significant in functioning as refugia for a host of old-growth associated species, particularly those with limited dispersal capabilities that are not able to migrate across large landscapes of younger stands." Remnant old-growth stands "function as refugia where old-growth associated species are able to persist until conditions become suitable for their dispersal into adjacent stands" (ROD p. C-44).

Green tree retention in the matrix is also designed to provide habitat for many organisms. "These trees may also act as refugia or centers of dispersal for many organisms including plants, fungi, lichens, small vertebrates, and arthropods" (ROD p. B-6).

Patches of down logs provide refugia for some species and are an important habitat component for many late-successional associated species. To provide the appropriate microclimate for organisms using down logs, existing down logs should be left within retained forest patches (ROD p. C-41). Logs in the Matrix may not provide the same microclimate as those in older forest and thus may not provide habitat for all species. However, logs in the younger forests "may provide transitional islands for the

maintenance and eventual recovery of some late-successional organisms in the matrix" (ROD p. B-7).

Roads can fragment habitat and isolate populations of some species by creating barriers to movement for less mobile species. Roads provide access to humans which causes disturbance for some species. They also provide corridors for movement of introduced species. Road densities are expected to decline in LSRs and across the Forest, improving conditions for most species.

Disturbance Processes

Fine scale disturbances, generally by insects and diseases, but also fire and wind, cause deaths of single trees or small groups of trees. These processes are desirable as they create small gaps in the overstory that characterize the transition and shifting-gap stages of old-growth forest development. They also create essential structures (brooms, cavities, snags, and downed logs). At some point, the extent of these disturbances, dominates stand conditions, favoring early successional flora and fauna. Introduced disease, such as white pine blister rust, while not desired, are here to stay. Still, we want to maintain present species diversity provided by western white pine and whitebark pine.

Rarely will insects and disease result in continuous mortality over ten acres. The exception would be when multiple agents impact a stand over several years. Most salvage scenarios would likely follow disturbances from fire or wind.

When it is deemed prudent to salvage disturbed sites for safety, facilitate habitat recovery, and/or reduce the risk of future stand replacing events, the salvage prescription should evaluate the response of insects and disease already present or expected. There is generally no shortage of insect and disease pathogens and their spread need not be accentuated where it would diminish adjacent suitable habitat or delay forest development. At the same time, the ability of pathogens to create desired structures for wildlife, should be integrated into management actions.

Existing Developments

Existing developments, such as campgrounds, interpretive sites and trails, and those operated by the public under special use permit, should be managed to avoid conflict with goals and objectives of LSRs or the Aquatic Conservation Strategy. Development of new facilities will be permitted that do not adversely affect Late-Successional Reserves and are consistent with other standards and guidelines. Standards and guidelines permit maintenance to ensure public safety (campgrounds, recreation residences), and to protect and maintain infrastructure investments (utility corridors, electronic sites). Existing developments within LSRs are described in Chapter 4.

Roads

New roads will be kept to a minimum, routed through other than late-successional habitat where possible and be designed to minimize adverse impacts (ROD p. C-16).

The road system in LSRs will be the minimum necessary to provide access to existing facilities and uses, implement activities proposed in Chapter 5, and provide access for fire protection. There will be few new permanent roads constructed for silvicultural manipulation, salvage, or other activities. Most needs will be met by the present network of roads and limited temporary road construction.

Roads will be maintained and repaired as needed to provide safe travel routes and minimize adverse effects on aquatic resources.

LSRs are priority areas for road decommissioning or obliteration. Because many of the LSRs overlap with key watersheds, road densities will decrease to meet aquatic conservation strategy objectives. Watershed Analyses and District Access and Travel Management Plans list roads to be considered for decommissioning/ obliteration due to either the lack of immediate need or resource concerns.

Treaty Rights

Nothing in the NWFP and GPNF Forest Plan direction is intended to conflict with or restrict treaty rights of the tribes. The Yakama, Nisqually, Puyallup, Squaxin Island and Steilacoom Indian Tribes have treaty rights on the Gifford Pinchot National Forest.

Human Uses

Most lands in the LSRs will meet or exceed the visual quality objective of retention. Human uses in the LSRs will conform with the roaded natural classification of the Recreation Opportunity Spectrum. Exceptions are pre-existing developments such as seed orchards, and administrative and utility sites. Compatible human uses expected to continue in the LSRs include:

- Treaty rights.
- Hunting and fishing.
- Hiking and camping
- Developed and dispersed camp-ground and picnic areas.
- Placer and lode mining.
- Existing rights-of-way, contracted rights and special use permits which are neutral or beneficial to the creation of late-successional habitat
- Collection of berries, nuts, mushrooms, and firewood for incidental and personal use. Limited harvest of mushrooms and other plant species of concern on a commercial basis.
- Christmas tree harvest for personal use.
- Evergreen bough harvest on a commercial basis where permitted. Noxious weed removal, e.g., Scotch broom.
- Seed cone collection.
- Firewood for personal and commercial use where permitted.

Range

As early seral vegetation matures, forage production and its value as transitory range will diminish. Range-related management that does not adversely affect late-successional habitat will be developed in coordination with wildlife and fisheries biologists. (ROD p. C-17).

The Mt. Adams, Ice Caves, and Twin Buttes Allotments will remain active with the numbers of livestock allowed near current levels. Traditional livestock handling facilities will also remain in use at their current locations. Within LSRs use by domestic livestock is low and likely to decrease over time as early-successional forests mature and transitory range diminishes.

Monitoring of sensitive sites and high use areas will continue. It will form the basis for adjusting grazing practices, as would the discovery of Survey and Manage or other sensitive species. Known and newly discovered sites of specified mollusks will be protected from grazing by all practical methods to ensure that the local populations of the species will not be impacted (ROD p. C-6).

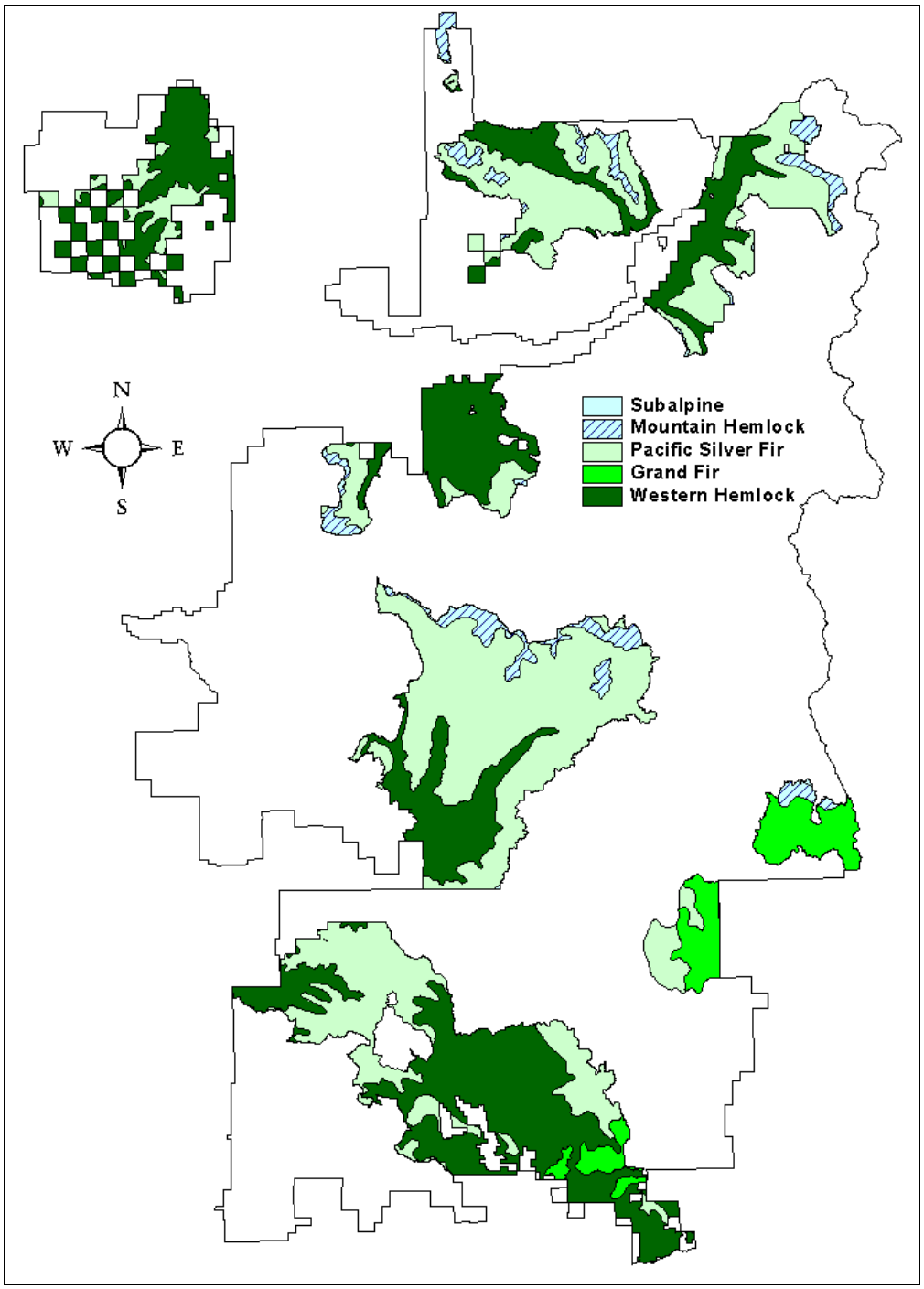
Any needed adjustments in range management would be implemented through each allotment annual operating plan, and need not wait for the ten-year term permit to expire. This will ensure that the grazing program within LSRs remains neutral to LSR objectives.

Fire

Fire has a role in the maintenance of ecosystems. Fire will be used or suppressed in the context of achieving ecosystem management objectives at the landscape level. Natural disturbance is an important process within late-successional forest ecosystems but humans have altered the disturbance regimes. Fire may be reintroduced or suppressed, depending on plant zone, length of time since last disturbance and other management objectives. The fire management plan for the LSRs is described in Chapter 6.

Fire management activities will consist of wildfire suppression and wildfire hazard reduction (mechanical, prescribed fire, or a combination) resulting in a fuel mosaic across the landscape. Some treatments may have short-term effects that reduce the quality of habitat for late-successional species. Thus, managers need to seek a balanced approach that reduces risk of fire while protecting late-successional habitat.

Map 3-1 Plant Zone Distribution



3-2 Plant Zone Scale Desired Condition

Plant Zones are defined as areas where a particular tree species is expected to dominate in stable, mature stands approximating climax conditions (Topik, 1989). On the Gifford Pinchot NF these zones include the western hemlock (*Tsuga heterophylla* - TSHE), Pacific silver fir (*Abies amabalis* - ABAM), mountain hemlock (*Tsuga mertensiana* - TSME), grand fir (*Abies grandis* - ABGR), subalpine parklands and alpine zones. All but the alpine zone are represented in LSRs on the Forest, and the acreage of subalpine parklands is small. Map 3-1 displays plant zone in each LSR. Plant zones are of interest because they generally reflect major large-scale climatic differences within a region, and thus, represent areas with similar potentials and limitations for vegetation development. Different kinds of manage-ment practices may be appropriate to each zone.

Table 3-1 Plant Zone Composition of Late-Successional Reserves

Trees	Acres	Percent
Silver Fir	211,510	48
Western Hemlock	183,964	41
Grand Fir	27,690	6
Mountain Hemlock	24,258	5
Subalpine Fir	75	0
Totals	447,497	100

Western Hemlock Zone

The western hemlock zone includes the lower elevation moist forest portion of the Western Cascade region of the Forest (See Map 3-1). The transition to the Pacific silver fir zone occurs at about 3000 feet in elevation. The western hemlock zone is usually dominated by Douglas-fir and is define by the presence of western hemlock reproducing in the shade of a mature forest overstory.

The desired condition of stands within the western hemlock zone is essentially a continuous large patch of old-growth forest. This old-growth forest will have large trees, snags of all sizes, fallen logs, multiple canopy layers, a significant amount of broken tops and deformed limbs, and a patchy understory.

The late-successional and old-growth conditions of the stands in this zone will be dominated by Douglas-fir, western hemlock and western redcedar. Although the goal is late-successional habitat, natural distur-bances from insects, diseases, windthrow, and fire will maintain a variety of seral stages. A high percentage of the land area (80 percent or more) in this zone is expected to be in a late-successional or old-growth condition. Fire is the dominant disturbance agent, though wind and root rot disease are expected to also reduce the area in late-successional or old-growth condition.

The data in the following tables provide a quantitative description of the desired vegetative conditions. It was summarized from *Region 6 Interim Old-growth Definitions* and from the *Plant Association and Management Guide for the Western Hemlock Zone on the Gifford Pinchot NF*. Consult these publications for more detailed information. Both references utilized Region 6 Ecology Program ecology plot data.

These values are intended as references rather than a target value for every stand in the western hemlock zone. The range in attribute values is accounted for by differences in site potential and stand history. More site-specific values can be developed by assessing site potential as reflected by plant associations. Also, it should be noted that these values reflect slightly different data sets. *Plant Association* and *Management Guide* values

reflect the range of conditions encountered in sampling mature stands. The *Interim Old-Growth Definition* methodology selected only those stands meeting the old-growth criteria, i.e., those greater than 200 years old and, thus, may better represent old-growth conditions.

Table 3-2 Western Hemlock Quantative Description of Desired Conditions

Description	Plant Association and Management Guide		R6 Old-Growth Definition.	
	Ave	**Range**	**Ave**	**Range**
Trees/acre	200	118-307	106	54-177
Basal Area (ft^2)	288	200-370	314	305-318
Mean Tree Diameter (in.)	18.6	13.7-24.5	30	20.0-39.8
Snags/acre	35	N/A	44	20-68
Snag DBH	38	N/A		
Snag quad. Mean Diameter (in.)	N/A	N/A	29.5	19.5-43.1
Down Logs/acre	257	N/A	101	76-166
Down Logs Diameter (in.)	N/A	N/A	15	12-17

In addition to the ranges displayed in Table 3-2, the *Interim Old-Growth Definition* provides old-growth reference values which varies by site. This is the minimum condition to be achieved, in contrast to the desired condition. For site class 4, the most prevalent western hemlock site of LSRs on the Forest, the reference values are shown in Table 3-3.

Table 3-3 Minimum Old-Growth Conditions - Western Hemlock Zone

Large Trees per acre:	8 at least 31" DBH
Canopy Layers:	2 or more
Snags per acre:	4 at least 20" DBH
Down Logs per acre:	29 at least 8" diameter

Pacific Silver Fir Zone

The Pacific silver fir zone on the Gifford Pinchot NF ranges from about 3000 feet in elevation up to about 4200 feet (See Map 3-1) It lies between the western hemlock zone and the mountain hemlock zone. It is the most extensive zone on the Forest. Moderately cool summer temperatures and a winter-long snowpack are typical of this zone. It is characterized by the presence of at least 10 percent canopy cover of Pacific silver fir, reproducing in the shade of mature stands. In the lower elevation areas of this zone, Douglas-fir may be a long-lived component of these forests. Other associated tree species include noble fir, western redcedar, western white pine, and western hemlock, while at higher elevations these give way to Engelmann spruce, mountain hemlock, Alaska yellow cedar (*Chamaecyparis nootkatensis*) and sub-alpine fir (*Abies lasiocarpa*).

Table 3-4 Pacific Silver Fir Quantative Description of Desired Conditions

Description	Plant Association and Management Guide		R6 Old-Growth Definition.	
	Ave	**Range**	**Ave**	**Range**
Trees/acre	157	99-254	201	153-182
Basal Area (ft^2)	274	221-325	356	345-409
Mean Tree Diameter (in.)	20	16-24	21	20-22
Snags/acre	N/A	N/A	48	32-45
Snag quad. mean diameter (in.)	N/A	N/A	23	21-26
Stand Age	424	312-554	250	180-360

Pacific silver fir is seldom found growing in pure stands in the juvenile stage. It usually exists as advanced regeneration under less shade tolerant species. In late-successional stages a mixture of species is still common, with silver fir in approximately equal proportions with western hemlock.

Although the goal is late-successional habitat, natural disturbances in these areas are expected to keep a lower percentage of this land area in late-successional or old-growth conditions than in the western hemlock zone (75 percent or more), because of greater susceptibility to disease, the higher fire frequencies associated with elevation and exposure to lightening and slower stand development.

The stand characteristics in Table 3-4 provides a quantitative description of the desired vegetative conditions. (R6 Interim Old-Growth Definitions 1993 and the Plant Association and Management Guide for the Pacific Silver Fir Zone on the Gifford Pinchot NF 1983.)

The values provide general guidance on determining desired stand characteristics. Site-specific decisions will be made after considering existing stand conditions and site potential reflected by plant associations.

In addition to the ranges displayed in Table 3-4 the R6 Interim Old-Growth Definition provides old-growth reference values which vary by site. This is the minimum condition to be achieved, in contrast to the desired condition. For site class 4, the average silver fir site in LSRs on the Forest, the reference values are shown in Table 3-5

Table 3-5 Minimum Old-Growth Conditions - Pacific Silver Fir Zone

Large Trees per acre:	7 at least 25” DBH
Canopy Layers:	2 or more
Snags per acre:	4 at least 22” DBH
Down Logs per acre:	4 at least 24” diameter

Mountain Hemlock Zone

The mountain hemlock zone extends from the upper boundary of the silver fir zone (about 4200 feet elevation) to subalpine parklands (Map 3-1) It has the slowest growth rates of any plant zone on the Forest due to a short, cool growing season and a deep, persistent snowpack. Elevations are generally higher than those used by the spotted owl.

Mountain hemlock zone forests are distinguished by the presence of at least 10 percent canopy cover of mountain hemlock reproducing in the shade of mature stands. Because of the cool, relatively moist climate and reduced risk of fire, a high percentage (85 percent or more) of the land area in this zone is expected to be in a late-successional or old-growth condition. Most fires in this zone are spotty and involve only a few trees scattered among clumps. Old-growth stands in this zone have traits in common with other forest zones including large trees and snags, accumulations of fallen logs, broken tops and gnarly canopies, and two or more canopy layers. Tree size, especially height, is considerably less than in other zones because of the harsh climate. Major tree species, in addition to mountain hemlock, are western hemlock, subalpine fir, Engelmann spruce (Picea engelmannii), Alaska yellow cedar, Pacific silver fir, lodgepole pine, whitebark pine (Pinus albicaulis) at the upper margin and Douglas-fir at the lower margin.

Descriptions of desired conditions have not been developed for this zone by the Plant Association Guide. Table 3-6 displays the minimum attributes for cool, mesic mountain hemlock forests.

Table 3-6 Minimum Old-Growth Conditions - Mountain Hemlock Zone

Large Trees per acre:	11 $\geq$ 21” DBH
Canopy Layers:	1-2
Snags per acre:	4 $\geq$ 15” DBH
Stand age:	230 - 400 years.

Grand Fir Zone

The grand fir zone is the driest on the Gifford Pinchot NF. It is located along the eastern margin of the Forest, south of Mt. Adams to the Columbia River (See Map 3-1) It is bounded to the north and west by the Pacific silver fir zone. It is defined by the presence of at least 10 percent grand fir reproducing in the shade of mature stands. Because of the relatively higher fire risk in this zone a lower percent (70 percent or more) is expected to be in a late-successional or old-growth condition.

Major tree species include Douglas-fir, ponderosa pine, western white pine, western hemlock, western larch, lodgepole pine, western hemlock and grand fir. Also included are several small patches of quaking aspen (*Populus tremuloides*) and western redcedar in moist areas, and Oregon white oak (*Quercus garryana*) in very droughty areas.

Historically, fire played the major disturbance role in these ecosystems, particularly in the drier sites. Fire tolerant, open, "park-like" stands, composed mainly of large diameter ponderosa pine and Douglas-fir, dominated parts of the landscape. This condition resulted as multiple-canopy forests, with shade-tolerant, primarily grand fir understories, were periodically set back by fire.

Twentieth century management has allowed multiple-canopy forests to develop through fire exclusion. In addition, many old-growth trees have been removed through partial timber harvests. Stands today are generally more dense, and differ in species composition.

The risk of catastrophic loss from fire calls for a more complex pattern of stand conditions in the grand fir zone, particularly in the drier portions of the zone. These drier portions of the grand fir zone are included in fire groups 2 and 3 (Evers, et al. 1996), and occur primarily within the Gotchen LSR. The desired condition, at the stand level, consists of large, old-growth ponderosa pine or Douglas-fir trees, with secondary canopies made up of younger, shade-tolerant grand fir, along with some western hemlock, Douglas-fir, and ponderosa pine. This condition functions as late-successional habitat. The shade-tolerant understory should be less than 100 years old; at older ages (or when the shade-tolerant layer becomes overly dense) tree vigor may decrease, and stands become more susceptible to insect and disease pathogens.

Table 3-7 Grand Fir Quantative Description of Desired Conditions

Description	Plant Association and Management Guide	
	Ave	Range
Trees/acre	216	100-431
Basal Area	295	240-365
Mean Tree Diameter	18.6	12.6-24.9
Canopy Layers	2	
Snags/acre	N/A	11-42
Down Logs/acre	12-19	15-25
Down Logs/acre >19"	N/A	1-10

At any given point in time, not all stands will match the desired condition. Some stands will provide late-successional habitat, yet may contain few large, old-growth trees. Younger stands, such as old clearcuts, wildfire areas, and areas where pathogens have resulted in significant tree mortality, will be open and lightly stocked. Species composition in these stands will consist mostly of early seral ponderosa pine and Douglas-fir, with some western larch and western white pine. These open stands will result in maximum individual tree growth, providing large trees for future old-growth stands.

Table 3-7 provides a quantitative description of the desired vegetative conditions. It was summarized from the Plant Association and Management Guide for the Grand Fir Zone on the Gifford Pinchot NF. Comparable data were not provided in the R6 Interim Old-Growth Definitions.

In addition to the ranges displayed in Table 3-7, the R6 Interim Old-Growth Definition provides old-growth reference values which vary by site. This is the minimum condition to be achieved, in contrast to the desired condition. The reader is cautioned that these figures were developed from plots in central Oregon and may need to be adjusted for conditions on the Gifford Pinchot NF when local data becomes available. For low and medium site potentials, the minimum reference values are shown in Table 3-8.

Table 3-8 Minimum Old-Growth Conditions - Grand Fir Zone

Large Trees per acre:	10 at least 21" DBH
Canopy Layers:	2 or more
Snags per acre:	1 at least 14" DBH
Down Logs per acre:	5 at least 12" diameter

Subalpine Parklands

Subalpine parklands are characterized by a mosaic of forest patches and intervening grass/forb or shrub-dominated openings. Also characteristic of this area are clumps of low-growing trees and shrubs known as krummholtz. The dynamics of subalpine parklands are poorly understood. Openings may be caused by soils with seasonally high water tables or due to deep, persistent snowpacks which retard tree seedling development. Only 75 acres in LSRs are classified as subalpine parklands. This zone is transitional between the mountain hemlock zone of continuous forest cover below, and the treeless alpine zone above.

Species composition is similar to that of the upper part of the mountain hemlock zone with subalpine fir, mountain hemlock, Alaska yellow cedar, whitebark pine and lodgepole pine being the most widespread.

This zone is not considered commercial forest land on the Gifford Pinchot NF. Forest structure in this zone has been and will continue to be shaped by natural forces. Scattered clumps and stringers of trees and large natural openings probably do not function well for many late-successional species. These areas are, however, likely at their potential under the present climatic regime. Therefore, the desired condition for these areas is the same as the existing condition.

3-3 Desired Conditions By LSR

Following is a description of desired conditions specific to individual LSRs. Only aspects of the desired condition which do not apply either Forest-wide or plant zone-wide are discussed. To obtain a complete picture of the desired condition for an LSR, all three scales must be reviewed.

Gotchen LSR

The Gotchen LSR is comprised of the Grand Fir (86 percent) and Western Hemlock (13 percent) plant zones. Gotchen LSR is the only location of Subalpine Parklands (1 percent). See the respective plant zone desired condition descriptions earlier in this chapter.

Riparian Resources

Conditions of riparian resources and functions are described in the *Upper White Salmon Watershed Analysis* and are not repeated here.

Disturbance Regimes

Insect, Disease, and Fire. The desired condition within the Gotchen LSR is to maintain the current acreage of late-successional forest, and reduced risk of stand replacing insect and disease infestations and subsequent catastrophic fire. This may be accomplished by increasing the amount of single-story large tree forests comprised of early seral tree species (e.g. ponderosa pine, western larch, Douglas-fir), that are maintained by under-burning. These stands carry a lower hazard of stand disturbance, and their arrangement on the landscape can reduce the overall risk of the LSR to large stand replacing fires.

Being on the more moist, west end of the grand fir zone, most of these stands are expected to remain late-successional forest following this budworm episode. Likewise, the risk of stand replacing fire is also not currently high, given the topography, surrounding stand conditions, and ignition history of this LSR. Still, a gradual conversion of grand fir dominated stands is prudent where it is no longer late-successional habitat and where it can serve as a fuel break.

In the absence of a large, stand replacing fire, grand fir dominated stands will comprise the majority of forests in this LSR into the future. Though they carry a high hazard for disturbance, they also provide dense, multi-layered canopies that are desired by late-successional wildlife. In addition, they currently serve the larger province by providing large blocks of late-successional forest that are well connected to similar forests on Yakama Indian Nation land to the east.

Special Habitats

This LSR contains ponderosa pine habitat for the protection buffer species, flamulated owl, pigmy nuthatch and white-headed woodpecker (ROD p. C-45 to C-47). Future management activities should ensure habitat is maintained for these species.

This LSR contains important great gray owl habitat where large trees are found adjacent to meadows. Great grey-owl habitat may decline as trees encroach on the existing meadows.

Grazing

Although the amount of available forage will decline as current early seral vegetation matures, grazing consistent with LSR objectives is expected to continue into the future.

Lewis LSR

The Lewis LSR is comprised of the Pacific Silver Fir (72 percent), Western Hemlock (21 percent) and Mountain Hemlock (7 percent) plant zones. See the respective plant zone desired condition descriptions earlier in this chapter.

Riparian Resources

Desired conditions for riparian resources and functions are described in the *Upper North Fork Lewis River* and *Middle North Fork Lewis River Watershed Analyses* and are not repeated here.

Special Habitats

Management activities in this LSR should be designed to maintain or enhance the special botanical sites, habitat for bull trout and hybernacular caves for Townsends big-eared bats.

Over 20 thousand acres in this LSR consists of deer and elk biological winter range. As an objective secondary to those of the LSR treatments should consider opportunities to provide forage for deer and elk. Such treatments will not retard the attainment of the late-successional habitat.

Management activities should emphasize improving connectivity east and west within the LSR.

Grazing

Although the amount of available forage will decline as current early seral vegetation matures, grazing consistent with LSR objectives is expected to continue into the future.

Mineral LSR

The Mineral LSR is comprised of the Western Hemlock (78 percent) and Pacific silver-fir (22 percent) plant zones. See the respective plant zone desired condition descriptions earlier in this chapter.

Riparian Resources

Desired conditions for riparian resources and functions will be described in the *Tilton and Nisqually Watershed Analyses* which are scheduled for completion in 1998.

Special Habitats

Management activities should be designed to maintain or enhance nesting habitat for the marbled murrelet on the Forest. This LSR contains the only known marbled murrelet nesting habitat on the Forest.

Roads

Open road density will continue to be high in this area because of numerous cooperative road management agreements associated with access of adjacent private property.

Connectivity

The Mineral LSR is important because it provides connectivity to the Olympic Province and, to some degree, the Northern Cascade Province. The best opportunity to improve connectivity is with Washington Department of Natural Resources (DNR) forest land which lies between the Mineral and Nisqually LSRs. Collaboration with Washington DNR forest managers should be pursued to encourage development of late-successional habitat on their lands, at least in riparian areas.

Extensive young stands in the middle of the LSR provide an opportunity to accelerate the development of late-successional functions through stand manipulation activities.

Nisqually LSR

The Nisqually LSR is comprised of the Pacific silver-fir (60 percent), western hemlock (29 percent) and mountain hemlock (11 percent) plant zones. See the respective plant zone desired condition descriptions earlier in this chapter.

Because of the higher elevation of this LSR, progress toward late-successional conditions will be at a slower rate than others on the Forest.

Riparian Resources

Desired conditions for riparian resources and functions will be described in the *Puyallup and Nisqually Watershed Analyses* which are scheduled for completion in 1998.

Packwood LSR

The Packwood LSR is comprised of the Pacific silver fir (54 percent), western hemlock (36 percent) and mountain hemlock (10 percent) plant zones. See the respective plant zone desired condition descriptions earlier in this chapter.

Riparian Resources

Desired conditions for riparian resources and functions will be described in the *Clear Fork Cowlitz and Upper Cowlitz Watershed Analyses* which are scheduled for completion in 1998.

Peterson LSR/MLSA

The Peterson LSR/MLSA is comprised of the grand fir (57 percent) and Pacific silver fir (43 percent) plant zone. See the respective plant zone desired condition descriptions earlier in this chapter.

Riparian Resources

Desired conditions for riparian resources and functions are described in the *Trout Lake Creek Watershed Analysis* and are not repeated here.

Special Habitats

Meadow habitats will be maintained where they support populations of sensitive plant species, such as pale-blue eyed grass.

Ponderosa pine habitat for the protection buffer species flamulated owl, pigmy nuthatch and white-headed woodpecker occurs in this LSR (ROD p. C-45 to 47). Future management activities should ensure habitat is maintained for these species.

Owl Habitat

Within the Managed Late-Successional Area the *NWFP* specifies amounts of suitable owl habitat to be maintained within the home range. Amount of suitable habitat is not given for the Eastern Cascades physiographic province. *NWFP* Table C-1 shows the median home range in the Eastern Cascades Province is 7124 acres. While no median amount of habitat is given in Table C-2 for this province, in the Western Cascades Province roughly half of the home range is suitable habitat which suggest about 3600 acres is needed in the Peterson MLSA.

Human Uses

Although the amount of available forage will decline as current early seral vegetation matures, grazing consistent with LSR objectives is expected to continue into the future.

Opportunities for huckleberry picking are expected to diminish as early and mid-seral vegetation matures.

Quartz LSR

The Quartz LSR is comprised of the Pacific silver fir (52 percent), mountain Hemlock (30 percent) and western hemlock (18 percent) plant zones. See the respective plant zone desired condition descriptions earlier in this chapter.

Riparian Resources

Desired conditions for riparian resources and functions are described in the *Lower Cispus West Watershed Analysis* and are not repeated here.

Wind LSR

The Wind LSR is comprised of the western hemlock (58 percent), Pacific silver fir (37 percent), and grand fir (5 percent) plant zones. See the respective plant zone desired condition descriptions earlier in this chapter.

Riparian Resources

Desired conditions for riparian resources and functions are described in the *Wind and Lower North Fork Lewis River Watershed Analyses* and are not repeated here.

Connectivity

The Columbia River presents a formidable obstacle to most terrestrial species. It is possible, however, for migration of birds, such as spotted owls, to occur across the river. The area with greatest potential to provide connectivity across the river is located in the Dog Mountain area. Presently there is little late-successional forest on Dog Mountain due to past wildfires. Accelerating the development of these stands should be a high priority for LSR management.

Management activities should emphasize restoring the gap in connectivity that exists because of the expanse of young stands in the middle of the LSR.

Existing Developments

Research within the TT Munger Experimental Forest will continue subject to NWFP consistency requirements described in the ROD page C-4.

The Wind River Nursery site should be managed to minimize effects on the adjacent late-successional habitats. New uses which would adversely effect the late-successional reserve should not be permitted (ROD p. C-17).

Special Habitats

Over 45 thousand acres in this LSR are considered deer and elk biological winter range. As an objective secondary to those of the LSR, treatments should consider opportunities to provide forage for deer and elk.

Meadows in this LSR are believed to provide habitat for the great gray owl.

Woods LSR

The Woods LSR is comprised of the western hemlock (85 percent) and Pacific silver fir (15 percent) plant zone. See the respective plant zone desired condition descriptions earlier in this chapter.

Riparian Resources

Desired conditions for riparian resources and functions are described in the *Lower Cispus East Watershed Analysis* and are not repeated here.

Special Habitats

Over 17 thousand acres in this LSR are considered of deer and elk biological winter range. As an objective secondary to those of the LSR, treatments should consider opportunities to provide forage for deer and elk.

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