CHAPTER 5. VEGETATION

Characterization

Gordon Creek Watershed lies within the *Tsuga heterophylla* (western hemlock) forest zone, according to a classification based on dominant climax tree species (Franklin and Dyrness 1988). Pre-settlement forests in this zone were largely dominated by stands of Douglas-fir (*Pseudotsuga menziesii*), western redcedar (*Thuja plicata*), and western hemlock. Broadleaf trees such as red alder (*Alnus rubra*) and bigleaf maple (*Acer macrophyllum*) are important sub-dominant trees in many conifer stands and may temporarily dominate disturbed sites and riparian areas. Dry sites within the *Tsuga heterophylla* zone commonly have understories composed of salal (*Gaultheria shallon*) or ocean-spray (*Holodiscus discolor*), while very moist sites are characterized by sword fern (*Polystichum munitum*) or Oregon oxalis (*Oxalis oregana*). Intermediate sites are typified by rhododendron (*Rhododendron macrophyllum*) or low Oregon-grape (*Berberis nervosa*) shrub layers.

The highest elevations in the Gordon Creek Watershed extends into the Pacific Silver Fir vegetative zone. Douglas-fir is also prevalent in this zone, but the forest commonly includes noble fir (*Abies procera*), western white pine (*Pinus monticola)*, mountain hemlock (*Tsuga mertensiana*), and western redcedar. The understory includes oxalis, foam flower (*Tiarella cordifolia*), vine maple (*Acer circinatum*), devil's club (*Oplopanax horridum)*, salal, Alaska huckleberry (*Vaccinium alaskaense*), rhododendron, Oregon grape, big huckleberry (*Vaccinium membranaceum*), cascade azalea (*Rhododendron albiflorum*), and beargrass (*Xerophyllum tenax*).

Old-growth and late-successional stands of Douglas-fir and western hemlock are characterized by a high degree of structural diversity that distinguish them from commercial timber stands. Some important attributes of old-growth that were reported by Spies and Franklin (1991) include:

- Uneven age and size class distributions among trees that result in multi-storied forest canopies
- Tree gaps that allow light to penetrate the canopy and cause a "patchy" distribution of understory vegetation
- Presence of very large, old-growth trees
- Significant numbers of large-diameter snags and accumulation of downed, decayed logs.

Although plant and animal diversity associated with late-successional forest is not as great as in early-seral stands before canopy closure, older forests support a large number of specialist species (Franklin and Spies 1991). Examples in the western Cascades include: hemlock dwarf-mistletoe

(*Arceuthobium tsugense*), Oregon slender salamander (*Batrachoseps wrighti*), and fisher (*Martes pennanti*).

Younger, unmanaged stands differ from late-successional forests in having less structural complexity. Younger forests are characterized by higher tree densities, fewer numbers of shade-tolerant trees, and less variability among tree ages (Franklin and Spies 1991). The uniform tree canopy that is typically present over mid-successional forests excludes most sunlight from the understory, causing the loss of all but the most shade-tolerant plants.

Current Conditions

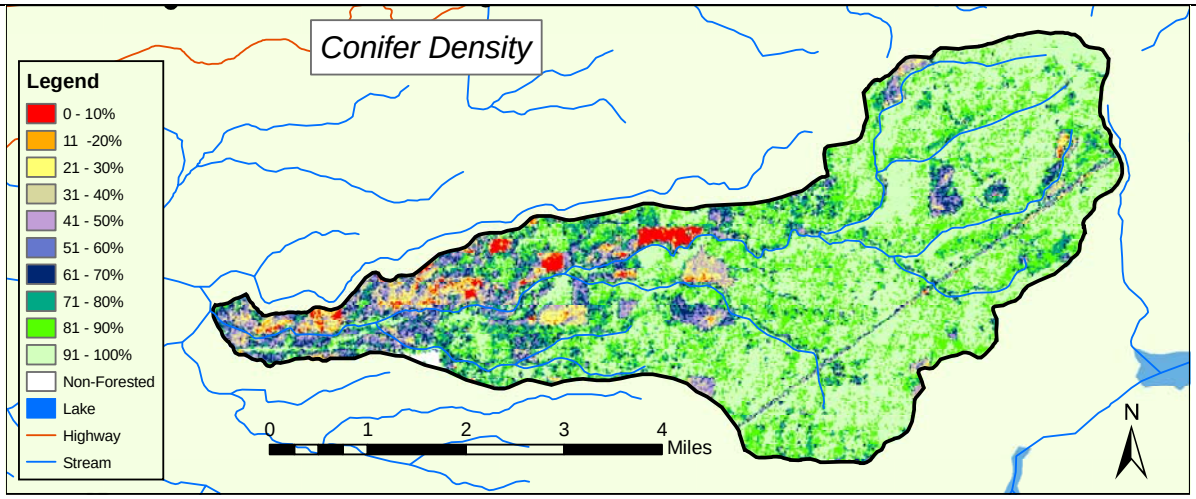
Forest Composition and Structure

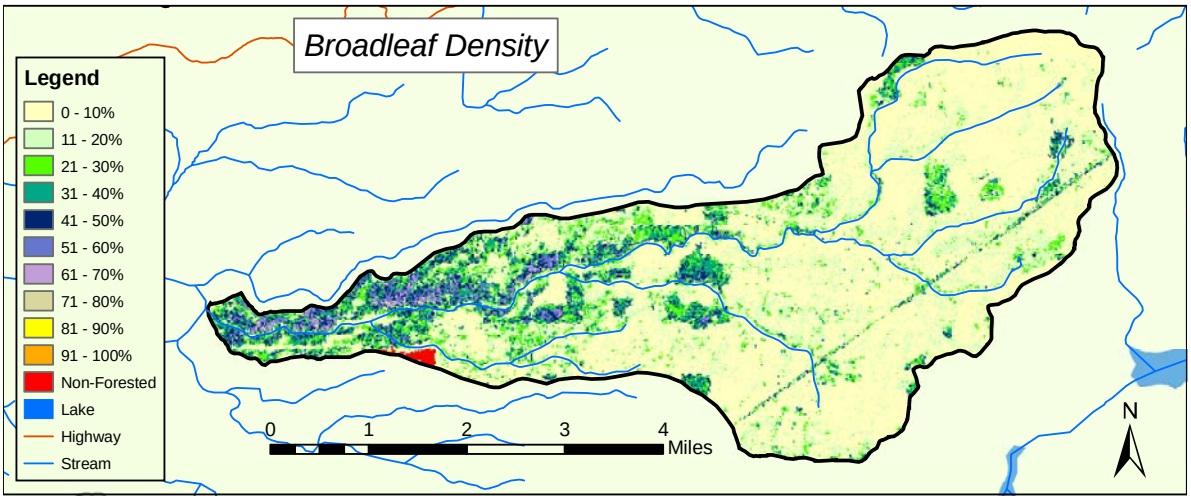
Satellite imagery classified and mapped by the federal Interagency Vegetation Mapping Program (IVMP) was used to assess watershed-wide forest conditions. IVMP imagery can distinguish between conifer and broadleaf forests, as well as non-forest areas. Howeve, the imagery is not of sufficient resolution to classify forest stands by tree species.

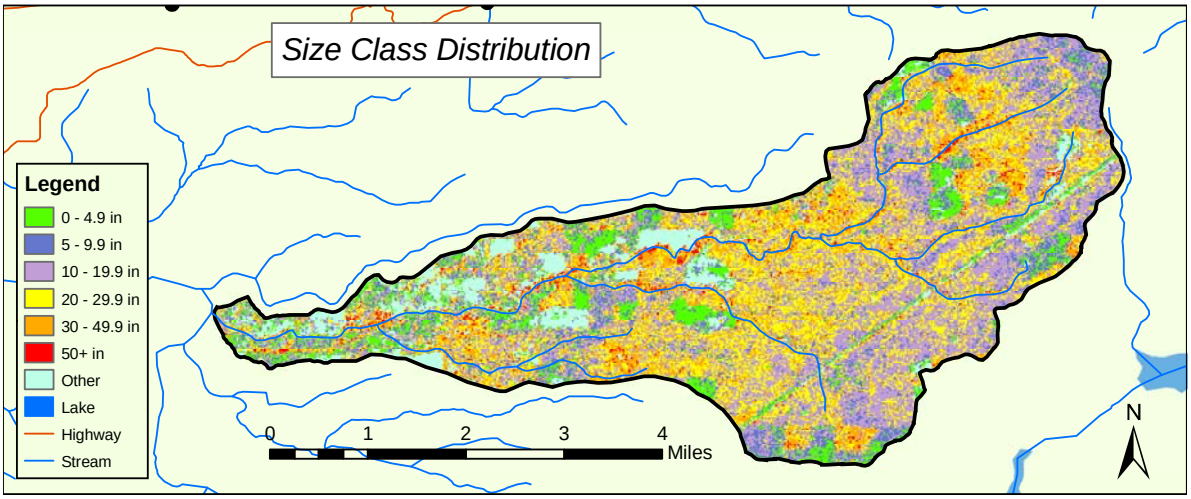
The IVMP data indicate that more than 79 percent of Gordon Creek Watershed is dominated by closed-canopy conifer forests; 20 percent of the watershed area is covered by mixed conifer-broadleaf forests (Table 5-1). The ratio of conifer-to-broadleaf trees within mixed stands is generally characterized by a strong elevational gradient; conifers become more dominant with increasing elevation (Map 5-1). However, broadleaf species remain a common element in mixed composition riparian areas throughout much of the watershed (Map 5-1). Broadleaf-dominated stands with more than 70 percent broadleaf species are rare in the watershed (Table 5-1).

Table 5-1. Acreage and percent area by tree composition class in Gordon Creek Watershed. Conifer and broadleaf classes are defined as composition greater than 70 percent of conifer or broadleaf trees, respectively. The mixed class is defined as closed-canopy forests not clearly dominated (70 percent or less cover) by conifer or broadleaf trees. Source: Interagency Vegetation Mapping Program.

	Area	
Composition Class	**Acres**	**Percent**
Conifer	8,854	79.4
Broadleaf	20	<0.5
Mixed	2,258	20.0
Non-forest	570	0.5







Map 5-1 Interagency Vegetative Mapping Program (IVMP) forest stand classification.

According to IVMP data, more than 57 percent of the trees in Gordon Creek Watershed are between 10 and 30 inches diameter at breast height (dbh; Table 5-2). Assuming that forest stands in the watershed are fully stocked and of average productivity (Site Class III), stands composed of trees in this diameter range would be classified as mid-seral (41 to 80 years) and mature (81 to 120 years) forests (See Table 2, McArdle and Meyer 1961). Larger trees are concentrated in riparian areas that occur along the mainstem and North Fork of Gordon Creek, and in small, scattered patches across the watershed (Map 5-1). Most trees in the largest diameter classes (i.e. 30-49.9 inches, 50+ inches dbh) occur on private industrial forest lands (Table 5-2).

Table 5-2. Acreage and percent area by dominant tree size class in Gordon Creek Watershed. Source: Interagency Vegetation Mapping Program.

	BLM		USFS		Private Industrial Timberland		Private Land		Local Government	
Diameter Class (inches)	Area (ac)	%*	Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%
0 - 4.9	113.6	4	251.4	8	410.9	11	208.0	15	25.4	18
5 - 9.9	197.0	8	410.8	13	333.5	9	165.9	12	27.5	20
10 - 19.9	1,030.1	39	1,248.4	39	1,145.2	30	291.8	21	34.5	25
20 - 29.9	770.8	29	731.4	23	988.1	26	191.0	14	21.0	15
30 - 49.9	346.8	13	379.1	12	573.7	15	141.4	10	28.2	20
50+	42.4	2	44.8	1	77.9	2	27.6	2	2.5	2
Other**	120.0	5	102.3	3	312.9	8	361.6	26	1.3	1

* Percent of owner class
** Includes non-forest, sparsely vegetated forest, or highly variable size classes

Forest operations inventory data available for BLM and USFS lands were used to further characterize seral stage distributions on federal forests in Gordon Creek Watershed. Seral stage distributions on BLM forestlands are highly skewed toward mid-seral (41-80 years) stands. Approximately 80 percent of BLM forests in the watershed are in this stage (Figure 5-1). Mid-seral stands are generally composed of pole- and saw timber-size trees, depending on site quality and management practices. Approximately six percent of BLM lands in the watershed are in early-seral stage, and six percent are in open-sapling condition (Figure 5-1). Stands in these stages range from recently-harvested areas dominated by herbaceous vegetation or shrubs, to pole-size stands that are beginning to attain canopy closure. Less than 10 percent of BLM forests in the watershed are in mature and older forest seral stages (Figure 5-1). These older stands occur as small (less than 40 acres), isolated patches scattered across BLM forestlands. Forest operations inventory data indicate that the oldest BLM stands in the watershed are 150 to 170 years old. Most of these stands are eligible for regeneration harvest (See BLM 1995)

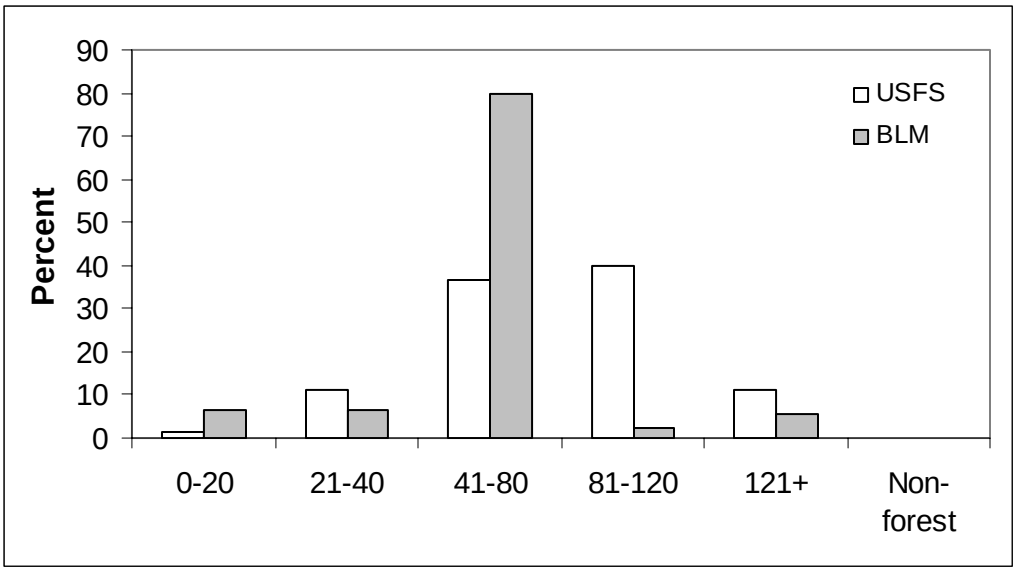


Figure 5-1. Seral stage distribution of forest stands on lands administered by the BLM and USFS in the Gordon Creek Watershed. Vertical axis represents percentage of agency's (BLM or USFS) land area. Source: BLM/USFS forest operation inventory.

USFS forests in the watershed are skewed toward more advanced seral stages than BLM-administered forests. More than 50 percent of USFS forests are in mature or older forest condition (Figure 5-1).

Forest Landscape Patterns

Current landscape forest patterns strongly reflect federal and private ownership boundaries across Gordon Creek Watershed and the different management directions between these two major ownership classes. The lower portion of the analysis area is dominated by industrial forests and smaller private landowners (Map 1-3). Forest inventories were unavailable for private lands, but watershed maps prepared using IVMP satellite data show general vegetation patterns (Map 5-1). It is likely that that most private industrial forests are managed on 45 to 50 year rotations and regenerated by clearcutting (Bunnell et al. 1997). State forest practice rules limiting clearcuts to less than 120 acres result in a relatively homogenous landscape composed of young and mid-seral forest patches between 40 and 120 acres in size. High-contrast edges between harvest units and adjacent stands are a prominent feature on industrial forest landscapes (Map 5-1).

Landscape patterns in mid-elevation areas of the watershed are characterized by a "checkerboard" of BLM lands alternating with sections of industrial forest lands. Stands between 60 and 80 years old comprise the dominant age class on BLM lands and are generally aggregated into five large patches ranging in size between approximately 100 and 600 acres.
It is assumed that private industrial forests are composed largely of stands less than 50 years old and less than 120 acres in size. However, approximately 17 percent of private industrial forests are dominated by trees greater than 30 inches in diameter (Table 5-2). Trees of this size would take more than 160

years to develop, even on highly-productive sites. A few small, isolated patches of older forest (stand age greater than 100 years) are scattered over BLM lands in the lower- to mid-elevations of the watershed.

The uppermost portion of the analysis area lies almost entirely within the Mt. Hood National Forest. National Forest lands in the watershed are characterized by a mosaic of early- mid-, and late-successional forest stands (Map 5-2).

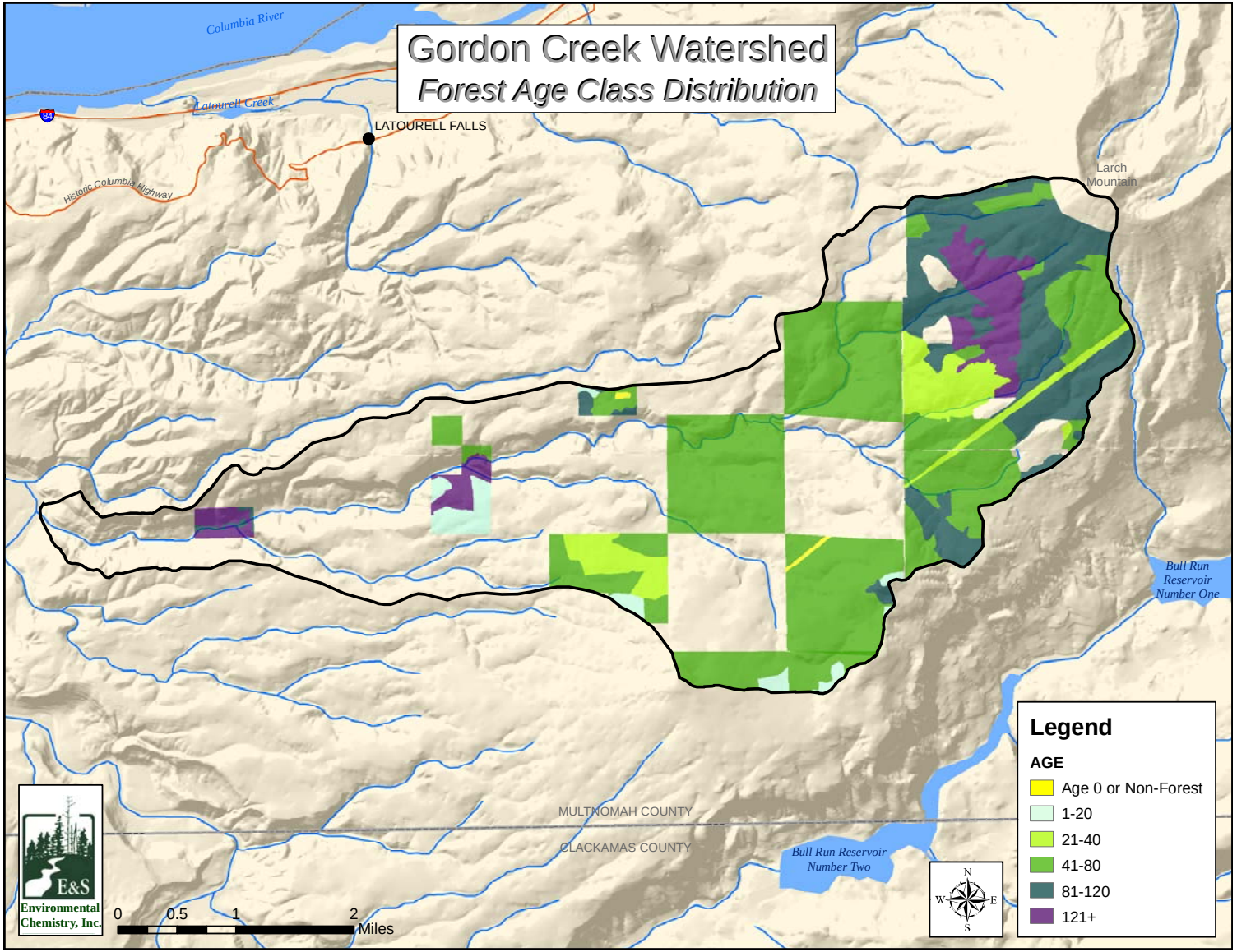
Perhaps one of the most important landscape features expected to emerge on BLM and National Forest lands in the future is late-successional conifer forests along perennial and intermittent streams. These forests will be allowed to grow and be shaped by natural disturbance events (e.g., flooding, debris flows) as a consequence of riparian reserve guidelines established under the Northwest Forest Plan (BLM 1994). Riparian Reserves are streamside zones between 150 and 600 feet wide in which commercial timber harvests are restricted, subject to additional management criteria related to the objectives described in the Aquatic Conservation Strategy. Many of these riparian forests are not currently in late-successional forest condition, but are expected to develop these attributes over time.

Reference Conditions

Douglas-fir has a potential lifespan of more than 750 years and western hemlock more than 400 years (Franklin and Dyrness 1988). Thus, it may take a millennium or more for forests in the *Tsuga heterophylla* zone to attain climax conditions. However, climax stands were probably uncommon even before logging, given the frequency and extent of natural disturbances such as fire, windthrow, tree diseases, and forest insect outbreaks.

Prior to logging, no other factor had as much influence in shaping landscape patterns in the western Cascades as fire. Infrequent, stand-replacing fires alter species compositions, stand structures, and landscape patterns. In the neighboring Bull Run watershed, the last large fire event occurred in 1873. On average, the fire return interval has been estimated at 250 to 350 years (USFS 1997). Second to fire, withthrow (blowdown) from high wind events originating from the Columbia Gorge has been a significant disturbance mechanism. High-velocity winds from the east have periodically resulted in large areas of uprooted and overturned trees.

In 1993, the Regional Ecological Assessment Project (REAP) estimated the historical range of natural variability (RNV) of late-seral forest abundance for the fourth-field Sandy River basin (USDA 1993). For the Sandy River basin as a whole, late-seral forest was estimated to have historically ranged from 47 to 59 percent of the basin, while early-seral forest accounted for 8 to 28 percent of the basin.



Map 5-2. Age-class distribution of forest stands administered by the BLM or USFS in Gordon Creek Watershed.

Wind damage, insect attacks, and tree pathogens tend to result in smaller patches of tree mortality than the infrequent extensive stand-replacement fires that were characteristic of unmanaged forests in the western Cascades. The three factors often follow in a sequence described by Campbell and Liegel (1996). First, laminated root rot (*Phellinus weirii*), a widespread disease of Douglas-fir and other species in the western Cascades, spreads via roots across patches of trees, causing stagnant growth and eventual tree mortality. Patches of dead and dying trees are particularly vulnerable to windthrow during winter storms. Damaged and blown down trees foster outbreaks of the Douglas-fir beetle, which attack and kill approximately one additional standing tree for every three or four windthrown tree. The forest openings that result from these disturbances add a level of complexity to forest landscape pattern beyond that created by fire history alone.

Special Status Plant Species

Location information was available for two special status plant species known to occur in Gordon Creek Watershed: withered bluegrass (*Poa marcida*) and *Racomitrium aquaticum* (T. Fennell pers. comm.). Management direction for special status species is guided by BLM policy (BLM 2003) and species-specific conservation assessments prepared by BLM staff.

Withered bluegrass

Withered bluegrass is associated with moist areas in coniferous forests. The species has been found at two locations within T1S R5E Sec. 13. Withered bluegrass is designated as a Bureau Tracking Species. BLM district personnel are encouraged to complete a sighting form when the species is encountered in the field. However, any special management is discretionary.

Racomitrium *aquaticum*

Racomitrium aquaticum is a mat-forming bryophyte that usually occurs on moist rocks along streams. However, it can occasionally be found on dry rocks in closed-canopy upland forests. It was designated as a Survey and Manage, Category B species under the 1994 Northwest Forest Plan Record of Decision (ROD) (BLM 1994). During the Annual Species Review process the status of this bryophyte was changed, and it is currently listed as a Category E species. As such, known locations occupied by *Racomitrium aquaticum* are still afforded protection buffers, even though it is now considered a Bureau Tracking Species (T. Fennell pers. comm.). No management activities that would disturb vegetation, soil, or other microsite characteristics are permitted within the buffers.

Noxious Weeds

Noxious weeds pose a serious threat to native plant communities and wildlife habitats. Many noxious weed species are able to aggressively invade harvest units, roadsides, and areas of natural disturbance. The absence of natural controls in the environment and their capacity to quickly grow and reproduce

tend to give exotic weed species an advantage over native plants. Left uncontrolled, weed infestations can significantly alter the composition, structure, and dynamics of native ecosystems. Twenty-nine weed species are listed by the Oregon Department of Agriculture (ODA) and are known to occur in Multnomah County (http://www.weedmapper.org).

The Salem District Resource Management Plan (BLM 1995) established management direction for noxious weeds occurring in the district. Some of the most common noxious weeds expected to be present in the district include tansy ragwort (*Senecio jacobaea*), Canadian thistle (*Circium arvense*), scotch broom (*Cytisus scoparius*), and meadow knapweed (*Centaurea pratensis*) (BLM 1995). However, many more species listed by ODA (e.g., Himalayan blackberry [*Rubus discolor*], English ivy [*Hedera helix*], and gorse [*Vlex europaeus*]) are also likely to occur.

Three known infestations of noxious weeds have been mapped on or near the Gordon Creek Watershed (T. Fennell, pers. comm.). Two of the infestations are of meadow knapweed. This species has been detected on the north boundary of a BLM parcel in T1S R5E Sec. 3 and on private land near the watershed boundary in T1S R5E Sec. 16. There is also one known location of Japanese knotweed (*Polygonum cuspidatum*) in T1S R5E Sec. 10.

Discussion

Forest planning and management activities have largely replaced fire in shaping forest structure and landscape patterns in the analysis area and in the western Cascades. Insects and tree diseases continue to affect fine-scale conditions on managed forests, but land managers respond quickly to developing outbreaks and attempt to minimize the impact of these agents using silvicultural interventions. Windstorms will continue to have local, and occasionally severe, effects on managed forests. However, salvaging operations typically harvest most standing and blown-down trees, thus removing most of the ecological legacies of the event. Only in federal Late-Successional Reserves (LSRs) are natural disturbance events likely to remain a significant influence on forest structure and landscape pattern. However, only 85 acres (less than one percent) of the Gordon Creek Watershed are within a designated LSR.

All of the BLM-administered forestlands in the Gordon Creek Watershed are designated as General Forest Management Areas (GFMAs) with associated Riparian Reserves. GFMAs were established under the Northwest Forest Plan as the land allocation where most commercial tree harvesting will occur (BLM 1994). Management guidelines for GFMAs in the Salem District specify that regeneration harvests will typically coincide with the culmination of mean annual increment (usually 70 to 110 years), but not in stands less than 60 years old (BLM 1995). As a result of this management direction, BLM-administered forests in the analysis area will be composed of younger

stands than is assumed to have dominated the landscape prior to commercial logging. Research indicates average fire return intervals in the western Cascades ranged from 95 to 150 years (Agee 1991).

Typical silvicultural practices on private industrial timberlands limit structural and compositional diversity in managed stands, compared to that of unmanaged Douglas-fir forests. First, natural succession is replaced by harvest rotations that truncate stand ages to 50 years or less (Bunnell et al. 1997), thereby preventing the development of mid- or late-successional forest conditions. Second, structural legacies (i.e., large snags, scattered live trees, and accumulations of downed logs) that persist in unmanaged stands long after natural disturbance events are often retained on harvest units only to the level that they are prescribed under Oregon forest practice rules. Finally, hardwood trees and deciduous shrubs that develop in unmanaged, early-seral stands are intensively controlled on industrial timberlands to prevent them from competing with commercial tree species. On BLM lands, guidelines for GFMAs prescribe higher retention levels of live trees, snags, and down logs than do state forest practice rules. As a result, BLM forestlands are expected to have greater structural complexity in the future than most private industrial forests.

Current forest landscape-scale patterns in the analysis area differ from unmanaged Douglas-fir forests in the western Cascades prior to extensive commercial tree harvesting. A legacy of staggered clearcuts on federal lands and state forest practice rules limiting harvest units to 120 acres or smaller have led to less variation in forest patch sizes than was typical in landscapes influenced only by natural disturbances. In Douglas-fir forests of the Pacific Northwest, wildfire typically created a pattern of large forest patches (1,000 to 3,000 acres). These large blocks of forest were characterized by greater interior area and less forest edge than current managed forest landscapes. Wildfire also tends to create complex edge patterns characterized by highly interspersed patches of forest and openings. In contrast, commercial forests typically have high-contrast edges between harvest units and surrounding forest.