CHAPTER 3. AFFECTED ENVIRONMENT

FIRE

Fire as part of the natural disturbance process has been removed from the Gotchen landscape for decades through policies of effective fire exclusion. Fire exclusion combined with vegetative management practices has resulted in a dense, homogenous distribution of vegetation that has become highly susceptible to outbreaks of western spruce budworm. The effects of the budworm have caused a massive build up of dead and dying trees that have increased surface fuels and ladder fuels that are considered far above historic levels in many parts of the Gotchen Planning Area. While much of the Gotchen Planning Area is within its natural fire regime (mid to high elevation stands) the central and southern portions have surface and ladder fuel loading that are considered far above historic levels. Large intense fires and the potential for crown fire (stand replacement fire) may now occur in forest types where it was once rare.

Fire History

Historical fire records document extensive fires that occurred on the Gifford Pinchot National Forest as early as 1764. These records show that large fires occurred in the LSR the early to mid 18th century (see Map 3-1, Gotchen Fire History,).

Recorded fire history of the Gifford Pinchot National Forest indicates that wildfires were frequent until approximately 1933 when suppression efforts became more effective. Before fire control was initiated about 1900, fires burned in the low elevation areas through the mixed conifer/ponderosa pine stands of the Gotchen Planning Area. Fire return intervals ranged from 8 to 30 years, with the longer intervals tending towards the western boundaries of the LSR. The clearing effect of regular burning would explain the open, grassy areas in the eastern portions of the LSR along the boundary with the Yakama Indian Reservation. It has been recognized that the Northwest Native Americans used fire in the environment for a variety of reasons. Human-caused fire was by far the most important tool of biomass manipulation throughout the Pacific Northwest. Lightning however, most likely was and continues to be a primary ignition source on the forest and in the Gotchen Planning Area.

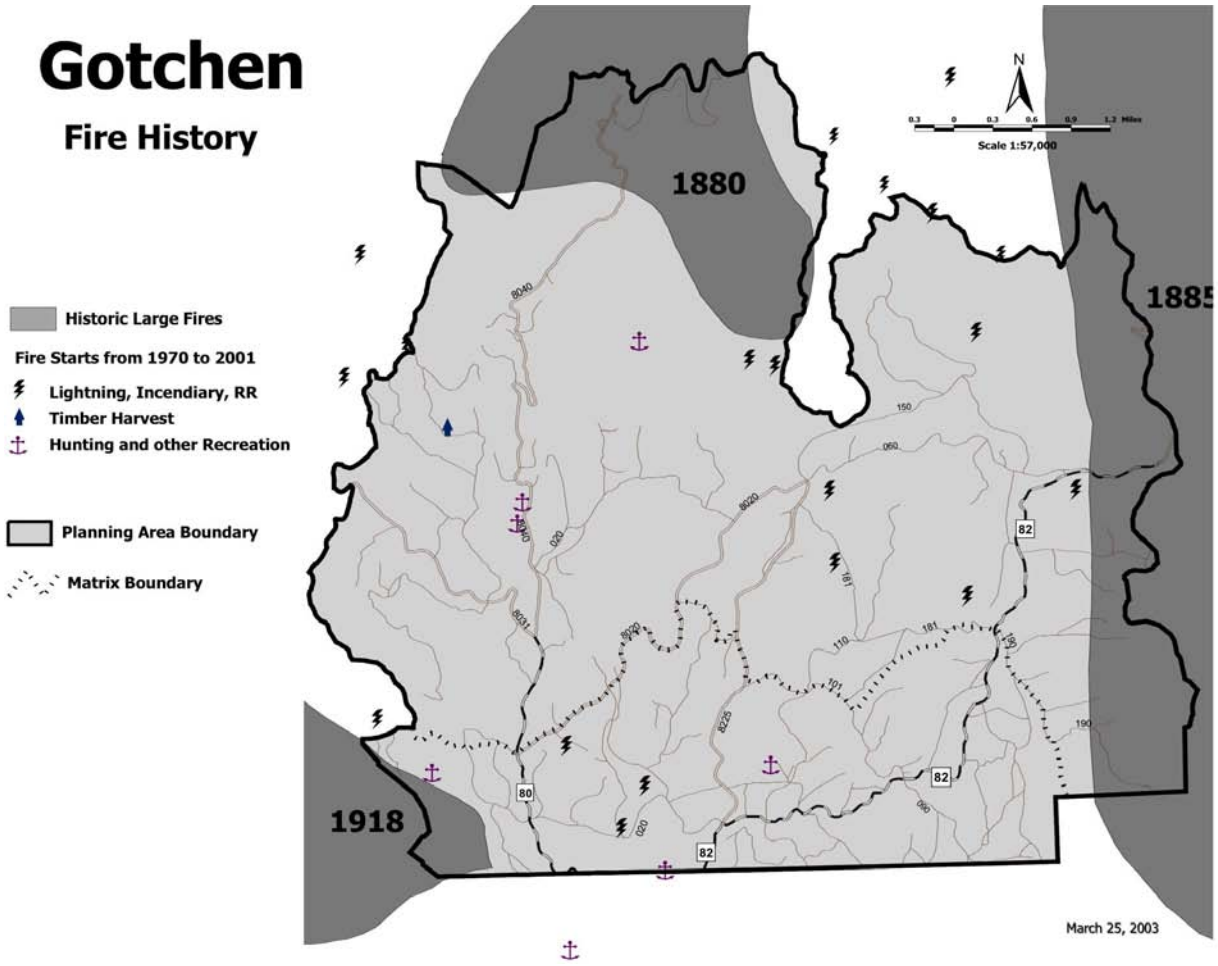
Forest visitor use declined in the 1940's due to the war and human caused fire starts declined. After the war, as timber cutting expanded, slash disposal was recognized as a serious fire hazard. Throughout the 1950's and 1960's, experience was gained in controlled slash burning to reduce fire risk and to 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.

The role of fire on the landscape has changed in the last hundred years. Land managers today are still dealing with a landscape that has been modified by decades of effective fire suppression practices. This has resulted in a change of species composition, their spatial

distribution over the landscape and has altered patterns of disturbance, which effect insect, disease, and fire risk.

Map 3-1. Gotchen Planning Area Fire History.



Historical fire regimes for the Gotchen Planning Area have been determined based on existing plant association groups and fire records. Dr. James Agee describes the fire regimes, plant association groups and current fire potential for the Gotchen Planning Area in a working paper titled "*Historic Ranges of Variability for the Gotchen Late Successional Reserve" September, 2001.* In this paper, Dr. Agee describes the historical fire regime of the Gotchen Planning Area as a "*gradient of fire regimes that increase with severity and disturbance openings with increasing elevation*." Three broadly represented regimes identified include the low elevation Dry Douglas-fir and Dry Grand Fir Plant Association group with a fire return interval of 10 – 22 years. Fires within this group tend to be large, low intensity burns and due to the gentle topography, may have burned for months. The mid elevation and westerly area includes the Wet Grand Fir Plant Association group. This group is classified as a moderate severity fire regime with a return interval of 70 – 150 years. The third regime, (high-severity) is within the Cold-Dry Subalpine and Mountain Hemlock-Subalpine Fir group with a fire return interval of 150 years or more. The fire regimes in Gotchen Planning Area represent a transitional mix of tree species and habitats between the east and west side of the Cascade mountain range. The historic low-severity

fire areas reflect the greatest vegetation change with increased levels of aerial and surface fuel buildup. (Refer to Map Packet – Map 3-4, Plant Association Groups.)

The natural fire rotation (regime) is defined as the time necessary for fires with a given frequency to burn over and reproduce a given area. Some stands within the area may burn more than once while others may not burn at all. Historical fire and vegetation patterns within the low to moderate to high severity regime areas are highly variable and influenced by weather cycles, topography, fuel loads and chance. Within the Gotchen Planning Area, frequent low intensity fires burned in the central and southern portions of the Gotchen Planning Area and as you move up in elevation and to the north, infrequent, high intense fires produced openings of 1,000 acres or more.

Existing Fire Environment

Weather

A typical fire season in the Gotchen Planning Area is from early June to late October. The climate is typified by cool wet winters and hot dry summers. The annual precipitation is over 100 inches in the northern portions of the Gotchen Planning Area and as you move to the south, less than 50 inches of moisture. The majority of the precipitation occurs in the form of snow. During the fire season, less than 5% of the annual perception occurs.

Fire weather records utilizing Fire Family Plus from the Trout Creek automated weather station were run for this analysis. Records from June 15 to Oct 15, 1970 through 2001 were used. Over the past thirty years, 15% of the fire season occurred under the “Low “range, 75% occurred in the “Moderate” range. Fires occurring under low and moderate weather conditions are generally such that they are controlled with ground resources during the first burning period. Fires in the upper Moderate range can be problematic and large fires have occurred on the forest under these conditions. Seven percent of the fire weather conditions were recorded in the “High” range and 3% of the time were recorded in the “Extreme” range. Fires burning under these conditions are of high mortality, difficult to control and are often stand-replacing type events.

Critical factors influencing fire size and intensity in the Gotchen Planning Area and on the forest include fuel characteristics, periods of drought, and wind events. East wind events (known as the Foehn wind) can occur at any time of the year on the forest, however they are most frequent in the fall and the strongest near the Columbia Gorge. The largest and most severe fires on the forest have all been associated by the east wind event, all occurred in September after several weeks of drought. Within the Gotchen Planning Area, due to the gentle topography, high winds would most likely be a contributing factor in the initiation and spread of crown fire.

Fire Occurrence

No large fire, over 100 acres, has occurred in the Gotchen Planning Area since the early 1900’s. Several large fires have occurred around the Gotchen Planning Area; most recently in September of 2001, a 314-acre fire burned in the Salt Creek drainage four miles to the northwest. This fire was caused from lightning, suppression action was taken, and

approximately half of the area burned as a stand replacement type fire. Records from 1970 – 2001 in the Gotchen Planning Area indicate thirty-four fire starts occurred (see Map 3-1). These fires were actively suppressed and all burned less than one half acre in size.

Over sixty percent of these fire starts were caused from lightning, the remainder from recreational and forest operational activities. The fire occurrence for the Gotchen Planning Area per year is 1.06. The fire frequency per 1000 acres is 0.05. Lightning is the primary ignition source in the Gotchen Planning Area. All areas of the Gotchen Planning Area are at risk to random ignition starts from lightning.

Fuel Models

Fuel models characterize what ground fuel and stand conditions are present and how a fire is likely to behave under specific circumstances. The plant association groups in the Gotchen Planning Area are represented under the timber group as NFFL Fuel Model Eight (Albibi 1976). The primary carrier of a fire in this fuel model is litter beneath the timber stand. Slow burning surface fires with flame lengths of one to two feet are most common, although the fire may encounter a “jackpot” or heavy concentration of fuel that can flare up.

In the areas of the budworm infestation, dead and dying trees have added fuel to the forest floor moving the model to NFFL Fuel Model Ten (10). With the projected and existing high surface fuel loads, the average flame length and intensity levels would continue to increase. As the progression of the budworm infestation and natural decay process continue to occur, fuel model ten conditions would also increase throughout the area.

Fuel surveys conducted in the early 1990’s (pre budworm) indicated much of the area had a surface fuel loading of 10 to 20 tons per acre. Recent surveys in the same areas indicate an increase of surface fuel over 50%. Fires in Fuel Model Ten burn the ground and surface fuels at a greater intensity than that of other timber fire models. Dead and down fuels are composed of high quantities of 3 inch and larger branches and tree bowls creating a high fuel load on the forest floor. Crowning out (a surface fire that burns a group of trees), spotting and torching of individual trees is frequent in this situation, leading to potential fire control difficulties. Other fuel models are also represented within the Gotchen landscape but at much smaller scale.

Fire behavior predictions analyzed through the BEHAVE program are based on existing measured surface fuel loads and specific weather conditions. The average fuel bed depth is increasing in areas of high bug kill and stand mortality. While the BEHAVE program considers fuel loading in the one and one hundred hour time lag range fuels in its fire projections, large diameter class fuel (greater than three inch) are not. A high percentage of the existing and expected surface fuel loadings in the Gotchen Planning Area would consist of this large diameter material. It is recognized that while this material is less flammable, once ignition occurs, fire intensity, flame lengths, burning duration and effects on resources would be greater. The potential for crown fire initiation and spread within the Gotchen Planning Area is based on several factors. The existing surface and aerial distribution of fuel is becoming more similar across the existing plant association groups. Surface fuel loads and stand densities in all of the Gotchen Planning Area are capable of producing intense, fast spreading fire supporting both independent and running crown fire. Other

variables influencing crown fire initiation and sustainability include fire weather, (wind and temperature) as well as topography (aspect and slope).

Fire Exclusion

The Dry Douglas-fir, Dry Grand Fir Plant Association group (low severity regime) along with the mid elevation Wet Grand Fir group (moderate fire regime) comprise the majority of the Gotchen Planning Area. Due to the exclusion of fire, the low severity regime area may have missed up to a dozen or so fires that would have cleared and maintained the undergrowth, surface fuel and tree density existing today. Fires occurring today in both the low and moderate fire regime areas would be at increased intensity levels due to the dense thickets of Douglas-fir, grand fir regeneration and surface fuel buildup. Grand fir and other true fir species while present in past conditions within the understory and overstory were strongly influenced by the role of fire. With the absence of fire, grand fir has become a dominant species in both the low severity and moderate fire regime areas.

The Cold-Dry Subalpine and Mountain Hemlock-Subalpine Group (including lodgepole pine) include the higher elevations areas of the Gotchen Planning Area. The effects of fire exclusion in these areas are less noticeable as they are within the natural fire regime. Current fire behavior has not changed from historical periods, fuel load levels and growth characteristics existing today promote highly destructive stand-replacing type fires when they occur during periods of moderate to extreme fire weather conditions.

There are many causes for the variability in fire effects. While weather, topography, and site history cannot be changed, the frequency and the application of fire along with the management of fuels and vegetation can be controlled.

Topography

The majority of the Gotchen Planning Area is less than 20% slope. Much is at or less than 10%. Fire rates of spread and resistance to control are greatly affected by topography and slope. Due to the gentle topography, rates of fire spread would be driven by high wind and fire weather events.

Risk Assessment

Under the “High” or “ Severe” fire weather condition; a high percent of the Gotchen Planning Area is at risk to large stand replacement fire, as is the majority of the Gifford Pinchot National Forest. Under the “Moderate” fire weather condition approximately forty percent of the Gotchen Planning Area is at a high threat to fire. A high fire threat indicates fire control difficulties and high mortality is likely. Fire hazard conditions are expected to increase sharply over the next decade as more of the Gotchen Planning Area succumbs to the increases of surface fuel and moves towards a climax forest.

At this time, the Gotchen Planning Area is identified as having a moderate to high fire hazard and a low to moderate ignition risk.

Fire hazard is defined as vegetation that forms a threat for fire ignition, rate of spread, and resistance to control based on the existing vegetation type, arrangement, volume, condition,

and location (aspect, slope, elevation). The fire hazard rating in the Gotchen Planning Area is expected to increase as the vegetation and physical characteristics of the fuel become more homogenous and widespread. Several fire rotations have been missed in the central and southern areas of the Gotchen Planning Area.

Fire ignition risk is defined as the likelihood or chance of an ignition to occur. The primary ignition source in the Gotchen Planning Area and on the forest, continues to be from lightning. Lightning and human-caused ignitions within the Gotchen Planning Area may potentially threaten high value lands and resources including the LSR, proposed RNA, developed recreational areas, wilderness areas, T&E species, soil, site productivity, and adjacent private lands.

An additional component of fire hazard and ignition risk is the ability of humans to suppress and or control wildfires when they occur. Existing conditions in the Gotchen Planning Area due to past fire suppression policies resulting in the present fuel conditions indicate high intensity fires increasing the likelihood of fires quickly spreading. While improvements in suppression technology and co-operative agreements for mutual aid have increased, District initial attack resources and forest-wide extended attack capability have decreased.

WILDLIFE

Wildlife Habitats and Species

Wildlife Habitats

The predominant wildlife habitat type for the Gotchen Planning Area is the “Eastside Mixed Conifer Forest” (Crawford 2001). This habitat type represents the mid-elevation, mixed-conifer forests common along the eastern slopes of the Cascade Mountains. This habitat type encompasses a wide variety of tree species and plant association groups. Douglas-fir is the most common tree species in the over-story, but in some areas grand fir may be dominant or co-dominant with Douglas-fir. Ponderosa pine is also common in this forest type, typically in lower elevations and on drier sites. Patches of open shrub and grass habitats are also present in this forest type (Crawford 2001). For more detailed information concerning plant association groups in the Gotchen Planning Area refer to the vegetation section (page 90).

Other wildlife habitat types include “Montane Mixed Conifer Forest”, “Lodgepole Pine Forest”, and small patches of “Upland Aspen Forest” (Chapell, et al. 2001). The mixed montane forest generally occurs above 5,000 feet elevation and consists of mixed stands of subalpine fir and lodgepole pine or mountain hemlock. The lodgepole pine forest occurs in the northeastern portion of the Gotchen Planning Area and is comprised of stands that are dominated by lodgepole pine in association with grand fir or subalpine fir. Upland aspen stands are uncommon and declining in the Gotchen Planning Area.

The Eastside Mixed Conifer Forest type supports a wide variety of wildlife species, from old-growth associated species such as spotted owls, to highly adaptive species such as common ravens that occupy a wide variety of habitat types. This is a transitional plant zone

between west and east side habitats; therefore, species richness is relatively high in this area. There are over 200 vertebrate species that are associated with the Eastside Mixed-Conifer Forest habitat type (O'Neil, et al. 2001). These species include amphibians, reptiles, birds, and mammals.

The following discussion will emphasize species dependent upon or closely associated with late-successional or old-growth forests (LSOG); species dependent upon unique habitats (e.g. snags); and species of State or Federal concern.

Late-Successional and Old-Growth Forest (LSOG)

Late-successional and old-growth forest (LSOG) has many key wildlife habitat features not readily found in other seral stages of forest. These include: a dense, multi-layered forest canopy; mistletoe brooms; large, live trees with deformities and dead parts; exfoliating bark; large snags and down logs; bark piles; and well-developed layers of organic litter and duff on the forest floor. The diversity of tree structure and plant life within LSOG is known to play key roles in the life requirements for many species.

The 1993 Scientific Analysis Team report on old-growth forests in the Pacific Northwest identified 94 vertebrate species (excluding fish) that are closely associated with old-growth forests within the range of the northern spotted owl (Thomas, et al. SAT 1993). Of these, 51 species are known or suspected to occur in the Gotchen Planning Area including four amphibian, 28 bird, and 19 mammal species (Table 3-1. "Wildlife associated with the Eastside Mixed-Conifer Habitat") that are closely associated with old-growth and late-successional forest (Johnson and O'Neil 2001).

Table 3-1 Wildlife associated with the Eastside Mixed-Conifer Habitat that are closely associated with old-growth and late-successional forest

Amphibians	**Birds**	**Mammals**
*Northwestern salamander	*White-headed woodpecker	Shrew mole
+Pacific giant salamander	*Three-toed woodpecker	*California myotis
Rough-skinned newt	*Black-backed woodpecker	*Yuma myotis
+Tailed Frog	*Northern flicker	*Little brown myotis
	*Pileated woodpecker	*Long-legged myotis
Birds	*Hammond's flycatcher	*Fringed myotis
Bald eagle	*Chestnut-backed chickadee	*Long-eared myotis
*Northern goshawk	*Red-breasted nuthatch	Silver-haired bat
+Flammulated owl	*Brown creeper	*Big brown bat
*Northern pygmy owl	*Winter Wren	Hoary bat
*Northern spotted owl	*Golden-crowned kinglet	*Townsend's chipmunk
*Barred owl	*Hermit thrush	*Douglas' squirrel
Great gray owl	*Varied thrush	*Northern flying squirrel
*Vaux's swift	*Townsend's warbler	Deer mouse
*Williamson's sapsucker	*Hermit warbler	Southern red-backed vole
*Red-breasted sapsucker	*Wilson's warbler	*Western red-backed vole
*Hairy woodpecker	*Red crossbill	*American marten
		Fisher
		Canada lynx

* = Species documented within the Gotchen Planning Area, + = species suspected within the Gotchen Planning Area. Species not identifed with a * or + may potentially occur in the area based on knowledge of the species historic range.

Special Habitat Features: Snags, Down Wood, Mistletoe Brooms, Hollow Trees, and Rock Outcrops

Decayed wood elements – snags, down wood, and live decaying trees - are widely recognized as essential habitat components for many wildlife species. Numerous wildlife functions are attributed to decaying wood as a source of food, nutrients, and cover (Marcot et al. 2001 p. 584). The NWFP notes the importance of snags and down wood as key elements of LSOG forest, and provides minimum guidelines for managing decayed wood resources.

The amount and distribution of snags and down wood varies widely across the landscape. In the Gotchen area timber harvest, fire suppression, and tree mortality associated with insects and disease are major factors that have influenced the distribution of decayed wood. The existing condition is a patchy mosaic of forest stands of different successional stages with various levels of snags and down wood, ranging from 0 snags/acre in clearcuts to 50+ snags/acre (Topik, 1989).

The variation in snags and down wood in the Gotchen area is consistent with forest conditions throughout the eastern Cascades. Site-specific data on existing snag and down wood resources for the Gotchen area are not available. However, regional summaries of snag and down wood resources are available for Eastside Mixed-Conifer Forest (Rose et al. 2002, Marcot et al 2002) and grand fir plant associations (Topik 1989). These data provide a baseline index for snags and down wood in "unmanaged" eastside mixed-conifer forests, and provide a basis for estimating snag and down wood retention guidelines in the Gotchen area.

Table 3-2. Average snag and down-wood densities in unmanaged Eastside Mixed Conifer Forests.

Successional Stage	Size Classes	Snags	Down Wood	
		snags/acre	% cover	logs/acre
Early Seral (<9.8" dbh)	Total	6.7	2.0	63.9
	Large	0.3	0.4	3.6
Mid –Seral (9.8"-19.7" dbh)	Total:	8.7	2.2	23.4
	Large:	1.7	0.5	4.2
Late-Seral (>19.7" dbh)	Total:	8.4	1.9	41.3
	Large:	3.2	0.7	6.4

Notes:

Early seral unmanaged refers to fire-regenerated stands, thus snag and down logs densities are relatively high.

Total snags include all snags ≥10" dbh, and ≥6.6 ft. tall.

Large snags include snags ≥19.7" and ≥6.6 ft. tall.

Total down logs include all logs ≥4.9" large-end diameter and ≥6.6 ft. long. Large down logs include logs ≥19.7" large-end diameter and ≥6.6 ft. long. Source: Rose et al 2001 p 586-588.

About 12% of Gotchen is comprised of young stands regenerated since 1960 with few or no snags, and about 25% is comprised of late-seral stands (>19.7" dbh). Management

considerations for snags and down wood generally include maintaining the largest potential and available snags and down logs on site. Topik (1989) found that large snags and down logs are generally not abundant in the grand fir zone, and therefore suggested maintaining all large down logs >20" diameter, and retaining at least 2 large snags per acre for wildlife habitat. In a recent synthesis of snag and down-wood research, Marcot and others (2002) suggested that managing snags at densities of 6.7 – 12.5/per acre and down wood at 2-4 percent cover per acre would maintain wood-dependent wildlife at low to moderate levels. Managing for higher densities of snags and down wood cover may provide for a greater number of species, but can also contribute to fuel loading and increased fire risk.

Project design criteria for Gotchen include guidelines for maintaining snags and down wood resources to support woodpecker populations (*Table 3-17). The objective is to provide for the 100% population potential in the LSR and 40-100% in Matrix. These snag and down wood guidelines are consistent with average levels for Eastside mixed-conifer forest. These criteria are listed in Chapter 2, under wildlife mitigation.

Hollow trees and mistletoe brooms, found predominately in LSOG forest, are also important habitat features. Management recommendations include maintaining all identifiable hollow trees and snags, as these structures provide critical denning, nesting, or roosting habitat for a wide-variety of wildlife species, and because hollow trees tend to be rare and can take centuries to develop (Marcot et al. 2002). Mistletoe brooms also provide important nesting habitat for a variety of species, therefore management recommendations include maintaining large, old trees with mistletoe brooms where they do not interfere with long-term management objectives.

Rock outcrops are a common habitat feature across the Gotchen forested landscape. These features are prime habitat for bushytail woodrats and pika, important prey for the northern spotted owls. Open meadows and grass habitats are also important wildlife habitat features in Gotchen.

Proposed, Threatened, Endangered, and Sensitive Species

There are over 260 fish and wildlife species that are federally listed or state listed as threatened, endangered, sensitive, or species of concern in Washington. The following species are known to occur or potentially occur in the Gotchen Planning Area. Listed species not included in Table 3-3 are not present in the Gotchen Planning Area based on unsuitable habitat; or, the Gotchen Planning Area is clearly outside the recognized range of the species.

Candidate species are those plant or animal species that, in the opinion of the U. S. Fish and Wildlife Service, enough information exists to warrant listing them as threatened or endangered. Species of Concern are those species whose conservation standing is of concern, but for which further status information is needed. Forest Service Sensitive Species are those recognized by the Regional Forester as species for which population viability is a concern or are listed as State endangered or threatened.

Table 3-3. Threatened, Endangered, and Sensitive species that are known to occur and/or potentially occur in the Gotchen Planning Area

Common Name	WA State Status	Federal Status	Documented Sightings	Probability of occupancy
Mammals				
Fringed myotis	-	SC, FS	Yes	High
Yuma myotis	-	SC	Yes	High
Keen's myotis	C	-	Yes	High
Small-footed myotis	-	SC	No	Moderate
Long-eared myotis	-	SC	Yes	High
Long-legged myotis	-	SC	Yes	High
Pacific Townsend's big-eared bat	C	SC, FS	No	Moderate
Pale Townsend's big-eared bat	-	SC	No	Moderate
Western gray squirrel	T	SC, FS	No	Low
Gray wolf	E	E	No	Low
Grizzly bear	E	T	No	Low
Pacific fisher	E	SC, FS	No	Moderate
Californa wolverine	C	SC, FS	No	Low
Lynx	T	T	No	Low
Birds				
Harlequin duck	-	SC	No	Moderate
Bald eagle	T	T	No	Moderate
Northern goshawk	C	SC	Yes	High
Merlin	C	-	No	Moderate
Peregrine Falcon	E	SC	No	Low
Flammulated Owl	C	-	No	Moderate
Northern spotted owl	E	T	Yes	High
Great gray owl	-	FS	No	Moderate
Vaux's Swift	C	-	Yes	High
Whiteheaded woodpecker	C	-	Yes	High
Blackbacked woodpecker	C	-	Yes	High
Pileated woodpecker	C	-	Yes	High
Lewis's woodpecker	C	-	No	Low

Common Name	WA State Status	Federal Status	Documented Sightings	Probability of occupancy
Amphibians				
Larch mountain salamander	S	SC, FS	No	Low
Red-legged frog	-	SC	No	Low
Cascades frog	-	SC	Yes	High
Tailed frog	-	SC	No	Moderate
Oregon spotted frog	E	C	No	Low
Western toad	C	SC	No	Low
Cascade torrent salamander	-	FS	No	Moderate
Cope's giant salamander	C	FS	No	Moderate
Fish				
Bull trout	C	T	No	Low
Coastal cutthroat trout	-	SC	No	Low
Butterflies				
Mardon skipper	E	C	Yes	High
Chinquapin hairstreak	C	-	No	Low
Johnson's hairstreak	C	-	No	Low

Definitions

Washington State Status	Federal Status
E = Endangered T = Threatened S = Sensitive C = Candidate	E = Endangered T = Threatened PT = Proposed Threatened C = Candidate SC = Species of Concern FS = USFS Sensitive Species

High = Suitable habitat is present, documented sightings in the Gotchen Planning Area.

Moderate = Suitable habitat is present, but species presence is not confirmed, or, the species has been documented adjacent to the Gotchen Planning Area.

Low = Habitat conditions for the species are marginal in the Gotchen Planning Area.

Threatened, Endangered, and Sensitive Wildlife – Mammals

Bats

Status: Federal species of concern, Washington State candidate species, Forest Service sensitive species, and NWFP Survey & Manage protection buffer species

The Mt. Adams Ranger District in cooperation with other researchers has conducted capture and radio-telemetry studies of forest bats in the Gotchen Planning Area (USDA 1998, Taylor 1999). These studies have identified at least eight bat species (Table 3-4) and located a number of seasonal day-roosts within the Gotchen Planning Area. Both arboreal and cave-roosting bats are present in the area (Taylor 1999). Late-successional and old-growth forest associated species such as the long-legged myotis, long-eared myotis, and little brown myotis were the most common species captured.

Table 3-4. Bat species captured within and adjacent to the Gotchen Planning Area.

Species captured within the Gotchen LSR[1]:	**Species captured adjacent to the Gotchen Planning Area:**
*Fringed myotis (*Myotis thysanodes*) Long-eared myotis (*M. evotis)* Long-legged myotis (*M. volans)* *Keen's myotis (*M. keenii)* Yuma myotis (M. yumanensis) Little brown myotis (*M. lucifugus)* California myotis (*M. californinus)* Big brown bat (*Eptesicus fuscus*)	Western small-footed myotis *(M .ciliolabrum)* *Townsend's big-eared bat *(Plecotus townsendii)* Silver-haired bat (*Lasionycteris noctavagans*) Hoary bat (*Lasiurus cinerus*) ([1]USDA 1998, R.Mendez 2000 unpublished data) ([2]Taylor 1999) *Cave roosting species

Bats utilize a variety of structures for hibernacula, maternity roosts, and seasonal day-roosts. Caves, crevices, mineshafts, buildings, bridges, hollow snags and trees, snags, live conifers and deciduous trees may all be used by bats as roosting habitats (Maser 1998). *Myotis* bats are insectivores that prey primarily upon moths, flies, and spiders (Maser 1998). The abundance of western spruce budworm in the Gotchen Planning Area provides a rich food source for forest bats.

At the landscape scale, the 15,000+ acres of mature forest stands in the Gotchen Planning Area provide important habitat for several bat species. The grand fir snags preferred by some bat species are generally abundant on the landscape due to mortality from budworm defoliation. However, large diameter old-growth snags and legacy trees important for arboreal bats are relatively uncommon. Rock outcrops and the Aiken Lava bed represent unique habitats within the Gotchen landscape that may provide cave and/or crevice habitat for bats. There are at least 105 acres of rock piles and other lava features in the Gotchen Planning Area (excluding Aiken lava bed).

Western Gray Squirrel *(Sciurus griseus)*

Status: Federal species of concern, Washington State threatened species, Forest Service sensitive species

Habitat conditions for the western gray squirrel are marginal in the Gotchen Planning Area with no sightings ever documented. In Washington, the western gray squirrel is closely associated with Oregon white oak and mixed white oak/conifer stands (Rodrick and Milner 1991). Although Oregon white oak is present in the area, it is limited to small, isolated patches and a few scattered individual trees in the southern part of the Gotchen Planning Area. The limited oak habitat that is present in the Gotchen Planning Area is being over-topped by conifer encroachment, resulting in a decline of potential habitat for western gray squirrel (USDA 1998).

Gray Wolf (*Canis lupus*), Grizzly Bear *(Ursus arctos)*, and California Wolverine *(Gulo gulo luteus)*

Status: Federal endangered species, Federal threatened species, and Forest Service sensitive species.

The gray wolf, grizzly bear, and wolverine are all large carnivores that require vast areas of undeveloped landscape encompassing a wide range of forest, shrub, riparian, and alpine habitats. These animals are rare in Washington, and are believed to be resident only in the North Cascades and in the Selkirk Mountains of northeastern Washington (Almack and Fitkin 1998; Banci 1994).

In the past 15 years there have been a few unverified sightings on the Gifford Pinchot National Forest, suggesting that these animals may be present in the southern Washington Cascades, but whether these reports represent resident animals or transient individuals is unknown (WDNR 2001; Almack and Fitkin 1998). There have been no reported sightings of any of these animals in the Gotchen Planning Area in recent years, and the probability of these animals occurring in the area is considered to be extremely low due to high road densities in the area and limited prey populations.

Given the wide-ranging nature of these carnivores, it is possible that transient individuals could occur in the Gotchen Planning Area. The Mt. Adams Wilderness and the Gotchen Creek Inventoried Roadless Area represent large landscapes without roads that could provide habitat for large carnivores.

Pacific Fisher (*Martes pennanti*)

Status: Federal species of concern, Washington State endangered species, Forest Service sensitive species

The late-successional and old-forest stands in the Gotchen Planning Area represent potential habitat for fishers. Extensive surveys for forest carnivores using track plates and baited camera stations have been conducted throughout the GPNF, including several stations in the Gotchen Planning Area. These surveys and other survey efforts throughout the Washington Cascades have failed to detect fishers (Lewis and Stinson 1998). Since 1979, there have been nine unverified sightings of fishers on the Gifford Pinchot National Forest. The most recent

sighting was in 1999, approximately 16 miles southwest of the Gotchen Planning Area (WDNR 2001).

Canada Lynx *(Lynx canadensis)*

Status: Federal threatened species, Washington State threatened species

The lynx is rare in Washington, probably numbering fewer than 100 individuals in the state (Stinson 2001). Lynx are primarily associated with subalpine and boreal forests, and they prey almost entirely upon snowshoe hare (Stinson 2001).

Recent efforts to identify suitable lynx habitat in Washington have focused on large contiguous stands of subalpine fir, generally above 4,000 feet in elevation. Lynx habitat maps prepared by the inter-agency Lynx Biology Team indicate that there is no suitable lynx habitat on the Gifford Pinchot National Forest. Although there is subalpine fir in the Mt. Adams area, the Lynx Biology Team concluded that these stands are too small and too open to provide lynx habitat (B. Naney, pers. com.).

Given the wide-ranging nature of lynx, it is possible that transient lynx could occur in the Gotchen Planning Area. In 1994, a single unverified lynx sighting was reported by a trapper in Klickitat County, approximately five miles south of the Gotchen Planning Area (WDNR, 2001). Snowshoe hare are present in the Gotchen Planning Area (USDA 1998), but it is not known if hares are present in sufficient densities to support lynx. Most of the Gotchen Planning Area lies below the 4,000-foot elevation band, and is therefore more suitable for lynx competitors such as bobcat and coyote (Ruediger, et al. 2000, USDA 1998).

A National hair-plate survey technique was used to determine the presence of lynx on the Gifford Pinchot National Forest from 1998 through 2002. In addition, remote camera stations were used during 2000 to survey for forest carnivores in the Gotchen Planning Area. These survey efforts have not detected any evidence of lynx on the GPNF (Stinson 2001).

Threatened, Endangered, and Sensitive Wildlife - Birds

Northern spotted owl (*Strix occidentalis caurina*)

Status: Federal threatened species, Washington State endangered species, Gifford Pinchot Forest Plan management indicator species

The spotted owl occurs throughout western Washington and along the eastern slope of the Cascade Mountains at elevations generally below 5,000 feet (Thomas, et al. 1990). In the eastern Washington Cascades, spotted owls occupy a wide-range of forest habitats from old-growth stands to mid-seral stands that have been partially logged, but which still retain some structural features that spotted owls require (Thomas, et al.1990). This latter condition is common in the Gotchen Planning Area.

Spotted owls are long-lived, non-migratory birds that establish territories that they defend against other owls and avian predators. They prey almost entirely on northern flying squirrels and other small mammals.

Suitable spotted owl habitat is generally mature or old-growth forest that has a moderate to high canopy closure; a multi-layered, multi-species canopy dominated by large overstory trees; numerous large snags and down logs; and sufficient open space below the canopy for owls to fly through (Thomas, et al. 1990). Suitable habitat is also referred to as NRF habitat (i.e. nesting, roosting, foraging habitat). Approximately 73% of the Gotchen Planning Area currently provides suitable spotted owl habitat. Table 3-5 displays the amount of suitable spotted owl habitat, by type, in the Gotchen Planning Area.

In the Gotchen Planning Area, spotted owl nesting and roosting habitat is defined as conifer stands having an average stand diameter of at least 16" dbh; canopy-closure of at least 60%; more than one canopy layer; and at least three large (>20" dbh) snags and/or trees per acre, and down wood cover of at least five percent. These structural features are generally associated with old-forest multi-story or understory reinitiation structural conditions. About 43% of the Gotchen Planning Area is spotted owl nesting habitat (Table 3-5).

Spotted-owl foraging habitat is defined as conifer stands having an average stand diameter of at least 12" dbh, and canopy closure greater than 40%. These structural features are generally associated with young-forest multi-story, stem-exclusion closed-canopy, or stem-exclusion open-canopy structural features. Foraging habitat lacks the structural features required for spotted owl nesting habitat, but does provide potential foraging or roosting areas. About 30% of the Gotchen Planning Area is foraging habitat (Table 3-5). For this analysis, all forested areas that are mapped as either nesting or foraging habitat are considered "suitable habitat".

Spotted owl dispersal habitat is generally not suitable for nesting or foraging, but allows spotted owls to travel between areas of suitable habitat (Thomas, et al. 1990). In the Gotchen Planning Area, dispersal habitat is defined as conifer stands having an average stand diameter of at least 8" dbh with an overstory canopy closure of 40% or more. About 13% of the Gotchen Planning Area is dispersal habitat.

These habitat definitions are based on criteria developed by the Washington Department of Natural Resources (WDNR 2000; Hansen, et al. 1993) and the U.S. Fish and Wildlife Service (USFWS 1995) for defining spotted owl habitat east of the Cascade crest.

The 14,506 acres of suitable habitat in the Gotchen Planning Area represent about 2.9% of all NRF habitat on the GPNF. Map 3-2, displays the distribution of spotted owl habitat in the Gotchen Planning Area.

Table 3-5. Suitable spotted owl habitat in the Gotchen Planning Area.

Nesting/Roosting habitat	8,562 acres (43%)
Foraging habitat	5,944 acres (30%)
Dispersal habitat	2,645 acres (13%)
Unsuitable habitat (clearcuts, rock) etc.)	2,680 acres (14%)
Total Area	19,831 acres (100%)
Total NRF:	14,506 acres (73%)

Note: All acreage figures are approximate values based on GIS data. Spotted owl habitat was evaluated using the GPVEG database. This database is different from that used in the Vegetation and Fire analysis for the FEIS. The use of GPVEG was necessary due to the need for a continuous GIS coverage that extended beyond the Gotchen Planning Area.

Factors influencing spotted owl habitat in Gotchen Planning Area

The following trends have been noted in the Gotchen Planning Area due to departures from natural disturbance and successional processes within the past 100 years:

In general, forest structures in the Gotchen Planning Area have become more homogenous (Hummel, et al. 2001).

Selective timber harvest and fire suppression have resulted in an increase in mid-seral forest.

Large, shade intolerant trees (e.g. ponderosa pine) have decreased in number and the density of smaller, shade-tolerant species (e.g. grand fir) has increased significantly.

Approximately 55% of the landscape has had some form of timber harvest during the past century.

Forests in the understory reinitiation structural class are much larger, more contiguous, and cover significantly more area than historical estimates.

The amount of old-growth forest that is currently present (9%) is consistent with historical estimates.

Forests in the understory reinitiation structural class historically covered about 20-30% of the landscape (Hessburg, et al. 1999), suggesting that the current distribution of spotted owl habitat covers more area now than it did historically, particularly in the southern half of the Gotchen Planning Area.

Camp and others (1997) suggest that old-growth forests in the east Cascades existed primarily as small patches associated with specific physiographic and topographic settings. These finding suggest that old-growth patches are most likely to persist on north-facing slopes or within valley bottoms, especially at the confluence of perennial streams (Camp, et al. 1997). Given that the Gotchen Planning Area is primarily a gentle –south facing slope with few perennial streams, the seemingly low estimates of historical old-forest cover are not unexpected.

Agee (2001) suggests that old-growth multi-story forests rarely existed on the Gotchen landscape due to frequent fire and insect disturbances. Agee (2001) suggests that potentially 20-40% of the Gotchen landscape historically could have been in mature and old-forest structural classes, but the majority of these forests would have been old-forest single story structural classes located on drier sites and maintained by frequent, low intensity fires.

Current patterns within the Gotchen landscape have departed from the historical conditions, resulting in an increase in potential spotted owl habitat, but these conditions are most likely not sustainable. Since 1994, forest health in the Gotchen Planning Area has declined dramatically due to epidemic levels of western spruce budworm. Suitable habitat for the spotted owl has also declined due to the budworm defoliation, and is increasingly vulnerable to loss from forest fire.

Although budworm defoliation has been documented across the entire planning area, the central and southern portions of the Gotchen Planning Area have been the most affected. Approximately 8,600 acres of suitable spotted owl habitat have been partially defoliated by

the budworm. Forest stands that previously had a relatively high over-story canopy closure (60-90%) have been defoliated to such an extent that canopy closure is now approaching 50% or less across much of the area. Defoliated forest stands that have a canopy closure of less than 40% are considered to be unsuitable as spotted owl habitat. To date, field surveys have verified that at least 532 acres of NRF habitat has declined below the 40% canopy cover threshold.

The natural decline and loss of spotted owl habitat is expected to continue throughout the area as forest stands die from stresses related to insects and disease. The extent to which the decline of suitable habitat would occur is unknown and difficult to predict.

Forest fragmentation and spotted owl habitat

The practice of staggered-set clearcut timber harvest during the past 40 years has fragmented much of the mature forest in the area. The amount of forest in early-seral stand initiation patches (10%) is similar to historical levels, but the relative size of patches resulting from clear-cuts are smaller and more widely scattered across the landscape than what would typically occur as a result of natural disturbance. Approximately 1900 acres of forest have been clear-cut since 1960, resulting in fragmentation and increased edge-density. Although a number of studies have attempted to define the significance of edge effects to spotted owls, there have been no definite conclusions regarding this matter (Irwin and Hicks 1995). However, old forest “interior habitat” is assumed to be important to spotted owls in that it provides optimal cover for nesting, roosting, foraging, dispersal, and for protection from predators.

For this analysis, fragmentation at the landscape scale was assessed by calculating the acres of “interior” and “edge” habitat in the Gotchen LSR. Edge habitat was assumed to extend 330 feet (100m) into the edge of NRF stands that bordered dispersal or non-suitable habitats. Current estimates indicate that over 28% of NRF habitat is comprised of edge habitats, and 72% is comprised of “interior” habitat. Although it is acknowledged that some road corridors can create an edge effect, roads were not included in this analysis.

Spotted owl dispersal habitat and connectivity with adjacent lands

Spotted owls use both NRF habitat and dispersal habitat for movements across the landscape (Forsman, et al. 2002). Connectivity is defined as the amount of and distribution of dispersal habitats located between conservation lands (Thomas, et al. 1990). Adjacent state lands along the southeast boundary of the Gotchen Planning Area are designated for spotted owl conservation and managed for spotted owl NRF and dispersal habitat (WDNR 1997). In the Gotchen Planning Area, over 86% of the area is capable of supporting spotted owl dispersal, and 79% of the Matrix area supports dispersal.

Northern Spotted Owl Sites

There are six known historic spotted owl nesting/roosting sites within the Gotchen Planning Area, all located within the LSR. These sites have been monitored annually since 1992 as part of a spotted owl demography study being conducted by the National Council of Air and Stream Improvement (NCASI) (Irwin and Fleming 1997; T. Fleming, pers. comm.). Spotted owl occupancy at these sites has declined in recent years, and only 2 sites were confirmed as

occupied in 2003 (T. Fleming, pers. comm.). Table 3-6 displays the status and reproductive success of the spotted owl sites during the past five years. Map 3-2 displays general spotted owl locations within the Gotchen Planning Area.

Table 3-6. Status of spotted owl sites in the Gotchen area.

Site Name	2003	2002	2001	2000	1999	1998
Crof	P-BO	P-BO	P-BO	P-BO	P-BO	NR
Gotchen	NR	NR	S-BO	S-BO	NR	S
Buck	P	P+2	P	P	P	P+2
BigTree	NR	NR	NR	S	P	NR
Ground	NR	NR	NR	P+2	P+1	P+2
Smith	S	P	P+1	P	P	S

S = Single spotted owl
P = Pair of spotted owls
P+2 = Spotted owl pair + number of young
NR = Site surveyed, no response (i.e. no owls detected)
P-BO/ S-BO = Pair Barred Owls/ Single Barred Owl
(Source: T.Fleming, pers. com). The specific causes of the decline of spotted owls in the Gotchen Planning Area are unknown. The widespread defoliation and loss of forest canopy may be a factor. The declining trends in the Gotchen Planning Area are consistent with declines in spotted owl populations throughout eastern Washington (T.Fleming, pers.com).

It is important to note that NCASI surveys for spotted owls in a 2.1-mile radius around each nesting/roosting site that is apparently abandoned. As a result, over 70% of the Gotchen Planning Area was surveyed for spotted owls in 2002. Only the southeastern corner of the Gotchen Planning Area was not surveyed. Although the individual owls that occupy nest sites have changed during the past ten years, no new nest sites have been located during the monitoring surveys. Almost all "new" owls that have been captured at the nest sites were banded individuals that came from other sites adjacent to the Gotchen Planning Area (T. Fleming, pers. comm.). These data suggest that there is a low likelihood of additional unknown nest sites within the Gotchen Planning Area.

The 1997 GIS database for the GPNF indicates there are 286 spotted owl nesting/roosting sites documented on the forest, including 221 pairs and 65 resident singles. The 6 spotted owl sites in Gotchen represent about 2 percent of the known sites on the forest. The actual population of spotted owls on the GPNF is unknown, as there have been no systematic surveys for spotted owls across the GPNF in recent years. Spotted owl monitoring on the north end of the GPNF indicates a declining trend in spotted owl sites on the Cowlitz Valley Ranger District. This decline appears to be directly correlated with an increasing number of barred owls in the area (Pearson and Livezey, in press).

The presence of barred owls in the Gotchen Planning Area may also be contributing to the decline of spotted owls due to the competitive interactions between the two species. Barred owls are larger than spotted owls; are territorial and aggressive towards spotted owls; occupy

smaller territories; they prey upon the same species as spotted owls (Herter and Hicks 2000, Hamer, et al. 2001). Barred owls were first detected in the Gotchen Planning Area by NCASI in 1996 (T. Fleming pers. com). Since 1996, single (possibly transient) barred owls have been detected in the vicinity of each of the nesting/roosting sites. Two breeding pairs of barred owls are now documented in the area, and both pairs are residing at former spotted owl nesting/roosting sites. Barred owls now occupy the "Crof" nesting/roosting site within the Gotchen Planning Area, and another pair occupies the King Mountain site, located adjacent to the Gotchen Planning Area.

Habitat Thresholds for Incidental Take

The average home range for a spotted owl in the Washington Cascades is 6,657 acres (USFWS 1992). The actual limits of home ranges for spotted owls in the Gotchen LSR are unknown, however, one study conducted in the 1980s revealed that a spotted owl pair occupying the Gotchen site had a relatively small summer range of 980 acres, and a very large winter range of over 17,000 acres (Hayes, et al. 1989).

For the purposes of habitat analysis, a circle is used to approximate the spotted owl homerange. In the Washington Cascades, a 1.82-mile radius circle is used to identify the management area around a spotted owl nesting/roosting site. The removal of suitable owl habitat below 40% (2,663 acres) of the area within the 1.82-mile radius circle is one of the FWS indicators of incidental take for this species. The FWS also uses a 0.7-mile radius circle to identify the core habitat around a spotted owl nesting/roosting site. The incidental take threshold at the 0.7-mile radius is 500 acres (USFWS 1992).

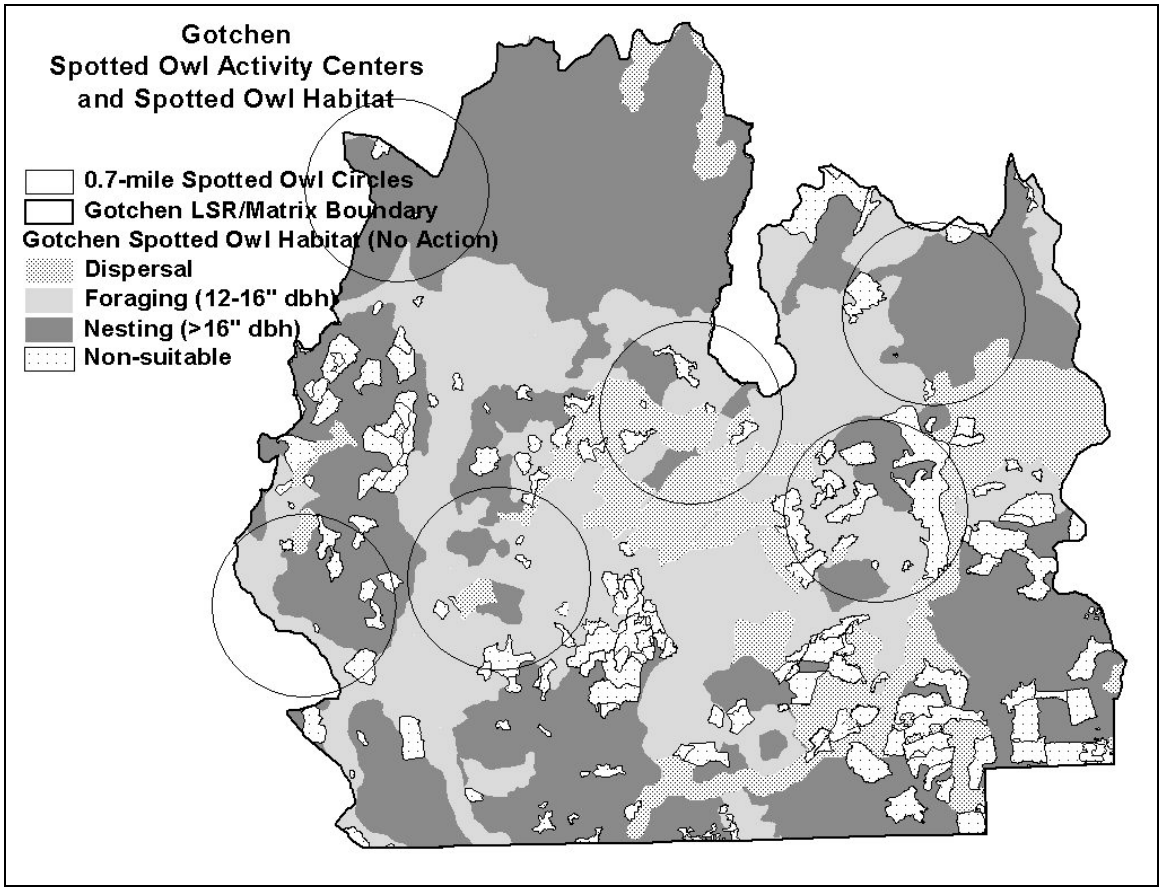
The "Ground" site currently has about 478 acres of suitable habitat within a 0.7-mile radius of the nesting/roosting site, which is below the suitable habitat threshold of 500 acres. This is due in part to the close proximity of the owl site to the Aiken Lava Bed. However, much of this area was selectively logged from 1900 – 1920, resulting in dense stands of grand fir interspersed with patches of old-growth trees. The Ground nesting/roosting site occurs in a remnant old-growth patch. Table 3-7 lists the current amount of suitable habitat for each spotted owl nesting/roosting site. Map 3-2 displays spotted owl habitat and the locations of spotted owl territories (0.7-mile radius circles).

Table 3-7. Current acres of suitable habitat surrounding spotted owl nesting/roosting sites.

Owl site Number	Site Name	Current NRF w/in 0.7 mi. (acres)	Current NRF w/in 1.8 mi.	Below FWS Habitat Threshold?
306	**Crof**	900	3,582	No
307	**Gotchen**	849	2,889	No
312	Buck	871	5,394	No
313	Big Tree	885	5,087	No
323	Ground	478	4,713	Yes
334	Smith	587	3,579	No

NRF = Nesting, Roosting, Foraging Habitat. **Note:** All acreage figures are approximate values based on GPNF GIS data.

Map 3-2. Spotted Owl Nesting/roosting sites and Spotted Owl Habitat.



Adjacent Spotted Owl Nesting/roosting sites

In addition to the spotted owl nesting/roosting sites located within the Gotchen Planning Area, there are another five historic nesting/roosting sites located outside the Gotchen Planning Area (one site on the National Forest, and four sites on Tribal, state, and/or private lands). The 1.82-mile management circles for these nesting/roosting sites overlap with the Gotchen Planning Area boundary. With the exception of the King Mountain site, the current status of these owl sites is unknown. The King Mountain site has been occupied by barred owls since 1998 (T. Fleming, pers. com.).Table 3-8 displays the status and percent area of these owl circles that overlap within the Gotchen Planning Area.

Table 3-8. Spotted owl nesting/roosting sites adjacent to the Gotchen Planning Area (GPA).

Owl site Number	Site Name	Acres of 1.8 mile circle w/in the GPA	Percent of 1.8mile circle w/in the GPA*	2002 Status
3011	Cascade Creek	134	2	Unknown
3017	S. Cakey Butte	39.5	0.5	Unknown
328	King Mountain	903	14	Barred owls
WDFW #1092	Lower Gotchen	349	5	Clearcut 1996-97
WDFW #940	Snowplow Mountain	304	4.5	Unknown

Note: All acreage figures are approximate values based on GPNF GIS data.

Northern Spotted Owl Critical Habitat

Critical habitat was designated for the northern spotted owl on January 15, 1992 (USDI 1992a). Critical habitat was designated to provide essential habitat for the conservation of spotted owls. The primary constituent elements of critical habitat for spotted owls are the physical and biological features that support nesting, roosting, foraging, and dispersal (USDI 1992a).

One hundred and ninety Critical Habitat Units (CHU) were designated on 6.9 million acres of federal lands across the range of the spotted owl. Approximately 32% of the CHUs are located in Washington. Within the Gotchen Planning Area, approximately 89% (17,585 acres) of the Gotchen Planning Area overlaps with CHU WA-42.

CHU WA-42 was designated with the expectation that the CHU would support a cluster of at least 12 spotted owl pairs and provide habitat and population connectivity between the Eastern and Western Cascades provinces (USDI 1991). CHU WA-42 covers approximately 37,445 acres, with 35,884 acres (96%) located on federal lands. The other 4% of the CHU was originally mapped to include state, private, and tribal lands located along the eastern edge of the CHU. In the final rule, only federal lands were designated as critical habitat (USDI 1992). Approximately 24,203 acres (67%) of the CHU currently provides suitable nesting, roosting, and foraging habitat for spotted owls. An additional 2,796 acres (6%) provide potential dispersal habitat. Only about 657 acres (2%) of the CHU consists of rock outcrops, meadows, or other habitats that are not capable of developing suitable owl habitat.

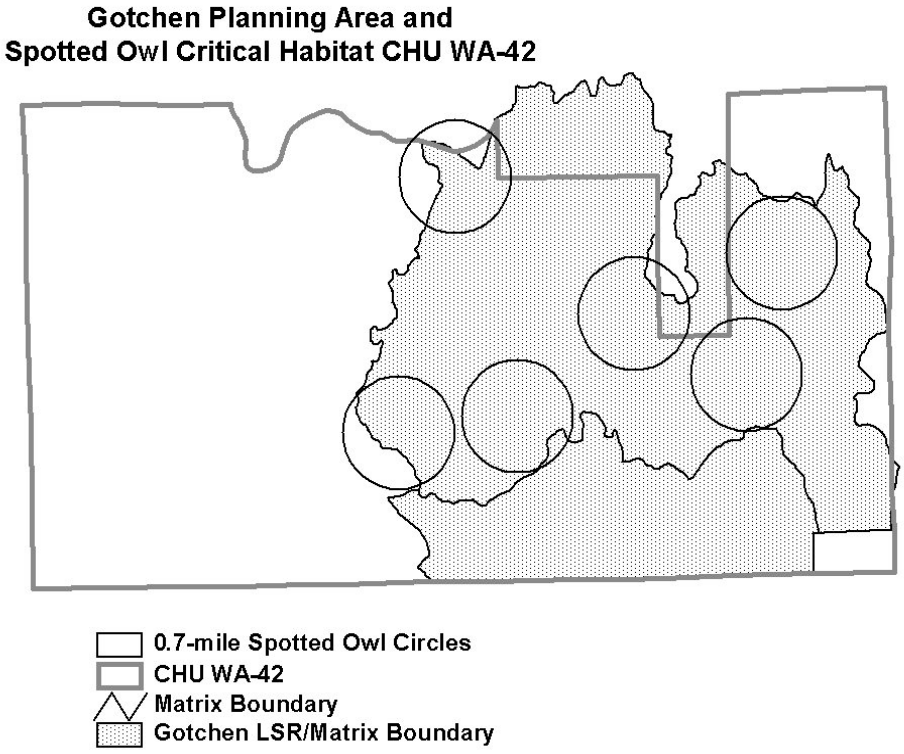
Under the Northwest Forest Plan, the LSR network is expected to perform the same conservation function that the CHU network provides. In most areas, there is a high-level of overlap between the LSRs and the CHUs (USDA and USDI 1994). In the Gotchen Planning Area, both CHU WA-42 and the Gotchen LSR were identified as important for conservation due to the large stands of LSOG forest in the area, and the location along the edge of the Eastern and Western Cascades provinces. Only about 41% of CHU WA-42 is in reserved land allocations, and 59% is Matrix. Table 3-9 compares the overlap between CHU WA-42 and the Gotchen LSR. Map 3-3 displays the overlap between the Gotchen Planning Area and CHU WA-42.

Table 3-9. Suitable spotted owl habitat within CHU-WA 42 and the Gotchen Planning Area.

CHU WA-42 (Federal lands = 35,884 ac)	Acres	Percent
CHU WA-42 Suitable Habitat (NRF*)	24,203 ac.	67%
CHU WA-42 acres in Gotchen LSR/Matrix	17,585 ac.	49%
CHU WA-42 NRF acres in Gotchen LSR/Matrix	13,129 ac	37%
CHU WA-42 acres in Gotchen LSR	12,963 ac.	36%
CHU WA-42 NRF acres in Gotchen LSR	9,812 ac	27%

*NRF = Nesting, Roosting, Foraging. Note: All acreage figures are approximate values based on GPNF GIS data.

Map 3-3. CHU WA-42 Spotted Owl Critical Habitat.



Bald Eagle (*Haliaeetus leucocephalus*)

Status: Federal threatened species, Gifford Pinchot Forest Plan protection buffer species

The bald eagle was federally listed as a threatened species in Washington in 1978 (USDI 1986). There are no known bald eagle nests within the Gotchen Planning Area. Late-successional and old growth forests, and particularly large, old-growth trees are important to bald eagles for nesting and roosting (USDI 1986). The likelihood of bald eagles nesting in the Gotchen Planning Area is low due to limited fish and waterfowl populations as available prey species. Bald eagles may occasionally pass through the Gotchen Planning Area during seasonal migrations to wintering areas near the Columbia River, and may roost along the Upper White Salmon River

Northern Goshawk (*Accipiter gentilis*)

Status: Federal species of concern, Washington State candidate species, Gifford Pinchot Forest Plan protection buffer species

The northern goshawk is currently state listed as a candidate species in Washington. There are two documented goshawk nest locations within the Gotchen Planning Area, and at least three other locations were goshawks have responded to auditory calls during the nesting season (WDNR Heritage Data 2001). Forest management guidelines indicate a minimum 31-acre buffer around known goshawk nests (GPNF 1995).

Northern goshawks utilize a variety of forest habitats (O'Neil, et al. 2001). Late-successional forests are particularly important to northern goshawks for nesting habitat. Assuming that suitable goshawk habitat is similar to suitable spotted owl habitat, there is approximately 14,506 acres of potential goshawk nesting habitat within the Gotchen Planning Area.

Great Gray Owl (*Strix nebulosa*)

Status: Forest Service sensitive species, Survey & Manage protection buffer species

Within the range of the northern spotted owl, the great gray owl is most common in lodgepole pine forests adjacent to meadows (S&Gs, pp. C-21). Surveys for great gray owls have been completed in the Gotchen Planning Area, but no confirmed sightings have been documented. In 1993, fourteen artificial nest platforms, targeting great gray owls, were installed across the Gotchen Planning Area. Platforms were installed in late-successional forest adjacent to tree plantations experiencing gopher damage. Great gray owls were targeted because gophers serve as their primary food source. Follow-up surveys were conducted during five successive years to determine if platform use was occurring. Monitoring revealed no use of the platforms by any animal species.

Harlequin Duck (*Histrionicus histrionicus*)

Status: Federal species of concern.

In the Gotchen Planning Area, the riparian zones adjacent to the White Salmon River may provide nesting habitat for harlequin ducks. Harlequin ducks have been documented adjacent to the Gotchen Planning Area in the Trout Lake Creek and the Upper White Salmon River drainages (WDNR Heritage Data 2001). During the summer harlequin ducks breed in fast-flowing streams or rivers with large woody debris or boulders for loafing and dense riparian vegetation for nesting (Rodrick and Milner 1991). In the fall, harlequins migrate to the Pacific coast and over winter there.

Neotropical Birds

Neotropical migrants are broadly defined as birds whose summer breeding habitat is in North America; and whose wintering habitat is located in Central or South America, south of the Tropic of Cancer (Sharp 1992).

In the Gotchen Planning Area, Breeding Bird Surveys (BBS) have been conducted each June since 1995 (USGS 2001). Eight years of bird data have been collected along this BBS route. The BBS routes are a nationwide network of approximately 2,900 survey routes that pool data on breeding birds and provide regional population trends by species. The East Mt. Adams BBS Route 89-909 travels through the heart of the budworm outbreak. To view the complete list of birds detected on East Mt. Adams BBS Route 89-909, visit the website: http://www.mp2-pwrc.usgs.gov/bbs/retrieval/menu.cfm. Certain bird species are not well represented under the BBS because they are more active at other times of the day (owls) or earlier in the season (blue grouse and woodpeckers). One species that occurs in more open habitats within the Gotchen Planning Area and is at the western extent of its range is the common poorwill.

These surveys have detected 60 species of birds, including 29 neotropical species. The fourteen most numerous species detected along the 50-station BBS route over eight years of surveys are listed along with their highest to lowest yearly count.

Several of the neo-tropical migrants detected in the Gotchen Planning Area are recognized as old-growth associated species. Seven of the fourteen species listed in Table 3-10 are closely associated with old-growth and late-successional forest. These include Vaux's swift, Hammond's flycatcher, Pacific-slope flycatcher, warbling vireo, hermit thrush, Wilson's warbler, hermit warbler, and Townsend's warbler.

Table 3-10. The fourteen most numerous species detected along the 50-station BBS route. Species in bold are closely associated with old-growth and late-successional forests.

Bird Species	Yearly Count High to Low
Evening grosbeak	224 to 28
Nashville warbler	77 to 18
Dark-eyed junco	59 to 13
Western tanager	52 to 14
Hermit thrush	49 to 21
Hermit/Townsend's warbler	46 to 7
Warbling vireo	35 to 10
Chipping sparrow	33 to 8
Red-breasted nuthatch	29 to 7
Black-headed grosbeak	28 to 11
Golden-crowned kinglet	27 to 5
Chestnut-backed chickadee	22 to 4
Common raven	22 to 3
Hammond's flycatcher	18 to 6

The evening grosbeak is an irruptive species, exploding in numbers during years with abundant food resources. The highest count (224) for evening grosbeaks occurred in 1995 and was directly associated with a peak outbreak period for the spruce budworm, a main food item during the nesting season (Takekawa and Garton 1984). Of the birds listed (except the raven), the entire suite of insectivores is represented. These species forage for insects and invertebrates at various forest canopy levels in these substrates: ground litter, bark, needle/leaf, and aerial (Ehrlich, et al. 1988). The following discussion will focus on listed or sensitive neo-tropical species that may occur or are known to occur in the Gotchen Planning Area:

Peregrine Falcon (*Falco peregrinus*)

Status: Federal species of concern, Gifford Pinchot Forest Plan protection buffer species

This species has not been detected in the Gotchen Planning Area, but may occur there as transient individuals during migrations. Peregrine falcons require cliffs for nesting habitat and forage primarily on songbirds in a variety of both forested and open habitats, usually within one or two miles of the nest site (Sharp 1992). There are no cliff habitats within the Gotchen Planning Area suitable for peregrine falcons.

Merlin (*Falco columbariusi*)

Status: Gifford Pinchot Forest Plan protection buffer species, Washington State candidate species

Merlins have not been documented in the Gotchen Planning Area, but they may occur there. Merlins use cavities in large snags or trees for nesting. They also use abandoned crow nests in large fir or spruce trees as nesting platforms. In forested habitats, they tend to forage along edges and in open spaces such as river corridors or meadows (Sharp1992), particularly during migration.

Flammulated Owl (*Otus flammeolus*)

Status: Northwest Forest Plan protection buffer species. Washington State candidate species.

An unverified flammulated owl was vocally detected in the Gotchen Planning Area by a NCASI owl surveyor in July 1997. The flammulated owl is a migratory moth eater and is closely associated with old-growth ponderosa pine and mixed pine-fir forests. They nest in cavities in large snags or trees, and forage in open-canopy forests (Rodrick and Milner 1991). The flammulated owl does occur on adjacent lands in the Yakama Nation.

Vaux's Swift (*Chaetura vauxi*)

Status: Gifford Pinchot Forest Plan protection buffer species, Washington State candidate species

This species has been detected in the Gotchen Planning Area, but appears to be rare in this landscape. Vaux's swifts nest in mature and old-growth forests, and forage in a variety of habitats. They require cavities in large hollow snags or broken tree-tops for nesting and communal roosting. Hollow snags or trees are also rare across the Gotchen landscape.

Olive-sided Flycatcher *(Contopus cooperi),* Willow Flycatcher *(Empidonax trailii)*

Status: Federal species of concern

Olive-sided flycatchers have been detected in the Gotchen Planning Area through BBS. Willow flycatchers are riparian associated species. Alder and willow thickets provide key habitats (Sharp 1992). This species has not been detected in the Gotchen Planning Area through BBS or reconnaissance. The olive-sided flycatcher breeds in a variety of habitats along forest edges and openings, including burns; natural edges of bogs, marshes, and open water; semi-open forest; and harvested forest with some structure retained (Altman and Sallabanks 2000). Common features in all nesting habitat are unobstructed air and tall, prominent trees and snags, which serve as singing and foraging perches (Altman and Sallabanks 2000).

Threatened, Endangered, and Sensitive Wildlife - Amphibians and Reptiles

Status: Northwest Forest Plan Survey & Manage Species, Washington State candidate species, federal species of concern.

The Northwest Forest Plan requires surveys for the Larch Mountain salamander *(Plethodon larselli)* and Van Dyke's salamander *(P. vandykei),* prior to implementing Forest Service activities that trigger the protocol. Both species of salamanders are considered to be rare. According to Crisafulli and Jones (1999), forests of variable age, composition and structure within proposed harvest units trigger the survey protocols for both species. No Survey and Manage amphibian species have been located in the area to date, and no sensitive reptile species are expected to occur in the area. If a target Survey and Manage species is found, special habitat protection buffers would be implemented to maintain microhabitat conditions. Each S&M salamander site would receive a no-cut protection buffer surrounding it equal to one-site potential tree.

Species detected during Gotchen amphibian surveys from 1999 through 2002 are the Cascades frog (*Rana cascadae)*, northwestern salamander (*Ambystoma gracile)*, Pacific tree frog (*Pseudacris regilla)* and the western toad (*Bufo boreas*).

Van Dyke's salamander is considered to have a close association with variable forest conditions, montane lakes, twilight zones of caves, lotic habitats (intermittent and perennial streams, river banks, and seeps). It typically occurs in cooler riparian sites than the Larch Mountain salamander. The Larch Mountain salamander also lives in variable forest conditions as well as in areas dominated by rocky substrates, gravelly soils with interstitial spaces, cave systems, and occasionally in or around seeps.

Tailed frogs (*Ascaphus truei*) are documented at Ninefoot Creek to the west of the Gotchen Planning Area and likely live in the swift flowing, cooler streams like Wicky Creek, Morrison Creek, and the White Salmon River. These same streams may hold potential habitat for Cascades torrent salamander (*Ryacotriton cascadae*), Pacific giant (*Dicamptodon tenebrosus*) and Cope's giant salamanders (*Dicamptodon copei*).

Long-toed salamanders (*Ambystoma macrodactylum*) breed in the wetland swales of Hole-in-the-Ground during late March, which retain snow and moisture into spring. Their egg masses were located while monitoring great gray owl nest platforms in 1995 (Flick, pers. obs.).

Other pond breeders may be less common in the Gotchen Planning Area likely due to the infrequent occurrence of ponds, canals, and ditches. Four active water troughs (concrete, galvanized metal, tire and concrete) are permanently placed in the Gotchen Planning Area for a cattle allotment, and several of these may provide breeding habitat. Forest road 8225-744 has a concrete trough with runoff that creates potentially favorable breeding habitat for long-toed salamanders.

There are no threatened, endangered or sensitive reptile species suspected to occur in the Gotchen Planning Area.

Threatened, Endangered, and Sensitive Wildlife - Terrestrial Mollusks

Status: Survey & Manage protection buffer species

The Northwest Forest Plan requires surveys for several terrestrial and aquatic mollusks prior to implementing Forest Service activities that trigger the protocol. Each species is listed either as a category A (rare) or C (uncommon), and pre-disturbance surveys are practical to perform for these categories (USDA 2001). Category A and C species have standardized

survey protocols developed by a team of taxa specialists. The surveys are conducted in likely habitat, and there are management protection buffers for occupied habitat.

Activities that trigger surveys are those that may directly or indirectly risk terrestrial mollusks (Furnish 1997). Special habitat features found in the Gotchen Planning Area include leaf litter from vine maple and other hardwood species, needle litter, bark, down wood of various decay and diameter classes, and moss mats.

No target Survey and Manage (S&M) species have been located in the Gotchen Planning Area. The following non-S&M mollusks are documented: *Discus whitneyi* (rare), *Haplotrema vancouverense* (common), *Hemphillia dromedarius* (rare), *Pristaloma species* (uncommon), *Prophysaon dubium* (uncommon), *Prophysaon vanattae* (uncommon), *Vesporicola columbiana* (common), *Zonitoides arboreus* (uncommon). One species, *Prophysaon dubium*, is no longer a S&M species nor receives a habitat protection buffer.

Spring habitats are unaffected by the FEIS proposed activities; therefore, surveys for aquatic mollusks are not required. If a target S&M species is found, special habitat protection buffers would be implemented to maintain microhabitat conditions. Each S&M mollusk site receives a 10-acre no-cut buffer (374’ radius) in regeneration harvest units and 120’ in commercial thinning units.

Threatened, Endangered, and Sensitive Wildlife - Butterflies

There are 196 species and subspecies of butterflies documented in Washington (Hinchliff 1996). The southern Washington Cascades is recognized as a species rich area for butterflies, with 114 species documented in Yakima County. At least 68 species have been documented directly from or adjacent to the Gotchen Planning Area. The following discussion will focus on listed or sensitive butterflies that may occur or are known to occur in the Gotchen Planning Area:

Mardon Skipper (*Polites mardon*)

Status: Federal candidate species, Washington State endangered species

The mardon skipper is a small, non-migratory butterfly currently found at four geographically disjunct areas in Washington, Oregon, and California (Potter, et al. 1999). Mardon skippers are known to be closely associated with Idaho fescue and other native bunchgrasses (Potter, et al. 1999). In Washington the mardon skipper is known to occupy grasslands near south Puget Sound and in the southern Washington Cascades (Potter, et al. 1999).

Surveys conducted in 2000 – 2002 have revealed 40 sites in the southern Washington Cascades, including 23 sites within the Gotchen Planning Area with mardon skippers present. The Gotchen sites account for about 30% of the known mardon skippers in the southern Cascades. These sites include both ‘natural’ meadows and grassy tree plantations. Occupied sites range in size from small (less than _ acre) grassy openings to large (one acre or larger) meadows or grass patches within tree plantations. The number of mardon skippers observed at these sites varies from 1 or 2 individuals to 50+ individuals. Most sites surveyed had less than 15 individuals counted, and only 2 sites had 50+ mardon skippers counted.

Survey efforts to date have searched about 70 different sites within the Gotchen Planning Area, covering approximately 570 acres. All occupied sites in the Gotchen Planning Area combined cover about 30 acres, although this figure over-estimates the amount of suitable habitat present at these sites. Mardon skippers appear to be highly localized at occupied sites and it is difficult to map the small patches of suitable habitat in these areas.

In the southern Cascades, mardon skippers are found in open, grassland sites associated with ponderosa pine and grand fir forests east of the Cascade crest (Potter and Fleckenstein 2001, Harke 2001). In the southern Cascades, mardon skippers have been observed at sites ranging from 1,800 to 5,600 feet in elevation. Suitable habitats include dry and mesic meadows with a dominant ground cover of *Festuca* grasses, and several species of flowering forbs. Other occupied habitats include 15 – 25 year-old tree plantations, with low tree cover and relatively high ground cover of grasses and forbs; as well as grassy roadsides and riparian areas (Potter and Fleckenstein 2001, Harke 2001).

Given the patchy distribution of grassland habitats, it is difficult to define how much area is potential habitat for mardon skipper. Most meadow and grass habitats are small features surrounded by larger patches of forest or shrub. Many grass habitats are not mapped in current GIS databases. A query of the GIS vegetation layer indicates there are over 1,700 acres of plantations with grass/forb or shrub/seedling structural conditions. The amount of open grass habitats within these plantations is unknown, but is probably less than 20% of the total area.

Open grass habitats that support mardon skippers have declined over the past century. Fire suppression, grazing, and timber harvest practices have altered grassland habitats throughout the eastern Cascades, including the Gotchen landscape (Agee 1994, Hessburg, et al. 1999). Natural grassland habitats that historically resulted from fire disturbances are now being lost to conifer encroachment and invasive plants associated with cattle grazing. In the Gotchen Planning Area, timber harvest has replaced fire as a disturbance on the landscape. Mardon skippers have colonized some plantation areas, but these sites are limited. Most plantations are densely stocked with trees and shrubs and are therefore not suitable for mardon skippers.

Aerial photographs indicate the meadows that support mardon skippers near the Gotchen Creek Guard Station were historically much larger than they are today. Conifer encroachment and invasive plants have reduced the native grass habitat and cattle grazing has impacted the amount and quality of bunchgrass available for mardon skippers (V.Harke pers. obs, Potter et al. 1999).

Pyle (1989) noted that the Gotchen Creek subwatershed is a key site for the conservation of mardon skippers. Management considerations for mardon skippers include protecting, restoring, and enhancing grassland habitats that support *Festuca* grasses.

Chinquapin Hairstreak (Habrodais grunus herri)

Status: Washington State candidate species.

The chinquapin hairstreak is known in Washington from a single location in the Little White Salmon watershed. The species host plant is the golden chinquapin tree, which is rare in Washington (Pyle 1989), but is locally common in the Little White Salmon River watershed

in the vicinity of the Big Lava Bed. Golden chinquapin has not been located in Gotchen (J. Scott, pers, com); therefore, it is unlikely that this species occurs in the planning area.

Johnson's Hairstreak *(Mitoura johnsoni)*

Status: Washington State candidate species.

Johnson's hairstreak is the only old-growth dependent butterfly species in Washington (Pyle, 1989). The species host plant is dwarf mistletoe, a parasitic plant commonly found on old-growth western-hemlock and Douglas-fir trees. The species is known mostly from low-elevation (<2,000') west-side forests, but it has also been documented in the Lower White Salmon watershed (Hinchliff 1996). The Gotchen area is located above 2,000 feet elevation, so there is a low likelihood that this species occurs in Gotchen. Management considerations include protection of low elevation old-growth stands and trees with mistletoe.

Gifford Pinchot National Forest Management Indicator Species and Northwest Forest Plan Protection Buffer Species

The Forest Plan identifies several wildlife species and/or species groups to serve as management indicator species (USDA 1990). Management indicator species occupy unique habitats that are important to a wide range of species that require the same habitat types. Table 3-11 lists the management indicator species and the habitats these species represent.

Table 3-11. Gifford Pinchot National Forest management indicator species.

Indicator Species	Habitats
Northern Spotted Owl, Pine marten, Pileated woodpecker	Represent species requiring late –successional and old-growth forest
Cavity excavators (woodpecker species)	Represent species requiring snags and down logs
Wood duck	Represent species requiring mature/old-growth deciduous riparian forest
Goldeneye	Represent species requiring mature/old-growth coniferous riparian forest
Deer and Elk, Mountain Goat	Game species important for hunting/viewing

The species and species groups dropped from further analyses in this FEIS are the wood duck, goldeneye, and mountain goat. The Gotchen Planning Area contains no ponds or lakes (either intermittent or permanent) that attract these breeding ducks. Several yearly sightings occur of mountain goats incidentally dispersing from higher elevations in late summer and early fall to mid-elevation sites like Sleeping Beauty. However, the habitat in the Gotchen Planning Area is not conducive to fulfilling the year-round life functions of mountain goats.

American Marten *(Martes americana)*

Status: Gifford Pinchot Forest Plan management indicator species

Martens were captured on film during forest carnivore surveys between 1996 and 2000 at Smith Butte and the Upper White Salmon River. Habitat for marten is distributed widely across the Gotchen Planning Area and encompasses stands of mixed conifer forest.

The summary for marten ecology is taken directly from Ruggiero, et al. 1994. Martens occupy a narrow band of habitat types, living in or near coniferous forests. They specifically associate closely with late-successional stands of mesic conifers with physical structure near the ground. A study in a lodgepole pine forest in central Oregon (Raphael and Jones 2002) finds that radio-tagged American marten use slash piles for resting cover and den sites.

Pileated Woodpecker (*Dryocopus pileatus*)

Status: Gifford Pinchot Forest Plan management indicator species, Washington State candidate species

Perhaps the most common sight in the Gotchen Planning Area is that of pileated woodpecker feeding excavations in grand fir snags. These foraging sites are so extensive that they make food sources available for other species, accelerate decay processes and nutrient cycling, and may facilitate inoculation by heart-rot fungi and mediate insect outbreaks (Aubry and Raley 1999). The pileated woodpecker is a keystone habitat modifier in the Pacific Northwest (Aubry and Raley 1999). It is the largest woodpecker in this region, and the only species that forages primarily by excavating. Only pileateds are capable of creating large cavities in hard snags and decadent live trees, in which a wide array of other species use old pileated nests and roost cavities (Aubry and Raley 1999).

Survey results in 2002 found a potential pileated nesting area (begging juveniles were heard) in the proximity of SE _, NW _, Section 26, T. 7 N, R. 10 E. The other obvious territorial core is north of Forest Road 8200-181 and east of 8225-110 by Smith Butte. Mean home range during the breeding season is 1,390 acres and is 2,400 acres for individuals across the year (Altman 1999). Territory is defended by a pair year round against other territorial birds, and a pair member will not abandon a territory even if its mate is lost (Bull and Jackson 1995).

Cavity Excavators

Status: Northwest Forest Plan protection buffer species, Gifford Pinchot Forest Plan management indicator species, Washington State candidate species

The Gotchen Planning Area contains the most diverse array of woodpecker species and secondary cavity users known to occur on the Mt. Adams Ranger District. This is attributed to the mixing of the western and eastern plant zones. Woodpecker species that are documented to occur and breed within the Gotchen Planning Area include the Williamson's sapsucker, red-breasted sapsucker, hairy woodpecker, northern flicker, pileated woodpecker, black-backed woodpecker, three-toed woodpecker, white-headed woodpecker, and potentially, the red-napped sapsucker. The Lewis woodpecker, a Washington State candidate species, has not been observed in the area, although the species is known to occur east of the Gotchen Planning Area in dry ponderosa pine forest.

Information is summarized on foraging techniques and nest-site requirements by woodpecker species. Overall, the woodpecker species present in Gotchen Planning Area require a wide variety of forest stand conditions, often very divergent from each other.

A woodpecker survey conducted across the Gotchen Planning Area in 2002 found northern flicker, black-backed woodpecker, pileated woodpecker, hairy woodpecker, and Williamson's sapsucker to be the most frequently encountered species, in that order. Forest road 8020 was extremely rich in woodpecker activity and species diversity.

The most ubiquitous species encountered across the Gotchen Planning Area was the black-backed woodpecker, which is an irruptive woodpecker that focuses on landscapes with insect outbreaks. It feeds on wood-boring and bark beetles, which infest weakened (grand fir) trees for several years following (spruce budworm) insect outbreaks (Hadfield and Magelssen 2000). The black-backed woodpecker requires a much higher tree density than other woodpeckers (Dixon and Saab 2000). The northern flicker prefers edge habitat while the hairy woodpecker is found in both edge and interior forest habitats (Altman 2000). Williamson's sapsucker is at the western-most extent of its range within the Gotchen Planning Area. Williamson's sapsuckers often reuse the same nest tree for life, riddling it with up to 40 cavities (Ehrlich, et al. 1988).

Although white-headed woodpeckers are not a frequent occurrence (one regularly used nest site was found in East Timber Sale), silvicultural management of older ponderosa pine stands can provide greater habitat for this species on the eastside forest and potentially increase their numbers. The large response of pileated woodpeckers during the survey may be due to their strong territoriality to the playback calls of other woodpeckers. Breeding densities for all these species appear to be greater in larger [insect] outbreak areas where food resources are abundant than in those forests with no extensive disturbance (Bate, pers. comm. 2002). Because aspen stands are a great attraction for woodpeckers, their restoration will increase wildlife species diversity (Bate, pers. comm. 2002).

Research of various woodpecker species indicates a wide range of snag densities required to meet individual species needs. To determine the snag needs for the Gotchen Planning Area, a review of life-history data for the seven most common woodpecker species in the Gotchen Planning Area was used to determine snag retention guidelines (Table 3-12).

Table 3-12. Estimated snag requirements for multiple woodpeckers at 100% population level by snag diameter and decay class. Numbers of snags per 100 acres are shown in parentheses.

Table 3-12. Estimated Snag Requirements

Snag DBH (inches)	DECAY CLASS Total Snags by DBH		
	Hard 2-3	Soft 4-5	
≥15	RBSA (45) HAWO (91) BBWO (107)	WHWO (60) HAWO (91)	(394)
≥17	WISA (150) BBWO (150) TTWO (6)	NOFL (48)	(354)
≥25	PIWO (6)	- -	(6)
TOTAL	**(555)**	**(199)**	**(754)**

BBWO = black-backed woodpecker
HAWO = hairy woodpecker
NOFL = northern flicker
PIWO = pileated woodpecker
RBSA = red-breasted sapsucker
TTWO = three-toed woodpecker
WISA = Williamson's sapsucker

(Dixon and Saab 2000 for BBWO, Dobbs et al. 1997 for WISA species and Brown 1985 for all other woodpeckers).

This analysis estimates that retaining 754 existing snags per 100 acres, or 7.5 snags/acre, would provide a 100% population level for cavity excavators. This figure is based on the cumulative total to meet each species needs. For example the pileated woodpecker requires a minimum 0.6 large snags/acre, and the Williamson's sapsucker requires 1.5 large snags/acre. If these were the only two species present in the Gotchen Planning Area, then the snag retention need would be 2.1 snags per acre. Combining the snags needs of the seven Gotchen woodpecker species yielded a cumulative total of 7.5 snags/acre. The minimum standard for snag retention in Matrix is to provide the 40% population potential for snag dependent species (ROD, p. C-42) The objective for Gotchen Matrix lands, is to manage populations at a 40% level for all woodpeckers except the black-backed and white-headed, which are managed at 100%. Using the figure above, this calculates to 489 snags per 100 acres, or 4.9 snags/acres.

The *Conservation Strategies for Landbirds on the Eastslope* (Altman 2000) recommends managing the Gotchen Planning Area for the life-history requirements of the pileated woodpecker and Williamson's sapsucker, which would provide for most species; however the black-backed woodpecker requires extremely high densities of dead and dying trees in aggregate patches. The pileated woodpecker requires even larger snags and down wood than the Williamson's sapsucker.

A recurring theme occurs when describing habitat conditions for woodpeckers from research studies in the Pacific Northwest. The studies reach into the Sierra Mountains, Idaho, eastern and east-central Oregon. Research studies have not focused on insect outbreaks in the grand fir plant zone where the tree species is an important nesting and foraging substrate due to its soft wood for cavity-excavator species.

Dead and dying grand fir serves as an important foraging substrate and is repeatedly illustrated under their life histories. It is evident that pileated woodpeckers are foraging on small to medium diameter grand firs across the Gotchen landscape as are all other species of woodpecker. aspens, due to their susceptibility to heartrot, attract woodpeckers according to Lisa Bate (pers. comm. 2002). Although the Gotchen Planning Area has extremely limited patches of quaking aspen, restoration of this unique habitat component would provide for cavity users.

Providing a diverse mosaic of forest stand conditions in large contiguous areas, capable of supporting multiple home ranges across the landscape, shall increase the variety of woodpecker species over time and other wildlife species shall also benefit.

Providing habitat for woodpeckers would also serve secondary cavity users. Spotted owls, marten, northern flying squirrels, small mammals, and many bird species use cavities created by primary excavators. All these species use cavities for roosting and would also use cavities in live trees or dead portions of live trees.

Black-tailed Deer and Roosevelt Elk Winter Range

Status: Gifford Pinchot Forest Plan management indicator species

Typically deer and elk winter range includes lands up to 2,200 feet in elevation on south and west-facing aspects, up to 2,000 feet on east-facing aspects, and to 1,800 feet on north-facing aspects. This description overlaps with the southern part of the Gotchen Planning Area, mostly in Matrix lands. The Forest Plan Management Allocation for winter Range (code ES) occurs adjacent to the southwest boundary of the Gotchen Planning Area.

High-use areas frequented by deer and elk during winter occur in the vicinity of Forest Road 8020, including Big Tree and Hole-in-the-Ground, and east of Forest Road 82 (from 8200-170 on south). In particular, these areas are used during the spring thaw starting in March.

The area in the west portion of the Gotchen Planning Area (Forest Road 8031) is located within transitional range between winter and summer habitats and as such is heavily used during the spring and fall. Additionally, small wetlands in this area provide ideal conditions for fawning and calving.

Great blue heron (*Ardea herodias*)

Status: Gifford Pinchot Forest Plan protection buffer species

Two historic great blue heron rookeries lie within the Gotchen Planning Area, Grand (#3078) and Ground (#3036). The two rookeries are unusual in that they are in forested grand fir stands containing remnant old-growth ponderosa pine and Douglas-fir trees with mistletoe brooms. Herons at the Ground rookery have been seen as early as late March. They favor nesting in older trees with mistletoe brooms or very large branches. These types of tree structures make a sound base on which to build a nest. Nests are located at least 50 feet up in the tree towards the top of the tree canopies. The rookeries are three and four-and-a-half miles, respectively, northeast of Trout Lake marsh, the closest body of water.

Ground was originally located prior to 1976 and then “rediscovered” in 1994 during northern spotted owl surveys. It has been actively used since that time with multiple nests occupied in

two to three trees. However, rookery checks in the last two years found reduced use and a possible goshawk nest nearby. Based on past monitoring, it appears that in some years, rookery activity wanes and is not an immediate call for concern. The Ground rookery is 1500 feet away from the nearest Forest road and within a quiet forest stand.

District records exist for the Grand rookery dating to 1981. Monitoring checks at the Grand rookery are spotty and abandonment is assumed.

VEGETATION

Ecological Groupings

The Gotchen Planning Area is primarily covered by forests classified into common ecological groups that serve as a framework for understanding and communicating succession and disturbance. The following terms are used:

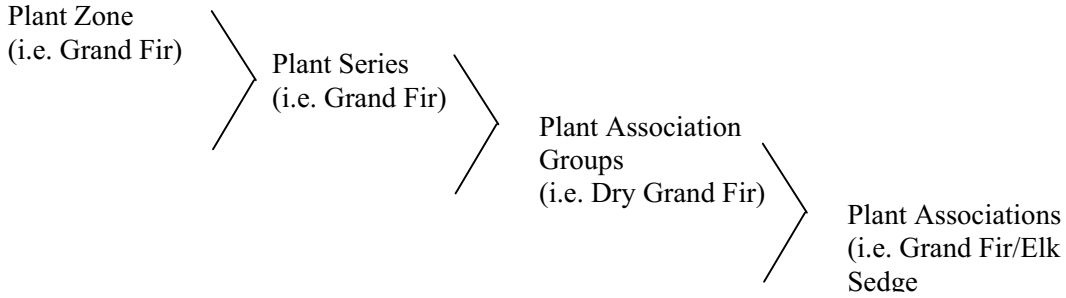
Plant Zones – Plant Zone describes the land-base on which a particular series dominates the landscape. Three plant zones, occupy the Gotchen Planning Area: the Grand Fir Zone, Mountain Hemlock Zone, and the Subalpine Zone (Gifford Pinchot National Forest Plant Association Handbooks). Nearly all of the Gotchen Planning Area lies within the Grand Fir Zone. All of the zones are capable of developing late-successional conditions (Hessburg et al. 1999). Within the Grand Fir Zone, most stands are described by Grand Fir Plant Associations, though riparian pockets may be described by Western Redcedar Plant Associations.

Plant Series – A plant series is the collection of all plant associations having the same descriptive tree species. The Grand Fir Series is inclusive of all plant associations where grand fir is the climax tree species.

Plant Association Groups (PAG) – Plant associations with minor differences are occasionally lumped into plant association groups. This is done to simplify the classification system yet retain its basic implications.

Plant Association – Plant associations are groupings of plant species, which re-occur on the landscape within particular environmental tolerances. A plant association is named for the successional endpoint community, and is defined by a climax tree species and a climax understory species (Franklin and Dyrness 1973). The overstory and understory species are identified as those that would dominate the site in the absence of disturbance, not because that is necessarily a desirable or even feasible ecological endpoint, but because a fairly predictable earlier successional sequence is implied by this classification (Agee 2001).

The following schematic depicts the hierarchy of these terms:



Grand Fir Zone

The Grand Fir Plant Associations are the driest plant associations on the Gifford Pinchot National Forest, though wetter and more productive than similarly described Grand Fir Plant Association of the east Cascades. Grand fir Plant Associations occur over most of the southern/middle portion of the area (90%), mostly at elevations below 4,500 feet on south-facing slopes. Dominant characteristics of the Grand Fir Zone are elevation-related temperature differences, the rain shadow effects of the Cascade Crest, and very low summer precipitation. In general, increasing elevation is associated with lower temperatures, more precipitation as snowfall, and higher precipitation levels. Summer drought begins early in the season, especially in the southern portion of the area and on southern slopes. Forests within the southern portion of the zone are usually dominated by Douglas-fir and include several other conifers, such as ponderosa pine, western larch, western white pine, and grand fir.

All of the activities proposed with this project are within the Grand Fir Zone.

Mountain Hemlock Zone

The upper elevation limits of the grand fir zone transition into the mountain hemlock zone where sufficient moisture and cool temperatures allow development of stands dominated by hemlocks, subalpine fir, Engelmann spruce, Pacific silver fir, lodgepole pine, and Douglas-fir at the lower margin, whitebark pine at the upper margin. The mountain hemlock zone in this area occurs typically above 4,500 feet and is characterized by cold sites with deep snow packs and a short growing season. In general, site productivity is low within this zone. It has the slowest growth rates of any plant zone on the Forest due to a short, cool growing season, and a deep, persistent snow pack. Tree size, especially height is considerably less than in other zones because of the harsh climate.

Subalpine Parklands Zone

This zone is transitional between the Mountain Hemlock Zone of continuous forest cover of the lower elevations and the treeless alpine zones at higher elevations. A mosaic of forest patches and intervening grass/forbs or shrub-dominated openings characterizes these areas. Clumps of low-growing trees and shrubs, known as krummholtz, are also characteristic. Species composition is similar to the upper portions of the mountain hemlock zone with subalpine fir, mountain hemlock, Alaska yellow cedar, whitebark pine and lodgepole pine. These forest stands are described by the Subapline Fir Plant Association (Topik 1989) and

have an estimated fire interval of 150 years or more (Agee 2001) or even 200-270 year (Evers, et al. 1997). The Salt Creek Fire occurred in 2001 in the same plant association, three miles to the west within Wilderness. The Salt Creek Fire covered 316 acres, and was of enough intensity to cause stand replacement on about 100 acres. The forest stands north of the Gotchen Planning Area are similar; an escaped wildfire would result in a substantial percentage of high severity, stand-replacing fire.

Non-Forest Zones

The Gotchen Planning Area contains approximately 14 acres of non-forest land (Refer to Map Packet – Map 10, Current Vegetation). These include talus slopes, rock outcrops, dry meadows and wet meadows. True dry meadows, resulting from edaphic conditions are scarce. There are some apparent dry meadows that have resulted from fire and heavy grazing at the end of the 19th century. Because of their relative scarcity and species richness, these features are often considered unique or special habitats. Despite being relatively small in total acreage, non-forest zones are the source for much of the overall biodiversity in the watershed. These features typically are slow to change through succession. Some were maintained by frequent disturbances, as in the case of dry meadows which were maintained by fire and grazing, as opposed to edaphic conditions. Consequently, the non-forested features were likely more abundance in historical times than the present.

Plant Association Groups (PAGs)

Dr. James Agee describes four PAGs for the Gotchen Planning Area (Douglas-fir PAG, Dry Grand Fir, Wet Grand Fir PAG, and Mountain Hemlock-Subalpine Fir PAG). All of the PAG descriptions are summarized from Dr. James Agee's working paper, 2001. They are included here to briefly characterize the likely fire histories in the Gotchen Planning Area, helping to formulate a picture of stand composition and structure in these zones.

The Douglas-fir PAG experienced frequent, low intensity fire return intervals, keeping the forest open and park-like, with wide-space, large cluster of trees and a carpet of low-shrub/herbaceous vegetation. Little tree understory or down wood existed in these stands. Ponderosa pine was the dominant tree. Western spruce budworm activity was largely absent due to lack of host species. Root diseases were limited in extent. This PAG is infrequent in the Gotchen Planning Area and may occur near the very southern National Forest boundary.

The Dry Grand Fir PAG experienced fire return intervals similar to the Douglas-fir PAG. Due to moister conditions, they might have had a slightly more patchy fire spread, or slightly longer fire return intervals, plus better growing sites for Douglas-fir and grand fir. A stump at Smith Butte within the Gotchen LSR had a fire return interval or 15 years. Evers, et al. (1997) indicates an average fire return interval of 10 – 22 years. The forests analyzed were likely fairly open, park-like stands, with clumps of mature trees. Mature sites were dominated by ponderosa pine. Spruce budworm activity was episodic.

The Wet Grand Fir PAG includes cooler, moister sites, typical of higher elevations. It can be distinguished from the drier sites due to the occurrence of lodgepole pine, western larch, and western white pine; ponderosa pine is uncommon. Fire is less common on these sites, and is commonly classified as moderate-severity fire regime, with a fire return interval between 70

– 200 years. In historic forests, this PAG had the most host material for western spruce budworm outbreaks. Root diseases were more common than in the drier types.

The Mountain Hemlock-Subalpine Fir PAG occurs in the higher elevations in the Cascades. The forests had a developed understory and downed logs. Fires burned infrequently and intensely with a return interval of 150+ years. Stand replacement fires were typical. Most fires would remain small or become quite large.

Historical Vegetation Conditions

The historical vegetation conditions for the Gotchen Planning Area have been pieced together from a number of sources, including inventory maps from 1899, 1926, and 1942; anecdotal descriptions from early Forest Rangers, land surveyors, homesteaders, and Indians studies. These sources provide a snapshot of vegetative conditions prior to timber removal that began in earnest in 1942.

Southern Gotchen Planning Area

Map Packet – Map 11, is a replication of a map made by Plummer (1899) of his initial reconnaissance of the Rainier Forest Reserve. Pine stands dominate the southern half of what we are now calling the Gotchen Planning Area. Wilcox (1909) described these stands:

> "The yellow [ponderosa] pine type of the Mt. Adams region is characterized by a very nearly clear stand of very large trees of prime quality… There is very little undergrowth in the yellow pine type except the yellow pine reproduction. The forest is very open and is covered with a good growth of pine grass, and blue bunch grass, so that the Mt. Adams regions furnishes some of the finest sheep range in the Northwest… The yellow pine extends to about 3000 feet elevation, and there is very little of it at a higher elevation than Gotchen Creek Ranger Station."

White (1923) made similar observations specific to the Gotchen Planning Area:

> "From Wicky Creek southward to the cultivated lands of the Trout Lake Valley, the timber is chiefly yellow pine… From Wicky Creek to Gotchen Creek the road [currently Forest Road 8040] winds through a heavy forest of yellow pine… South and east of Gotchen Creek Ranger Station is a large body of yellow pine timber, which would no doubt be in demand within a few years."

Map Packet – Map 12, depicts maps made by George Bright in 1926 and 1941. The mapping categories reflect the conifer species dominating the overstory and the relative age of the stand (mature, immature).

This mapping effort is much more detailed than Plummer's earlier mapping in 1899 and is supplemented with volume estimates by conifer species for each 40 acre, quarter/quarter section.

Bright's map reinforces the findings of Plummer regarding the large area of large size ponderosa pine in the southern half of the Gotchen Planning Area. Moreover, the volumes/species lists indicate these stands have had multiple age classes of ponderosa pine; timber volumes are noted for old growth, mature, and immature trees. Douglas-fir is the next prominent species (5 – 10 mbf/ac), followed by low densities of western larch (1 – 2 mbf/ac)

and grand fir (1 mbf/ac). Such stands would appear to be clumpy in places and open in other areas with ample resources for grasses to flourish as noted by Wilcox (1909).

The descriptions of these stands are consistent with Dry Grand fir Plant Association Groups (Agee 2001). Grand fir is present in very low numbers. Repeated low intensity fires left grand fir as a minor stand species while promoting the dominance of ponderosa pine.

Figure 3-1. Clumps of Ponderosa Pines in 1942.

Northern Gotchen Planning Area

North of Gotchen Creek Guard Station, Plummer mapped the forest stands as a mix of mature forest and burns, Map Packet – Map 11. A greater mix of species occupied these stands, owing to a climate of greater moisture yet colder winters. Wilcox (1909) found that, "Above the yellow pine the lodgepole pine, a few Douglas-fir, white fir (grand fir and subalpine fir), and tamarack (western larch) are found."

Bright's (1942) volume tables for the northern Gotchen Planning Area, the north slope of Smith Butte, and upper slopes of King Mountain list ponderosa pine and nearly equal amounts of Douglas-fir. Grand fir is a much larger component of these stands; Engelmann spruce, lodgepole pine, and western larch are also present. Stand volumes are quite low for the areas Plummer mapped as burns. This mix of species is indicative of Wet Grand Fir Plant Association Groups (Agee 2001) transitioning north to Subalpine Fir Plant Associations.

Bright mapped lodgepole pine dominating the area northeast of Smith Butte, and no timber volume or other species are recorded

Historic Insects and Disease Conditions

Bright's volume tables and anecdotal descriptions of ponderosa pine-dominated stands throughout the southern half of the Gotchen Planning Area suggest tree stocking was less than the site capacity for "full stocking" (Cochran, et al. 1994). This suggests individual trees, on average, would have been rather vigorous and less susceptible to mountain and western pine beetle. Probability for spruce budworm activity would have been low given the low volume, and likely low density of host species.

Grand fir, Douglas-fir, Engelmann spruce, and western larch, all host species for spruce budworm, were present in larger numbers in the northern half of the Gotchen Planning Area and on moister sites elsewhere. Certainly the indigenous insects and diseases that are present today were present then, but there are no indications or records of epidemic insect outbreaks in the Gotchen Planning Area.

Historic Composition and Structure

In general, presettlement patch sizes in vegetation communities were quite variable, but large patches tended to dominate the landscape. The large patches could have been early, middle or late successional forest, dictated by the pattern of fire frequency and intensity. Older stands in the Grand Fir Forest Zone would have widely spaced large trees, with a greater proportion of the trees comprised of early seral species such as ponderosa pine and Douglas-fir. Vegetative descriptions by Fred Plummer in 1900 match these expectations: Plummer describes the timber as being 75% ponderosa pine on lands that lie within the grand fir zone. Current stand ages and species composition support this description.

Timber Harvest

Timber harvesting was first done by settlers to clear land and provide timber for building materials. Prior to 1950, most timber harvesting on National Forest land consisted of partial cutting and salvage logging. The first commercial timber operation occurred in 1900 in the Trout Lake area. Timber harvest began in earnest in 1942. Rail lines were constructed up from the Glenwood Valley to facilitate the partial cutting of nearly all of the ponderosa pine dominated stands south of the Creek Guard station. The timber purchaser was allowed to remove 50% of the merchantable ponderosa pine. Associated with the partial cut harvests was the creation of dispersed skidding trail networks. This activity most likely increased the incidence and severity of the diseases within the area.

From the 1960's through the 1990's, clearcut harvesting and conifer reforestation was practiced to meet a variety of objectives. A major thinning effort occurred in the 1980's, in much of the same area that was partial cut earlier in the century, again removing ponderosa pine and Douglas-fir. Regeneration harvest with mature tree retention of various levels was started in the early 1990's. The intent of the leave trees and patches is to enable the plantations to achieve late-successional habitat conditions more quickly than in clearcuts where all of the trees are removed.

The most recent timber harvests (Joker Salvage and East Timber Sales) occurred in the late 1990's using a variety of cutting methods to harvest trees dying from insects and disease.

Current Vegetation Condition

The current vegetative descriptions for the Gotchen Planning Area have been developed from a variety of sources, including stand exams, surveys, and personnel knowledge. In addition, the current vegetation within the Gotchen Planning Area was mapped and characterized at the mid scale (1:12,000) by using photo-interpretation methods and vegetation classifications developed in the Interior Columbia Basin Ecosystem Management Project (ICBEMP) (Hessburg et al. 1996). Vegetation patches (polygons) resulting from photo interpretation were populated with both interpreted and stand data. Structural classes are based on the stand development phases identified by Oliver and Larsen (1990) and modified by O'Hara, et al. (1996). Forest and non-forest zones, insects and disease, current vegetative structures, and unique habitats are discussed.

Insects and Disease

Insects and disease are natural part of the ecosystem and are influencing the forest composition and structure within the Gotchen Planning Area. With the absence of fire and the removal of large diameter pine, the density of grand fir and Douglas-fir has increased in the eastern portion of the watershed. With this condition, insects and disease have become a more visible disturbance agent. The primary insects and diseases affecting the area western spruce budworm, laminated root disease, Annosus root disease, Armillaria root disease, and bark beetles.

Western Spruce Budworm

Western spruce budworm (*Choristoneura occidentalis*) defoliates a variety of conifer species but mainly grand fir, Douglas-fir, western larch, and Engelmann spruce. The greatest risk to budworm defoliation occurs in the Grand Fir Zone where fire suppression and increasing stand density have resulted in the predominance of host species with low vigor. Aerial observers first mapped the current outbreak of western spruce budworm within the Gotchen Planning Area during 1994. Yakama Indian Reservation lands on the eastern boundary, interspersed with private industrial forestlands, and Washington Department of Natural Resources lands, have also been affected with the budworm. Population sampling of larvae and male moths was initiated in 1999 subsequent to a marked increase in defoliation extent and severity in the Gotchen Planning Area during 1998. From 1999 to 2000, larval densities declined in the eastern portion of the Gotchen Planning Area, but increased in the western portion. Currently, the overall trend of the budworm larval population, within the Gotchen Planning Area, is downward; however, isolated parcels of elevated budworm levels still persist in 2002.

Damage to the conifers from the budworm and subsequent attacks from the fir engraver and Douglas-fir bark beetle are varied within the Gotchen Planning Area. Overall, the most damage to the conifers is within the Late Successional Reserve land allocation. Surveys taken within the Gotchen LSR revealed that nearly every host tree sampled had evidence of some level of defoliation. The level of western spruce budworm defoliation is usually correlated with the longevity of the outbreak and the tree species composition. The most severely impacted areas are located on the south and west sides of Smith Butte. These stands are comprised almost exclusively of grand fir, often 80% or more of the composition (Tilton,

1998). The budworm defoliation has been continuing in these areas since the outbreak first started in 1994.

Other insects and disease are present in these areas including dwarf mistletoe, cytospora canker, Armillaria root disease, and fir engraver bark beetles. The highest severity level to the conifer vegetation occurs when the budworm defoliation is combined with the other diseases and insects. Areas with multiple pathogens present correspond with a "heavy" intensity rating for spruce budworm defoliation.

Table 3-13. Acres of Western Spruce Budworm Defoliation within the Gotchen Planning Area.

Intensity Levels	1994	1995	1996	1997	1998[1]	1999	2000	2001
Low[2]	2,933	12,334	6,228	3,769	17,058	2,973	3,163	4,123
Moderate[2]	0	0	391	2,144	195	933	4,130	5,572
Heavy[2]	0	0	0	0	0	7,702	8,095	348
Total	2,933	12,334	6,619	5,913	17,253	11,608	15,388	10,043

[1] Actual extent and intensity was less than indicated here, according to ground information.
[2] Aerial survey-mapping codes for budworm defoliation intensity

Timber stands with the least impact from the budworm are those with a lower composition of grand fir. These stands meet the criteria for the aerial survey mapping code of "low" intensity rating in Table 3-13. A portion of these stands that meet this definition are along the eastern boundary of the LSR where the area consists of a mixture of grand fir with lodgepole pine due to the cold environment. Timber stands at the lowest elevations along the southern boundary of the National Forest contain a greater abundance of ponderosa pine and Douglas-fir and are also classified as low intensity. (A few years of moderate to heavy defoliation were recorded in some areas immediately adjacent to the southern boundary of the eastern half of the Gotchen LSR.) Defoliation levels are less severe (low intensity) where the timber stands transition between the grand fir zone and the mountain hemlock zone to the North. Map Packet – Map 3, Spruce Budworm Defoliation 1994 to 2000, depicts the areas defoliated by spruce budworm.

Bark Beetles

Various species of bark beetles, within the Gotchen Planning Area, have affected different tree species in stands weakened by overstocking or root disease, particularly during a prolonged drought period. Bark beetles that are present in the watershed include the Douglas-fir beetle (*Dendroctonus pseudotsuqae*), fir engraver (*Scolytus ventralis*), and mountain pine beetle (*Dendroctonus ponderosae*), and western pine beetle (*Dendroctonus brevicomis*). The resultant mortality frequently causes small gaps with high levels of snags and downed logs.

Douglas-fir Beetle: The Douglas-fir beetle is currently at a low, endemic level on National Forest System Lands within the Gotchen Planning Area. The beetle infests and kills scattered trees of Douglas-fir, including windfalls and trees injured by fire scorch, defoliation or root disease.

Fir Engraver: The level of mortality caused by the fir engraver within the Gotchen Planning Area is low-moderate and primarily associated with root rot pockets and moderate/heavy

intensity rated budworm areas. Continued mortality from the fir engraver and the Douglas-fir beetle would continue due to the abundance of weaken host species within the area.

Mountain Pine Beetle: The mountain pine beetle attacks lodgepole pine, ponderosa pine, and western white pine. Within the Gotchen Planning Area, lodgepole pine is of the most concern. Lodgepole dominated stands are very abundant to the north and east of Smith Butte on approximately 500 acres. Portions of this area currently have stand characteristics that suggest these acres are at risk from a mountain pine beetle attack. High-risk lodgepole pine stands have an average age of more than 80, an average diameter at breast height of more than 8 inches, and a suitable climate for beetle development based on elevation and latitude (USDA-Forest Service FID Leaflet 2). Stand exams have revealed that these stands meet the above requirements, are overstocked, and approaching biological culmination.

Western Pine Beetle: The western pine beetle is currently causing mortality to older ponderosa pine trees weaken by the stress from inter-tree competition. Several large, mature pine trees have succumbed to the western pine beetle over the last 10 years. Factors that have weakened the pines include old age combined with drought and high densities of surrounding fir trees.

Root diseases

Laminated root rot (*Phellinus weirii*), annosus root disease (*Heterobasidium annosum*), and Armillaria (*Armillaria ostoyae*) are found throughout the Gotchen Planning Area. Their incidence and impacts have increased in recent decades due to past management practices that have favored the disease, and changes in stand composition that have increased the numbers of susceptible hosts. Past entries into many of the timber stands within the Gotchen Planning Area has exacerbated and spread the pathogens, especially annosus root rot and Armillaria.

Laminated Root Disease: Laminated root rot is caused by the native fungus, *Phellinus weirii* (Murr.) Gilb. The pathogen is most destructive where Douglas-fir and grand fir are important components in mixed conifer types. Trees of all sizes and ages are attacked. Persistence from one rotation to the next and the gradual spread of the fungus can maintain the disease on the site indefinitely. The most susceptible hosts are Pacific silver fir, grand fir, Douglas-fir, and mountain hemlock. Other species, such as ponderosa pine, western larch, and cedar have some resistance to the fungus. Hardwoods are not infected.

Most infection centers in young stands begin when roots grow out and contact the fungus surviving in decaying wood from infected trees of past generations. The infection is spread when roots of other trees contact these infected roots. The rate of spread through a stand in this manner is estimated at about one foot per year. As the decay progresses, the wood tends to separate (laminate) along the annual rings, thus, the common name, laminated root rot. Aside from the history of infection, damage does not seem to be associated with any specific stand history.

Direct, effective control measures are largely untested or unknown. Management of disease areas involves changes in normal silvicultural procedures. A timber sale contract specification should be used when cutting in areas of laminated root rot to “scribe” the infected stumps for future identification when reforesting the area. Only conifer species that

have some resistance to the disease should be planted within fifty feet of the boundary of infection centers/ “scribed stumps.”

Annosus Root Disease: Annosus root disease is a normal part of most forest ecosystems in the western portion of the United States. The disease contributes to the structural and compositional diversity of forest stands by causing root decay, root mortality, reduced tree vigor, windthrow, predisposition to bark beetles, and outright mortality. Currently, various resource values, in particular wildlife habitat, are compromised by high levels of annosus within portions of the Gotchen Planning Area. Incidence and severity of annosus varies by stand type and management history. Generally, stands having a history of logging related disturbance are most severely affected. Stands that were partially cut, especially those with multiple removals have the highest level of annosus.

The Gotchen Planning Area contains two different groups of *H. annosum*. These two biological species have distinct host preferences. The P-group infects pines and the S-group infects grand fir and Douglas-fir. The fungus very rarely spreads between host species of these two groups. However, saprophytic stump colonization can involve either strain. Thus P-strain annosus may colonize grand fir stumps, but the disease would not develop in pines or firs surrounding these stumps.

Two kinds of spread are important in the life cycle of *H. annosum*: local, underground tree-to tree spread within a center and long distance, aerial spread that establishes new centers. Most local spread involves underground contact between an infected root and a healthy root. Past management practices of fire suppression have produced denser forests and has encouraged the underground root-to-root contacts. Past timber management activities, within the Gotchen Planning Area since the 1940’s have spread the fungus sporidia by producing freshly cut surfaces (stumps). The root disease would persist for several decades in the root systems of trees after they die or are harvested. By this means, the fungus spreads from tree to tree, creating an enlarging disease center in the stand. Long distance spread occurs when airborne sporidia produced from *H. annosum* conks disperse and infect freshly cut stump surfaces or woody tissues at wounds. .

Several prevention and control methods are available to reduce the spread of this disease. When partial cutting practices are implemented within an area that would be managed in the future for grand fir, care needs to be taken to minimize both the wounding of the residual grand fir and site disturbance. Treating freshly cut stump surfaces with a light coating of granular sodium tetraborate decahydrate or disodium octaborate tetrahydrate can largely prevent stump infection by *H. annosum*. Properly treated stumps are protected at an efficacy level of at least 90 percent from colonization by airborne spores of *H. annosum.* Stump treatment with these products is current recommended for those forested sites with known annosus root disease, especially where true firs (grand fir) would be managed in the future.

Armillaria Root Disease: Armillaria is caused by fungi, which live as parasites on living host tissue or as saprophytes on dead wood. These fungi are natural components of the forests. As parasites, the fungi cause mortality, wood decay, and growth reduction. They impact and kill trees that have been already weakened by competition, other pests, or climatic factors. The fungi also infect healthy trees, either killing them outright or predisposing them to attacks by other fungi or insects. Trees of different species and sizes may be killed individually throughout the stands and primarily affects ponderosa pine and grand fir.

Armillaria kills conifers in a pattern of progressively expanding disease centers. These centers develop in managed or unmanaged stands and vary from small areas affecting several trees to areas up to 1,000 acres. One or all species and sizes of conifers may be affected and in varying stages of decline.

Armillaria may live for decades in dead wood. From this food source, the fungi spread to living host trees. Spread occurs when rhizomorphs, growing through the soil, contact uninfected roots or when uninfected roots contact infected ones. Vigorously growing trees often confine the fungi to localized lesions and limit their spread in the roots by secreting resin and rapidly forming callus tissues. But when infected trees are in a weakened condition, Armillaria spreads rapidly through the roots. If the growth of the tree improves, fungal growth is checked. Such interaction occurs throughout the life of an infected host tree until (1) it outgrows the fungi or (2) the fungi reach the root collar, girdle the stem, and kill the tree. When infected live trees are cut, Armillaria rapidly spreads into the uncolonized parts of the roots and stump. As a result, the food source increases and may be responsible for initiating new disease centers.

Because these fungi are indigenous to many areas and live on a wide variety of plants and down wood, their eradication or complete exclusion is not feasible. However, management practices can be directed toward limiting the disease buildup or reducing its impact. Management considerations include (1) reforesting the sites with a mixture of species ecologically suited to the site and not obviously infected by Armillaria; (2) maintaining vigorous tree growth without causing undue damage to the soils; and (3) minimizing the stress to and wounding of the crop trees.

Structure Classes

Stand structure is the physical and temporal distribution of trees within a stand. Stand structures provide the reader with a basic description of the various timber stands within the Gotchen Planning Area, and when utilized with stand dynamics (changes within a stand over time), future stand structures and development patterns can be predicted.

Structure classes within the Gotchen Planning Area and associated acreages were based on the stand development phases identified by Oliver and Larsen (1990) and modified by O'Hara et al. (1996). These structural classes were mapped and characterized at the mid scale (1:12,000) by the Wenatchee Forest Sciences Lab, using photo-interpretation methods and vegetation classifications developed in the Interior Columbia Basin Ecosystem Management Project (ICBEMP) (Hessburg et al. 1996). The Portland Forestry Sciences Lab (PFSL) further refined the WFSL vegetation database by assigning actual timber stand exam data and forest inventory plot data into the WFSL polygons (Hummel 2001). The PFSL/Hummel's data was the main database used in the vegetation effects analysis.

The seven structural classes are briefly described below. The respective acreages are shown in Table 3-14 Illustrations of the seven classes are depicted in Map Packet -- Figures 1-7. Acres were queried from the WFSL database that was modified by Hummel's work.

- Stand Initiation Structural Stage - One canopy stratum (may be broken or continuous); one cohort of seedlings or saplings; grass, forbs, and shrubs may also be present.

- Stem Exclusion Open Canopy Structural Stage – One broken canopy stratum which includes poles or smaller trees; grasses, shrubs, or forbs may also be present.
- Stem Exclusion Closed Canopy Structural Stage – Continuous closed canopy, usually on cohort; poles, small or medium trees present. Suppressed trees, grasses, shrubs, and forbs may be absent in some cover types.
- Young Forest Multistory Structural Stage – Multi-aged (multi-cohort) stands with assortment of tree sizes and canopy strata present but very large trees absent. Grasses, forbs, and shrubs may be present.
- Understory Reinitiation Structural Stage - Broken overstory canopy with formation of understory stratum and two or more cohorts. Overstory may be poles or large trees; understory is seedlings, saplings, grasses, forbs, or shrubs. (Considered to be late-successional/ old growth forest in this analysis).
- Old Forest Multistory Structural Stage – Multi-aged stands with assortment of tree sizes and canopy strata present including large, old trees. Grasses, forbs, and shrubs may be present. (Considered to be late-successional/ old growth forest in this analysis).
- Old Forest Single Story Structural Stage – Broken or continuous canopy of medium to large, old trees. Single or multi-cohort. Understory absent or consisting of some seedlings, saplings, grasses, forbs, or shrubs. (Considered to be late-successional/ old growth forest in this analysis).

Table 3-14. Current WFSL (modified) Structural Classes.

Structure Class	Land Allocation				Total (acres)	Percent
	LSR (acres)	%	Matrix (acres)	%		
Stand Initiation	800	5%	830	18%	1,630	8%
Stem Exclusion Open Canopy	4,892	32%	169	4%	5,061	26%
Stem Exclusion Closed Canopy	4,087	27%	102	2%	4,189	21%
Young Forest Multistory	649	4%	1,018	23%	1,667	8%
Understory Reinitation*	3,382	23%	1,965	43%	5,347	27%
Old Forest Single Story*	0	0	115	3%	115	1%
Old Forest Multistory*	1,349	9%	322	7%	1,671	9%
Non Forest	14	—	0	—	14	—
Total	**15,173**	**100%**	**4,521**	**100%**	**19,694**	**100%**

*Denotes Late Successional and Old Growth Forest (LSOG)

Late Successional and Old Growth Forests (LSOG)

For this analysis, late-successional and old-growth forests are considered to be the 1,786 acres defined as old forest multistory and old forest single story stand structures, and the

5,347 acres of understory reinitiation (Table 3-13). This equates to a total of 7,133 acres of late-successional and old-growth forest in the Gotchen Planning Area.

Current Composition and Structure

Structure and composition of forested stands within the Gotchen Planning Area are closely correlated with the successional stage (early, mid, or late) and forest zone in which they occur. Within the grand fir zone late-successional forests, species composition is almost exclusively Douglas-fir and grand fir, mostly 80 – 100 years of age. These stands may have remnant old-growth ponderosa pine (typically 150 – 400 years old), western larch, or Douglas-fir that were not selectively logged in the 1950's or earlier. Understories are comprised of young conifer regeneration in skid trails or other areas of disturbance. The origin of the main cohort (age class) of Douglas-fir and grand fir can be traced back to around 1910 as a result of the initiation of active fire suppression.

Natural fire occurrence in the mountain hemlock zone, though less common than the grand fir zone, leads to a mosaic pattern and structural diversity within stands. Late-successional forests contain a variety of species and well-developed vertical canopy structure. The overstory tends to have more old-growth trees commonly 200 – 300 years old. Gaps have formed in the canopy, with small areas of conifer regeneration and other early-successional vegetation present. Species present in high abundance include western hemlock, Pacific silver fir, mountain hemlock, Douglas-fir and noble fir. Minor species include western white pine, western red cedar, lodgepole pine, Engelmann spruce, subalpine fir, whitebark pine, black cottonwood, and quaking aspen.

With the aggressive suppression of fires, early-successional forests today owe their existence largely to clearcut timber harvests. Species diversity within these stands largely reflects their forest zone. High numbers of snags and downed logs, which would have been present historically in early-successional stands, are missing. These stands today advance more quickly into the mid-successional stage of closed canopy, pole sized trees.

Ecological Range Of Forest Conditions

The composition and structure of forest within the Gotchen Planning Area at the turn of the century represent conditions where the influence of European settlement is nearly absent. It is merely a snapshot in time; forested landscapes are in constant state of change due to growth and disturbances. The conditions at the turn of the century do not necessarily represent the "ideal" condition. Two analyses have been conducted to determine the range of conditions that may have occurred in the early 20th Century (Agee 2001 and Hessberg, et al. 2001).

Historic Ranges of Variability for the Gotchen LSR/Matrix

Agee's working paper on the Gotchen LSR (Agee 2001) provides a simplistic evaluation of the range of successional conditions in pre-settlement landscapes. Seven structural classes were identified and utilized for each plant association group. Although Agee's paper focused on the LSR portion of the Gotchen Planning Area, he did discuss the Dry Douglas-fir PAG, which includes the matrix portion of the Gotchen Planning Area.

By utilizing various models, Agee was able to create a historical range of structural stages from low elevation, low-severity fire regimes of ponderosa pine to the high-elevation, high-severity fire regimes of subalpine forests Table 3-15 illustrates Agee's Ranges of Variability of Historic Structural Classes by Plant Association Group (PAG) for the central eastern Cascades of Washington. Some of the later structural stages could not be separated so the percentage shown is for multiple structure stages. The PAGs in Table 3-15 are found within the LSR and matrix area of the Gotchen Planning Area.

Table 3-15. Percent Area of Historic Structural Classes by Plant Association Group.

Plant Association Group	Grass-Forbs	Shrub-Seedling	Sapling-Pole	Small Tree	Medium Tree	Large Tree	Late Successional
Dry Douglas-fir	.012-0.25	.03-.075	.087-.125	.188-.275	.325-.35	.15-.35	Not Present
Dry Grand Fir	.012	.025-.03	.076-.087	.163-.188	.2-.325	.35-.525	Not Present
Wet Grand Fir_	.005-.013	.02-.038	.038-.125	.138-.188	.15-.2	.438-.638	Not Present
Wet Grand Fir_	.025-.063	.1-.172	.157-.284	.303-.374	.1-.189	.08-.156	
Dry Subalpine Fir	.049-.095	.09-.235	.114-.192	.218-.294	.203-.523		

_ Dry portion of type (approximately 1/3)
_ Wet portion of type (approximately 2/3)

Agee's late-successional definition includes only multi-storied stands. Interesting to note, that late successional stands were not historically present within the Dry Douglas-fir PAG, or the Dry Grand Fir PAG, or the dry portion of the Wet Grand Fir PAG (approximately 1/3). However, "Large tree" stands, single story, were historically present within all the PAGs. Thus, "late successional" stands were more likely in the cooler and wetter types of the Gotchen Planning Area. The author also notes that the proportion data were developed from a much larger landscape, so that it is likely that more local variability was historically present due to large, local fires in the Gotchen LSR.

Departure Analysis

The Forest Service Pacific Northwest Research Station, Wenatchee Forest Sciences Laboratory (WFSL) conducted a more sophisticated assessment of historical conditions. The methodology was pioneered in the Interior Columbia Basin Ecosystem Management Project and documented by Hessberg, et. al. (1999). Informally termed "Departure Analysis" the historical vegetative conditions were determined for sample watersheds within a larger ecological unit (Ecological Subregion 4, see Map Packet – Map 14). Current conditions in the Gotchen Planning Area were similarly assessed, then compared to the historical range to determine what elements of the current landscape depart from historical samples. Departure analysis considered various stand conditions (e.g. cover type, structure, crown closure, canopy layers) and the spatial arrangement of stands (percent area, patch density, and mean patch size). Table 3-16 illustrates the departure of current conditions of the Gotchen Planning Area (LSR and Matrix) from the reference variation (RV) of Ecological Subregion 4, as

displayed in the *Departure Analysis Gotchen LSR, Gifford Pinchot National,* (Hessberg, et al. 1999).

The Gotchen departure analysis in its entirety is included in the Project File.

Table 3-16. Comparison of current area and connectivity conditions in Gotchen LSR and Matrix with Natural Range of Variability (NRV) estimates of sampled subwatersheds, east side of the Cascade Range, WA.

Structure classes	Percent Area (%)			Patch Density (n/10,000ac)			Mean Patch Size (ac)		
	Current	Minimum	Maximum	Current	Minimum	Maximum	Current	Minimum	Maximum
Stand Initiation	9.9	0.5	16.2	**192.0**	7.0	64.0	**31.6**	41.3	229.6
Stem Exclusion-open canopy	**4.4**	4.6	15.2	49.0	19.0	103.0	**53.8**	80.4	237.5
Stem Exclusion-closed canopy	5.8	1.1	26.3	56.0	7.0	56.0	63.1	40.4	469.5
Understory Reinitiation	**68.6**	6.9	41.4	44.0	14.0	69.0	**967.6**	126.4	610.0
Young Forest- Multi-Story	7.4	5.9	32.8	**111.0**	37.0	98.0	**40.4**	81.7	241.2
Old Forest Multi-Story	3.4	0	19.6	24.0	0	37.0	83.1	0	887.1
Old Forest Single Story	0.6	0	10.9	9.0	0	27.0	37.9	0	531.8

The values in **bold** are outside of the estimated natural range of variation (which is nominally the sample median 80-percent range). These variables are described below; however, PFSL/Hummel's work, based on later stand data collection and analysis, revealed more of a vegetation understory component than what was originally estimated from the WFSL photo interpretation. Thus, for the percent area structure class analysis in Chapter 4, the current percent area as shown in Table 3-14 will be used instead of the current percent area as shown in Table 3-16. For patch density and mean patch size analysis purposes, only the stand initiation, old forest multi-story, and old forest single story figures (the shaded values from Table 3-16) will be referenced in the vegetation analysis in Chapter 4.

- The current patch size of the **stand initiation** structure has decreased and the patch density has increased.
- The current total area of the **stem exclusion - open canopy** structure and patch size has decreased.
- The current total area of the **understory reinitiation** structural stage and the average size of individual "patches" have increased. (Note: Hummel's work, based on stand data, shows a lot of these acres to be young forest multistory and stem exclusion-closed canopy.)
- The current total percent area, and average patch size of the **young forest multi-story** have decreased.

- The current total area of the **old forest multi-story** structure is low and the current patches are larger and more clumped than in the past.

Overall, patch sizes, except for **understory reinitiation**, associated with past timber harvest tend to be smaller and more dispersed than those in pre-settlement conditions. Presently, a large range of patch sizes still exists, but a high frequency of small patches (less than 40 acres) tend to dominate the landscape.

BOTANY

Sensitive Plant Species

Sensitive species surveys were completed in all proposed Gotchen units, except Unit R. This unit consists of two young plantations of a total of 38 acres that are proposed for thinning and underburning. These plantations are to be surveyed in July 2003. Any Sensitive species found would be given appropriate protection.

Pale blue-eyed grass Sisyrinchium sarmentosum

Pale blue-eyed grass *Sisyrinchium sarmentosum* (*Sisyrinchium)*, is the only Sensitive species recorded within the Gotchen Planning Area. This record refers to a single site in the northeast portion of The Gotchen Planning Area found in 1987. District personnel have not been able to relocate this population since that sighting. This species is endemic to south-central Washington and adjacent Oregon, and typically occurs in moist to dry meadows, swales and small openings in coniferous forests. This habitat is not abundant in the Gotchen Planning Area, but occurs sporadically across the area, mostly in the form of small openings. There is potential habitat for this species throughout the Gotchen Planning Area, in seasonally damp meadows. This species depends on natural meadow habitat that has been maintained, historically, by the frequent low intensity fires that characterize the natural fire regime of this area. Due to fire suppression during the last century or more, shrubs and conifers have encroached upon these meadow habitats, reducing the amount and quality of habitat for meadow dependent species, including *Sisyrinchium*. Meadow encroachment is one of the primary threats to this species.

Grazing constitutes another primary threat to this species, throughout its range. By causing the removal of flower heads before seed set, grazing decreases opportunities for sexual reproduction by plants, leading to reduced genetic diversity, which poses a long term threat to population viability. In addition, grazing causes ground disturbance that can harm or kill existing plants and create opportunities for the introduction of non-native species and noxious weeds to native meadow habitats that host *Sisyrinchium*. Grazing animals may act as weed seed transporters and vectors; livestock that graze in weed infested areas, or consume hay containing weed seeds, may either carry weed seeds clinging to their fur, or may deposit them in manure, into previously uninfested areas. The area in the vicinity of the known site of *Sisyrinchium* experiences a varying level of grazing. The population of the known site is located inside a fenced area that excludes cattle access to a spring, and is therefore not grazed. The area surrounding the fenced site is fairly heavily grazed and impacted by cattle.

Noxious weeds and other invasive species are another primary threat to native plants, particularly rare species like *Sisyrinchium sarmentosum*, by out-competing native species for space, water and sunlight, creating weedy monocultures that may permanently exclude native plants.

Sensitive species surveys in the Gotchen Planning Area did not locate this species. The historic site for *Sisyrinchium* was searched on two occasions but failed to locate the population. This site supposedly lies within a fenced cattle exclosure that surrounds a spring. The area surrounding the spring is heavily used by cattle to such a degree that it may preclude the occurrence of *Sisyrinchium* in the area outside the fence. Some of the water at the spring is diverted into a pipeline that connects to water troughs away from the spring. This system is maintained by the allotment permittee. At the time that this diversion was observed, it did not appear to substantially impact *Sisyrinchium* potential habitat in the local area.

Decommissioning has been proposed for road 8225-791 that passes through the open area adjacent to the Sisyrinchium site. Presently, this road appears to be nearly abandoned, and is only occasionally used, primarily by the permit holder and District range personnel. Decommissioning of the road would ensure that access to the Sisyrinchium site would be limited, and would preclude further development or increased human use in the area. Cattle use would be expected to remain the same as current levels.

Based on the historic record for *Sisyrinchium* at the spring site, all similar habitats in the Gotchen Planning Area consisting of small herbaceous dominated meadows and forest openings must be considered potential habitat. Of these potential habitats the meadows around Gotchen Creek Guard Station are the most prominent. Surveys conducted in this area, as well as in numerous smaller sites across the Gotchen Planning Area, did not locate this species.

Other Sensitive Species

Fifteen other Sensitive species were categorized as “suspected” to occur in the Gotchen Planning Area, based on their distributional ranges, proximity of known sites, and the presence of potential habitat in the Gotchen Planning Area. These species are summarized below in Table 3-17

Mountain ladyslipper *Cypripedium montanum* is reported from a single, and poorly documented sighting from 1992. The vicinity of this sighting was surveyed on three occasions over the period from 1999 to 2001 without finding this species, nor was it found anywhere else in the Gotchen Planning Area, even though similar habitat is abundant and widespread. The location and existence of *Cypripedium montanum* remains uncertain. No mitigation is prescribed at this time.

Sensitive species surveys conducted in the Gotchen Planning Area did not locate any of the species listed in Table 3-17. Based on this finding, habitat in the Gotchen Planning Area was considered unsuitable.

Table 3-17. Region Six Sensitive plants species surveyed for but not found in Gotchen planning area.

Sensitive Species Name	General Description of Potential Habitat
Agoseris elata tall agoseris	Dry meadows and open woods, in herbaceous dominated communities, low elevations to timberline; historic site reported in Klickitat county.
Calochortus longebarbatus var. longebarbatus long-bearded sego lily	In vernally moist meadows and grassy openings in ponderosa pine, lodgepole pine and Douglas-fir forests; known sites occur off the Forest in Klickitat county.
Carex densa dense sedge	Verified sightings of this species occur on eroding hummocks in intertidal marshland. However, there is a high elevation historic record for the species at a shaded spring on Mt. Adams by William Suksdorf in 1904. The species not been recorded from the area since. As unusual as this habitat and location of this record appears, it does warrant attention.
Chrysolepis chrysophylla golden chinquapin	Dry open sites, clearcuts to fairly thick coniferous forests of grand fir and Douglas-fir; known from Little White Salmon River watershed.
Cimicifuga elata Tall bugbane	Moist shady coniferous forest of western hemlock, Douglas-fir and western red cedar, mostly of western Cascades, but local sighting in Trout Lake Creek warranted placement on prefield list.
Cypripedium fasciculatum clustered ladyslipper	Moist to rather dry sites, typically with thin or rocky soils in open forests of Douglas-fir, grand fir or ponderosa pine, known from Little White Salmon River
Heuchera grossulariifolia var. tenuifolia gooseberry leaved alumroot	Basalt cliffs and steep slopes in ponderosa pine; known sites lower in White Salmon River watershed.
Liparis looselii twayblade	Around springs, in bogs and wet sunny places, in Douglas-fir dominated forests; known site in Klickitat county east of the Forest.
Lomatium suksdorfii Suksdorf's deser-parsley	In semi-open to open, dry rocky hillsides on moderate to steep slopes, in areas with scattered Oregon white oak, ponderosa pine and Douglas-fir, and ground vegetation including balsamroot (Balsamorhiza sagittata), grasswidows (Sisyrinchium douglasii) and others; several sites known lower in White Salmon River watershed.
Mimulus pulsiferae Pulsifer's monkey-flower	Seasonally moist open ponderosa pine and oak woodlands, often on mineral soil; known sites in Klickitat Co., near Trout Lake, WA.
Mimulus suksdorfii Suksdorf's monkey-flower	In open, moist to rather dry places, from valleys and foothills to moderated elevations in the mountains, typically in moist pockets and drainages in sagebrush steppe vegetation; however historic site (unverified location) is recorded in vicinity of the Gotchen Planning Area.
Montia diffusa diffuse montia	In grand fir associations in Little White Salmon River watershed, often in small forest openings and forest edges on loose mineral soil, unstable slopes and roadcuts.
Ophioglossum pusillum adder's tongue	In bogs, fens, wet meadows, moist woods, muddy creeks, grassy swales and cedar swamps; found east of the Forest in Klickitat county.
Potentilla breweri Brewer's cinquefoil	In moist meadows and streambanks to open exposed slopes, mid-montane to alpine, southern Oregon and California; historic site in Yakima County.
Sisyrinchium sarmentosum pale blue-eyed grass	In open areas, wet and dry meadows and forest openings from low- to mid-elevations; historic site reported in vicinity of the Gotchen Planning Area.
Veratrum insolitum Siskiyou false hellebore	In open prairies to thickets, and forested or open rocky slopes; found in lower portions of White Salmon River watershed.

Washington State Listed Sensitive Species

Mountain grapefern *Botrychium montanum*, and lance-leaved grapefern *Botrychium lanceolatum* were both found during surveys in the Gotchen Planning Area. These species are not included on the Region Six Sensitive species list but are listed as Sensitive species by

the State of Washington (1997). These species were found together in riparian habitat. *B. montanum* is also a Survey and Manage species.

Survey and Manage Species

Two Survey and Manage (S&M) plant species were found in the Gotchen Planning Area. A third species is reported in the area based on a historical sighting. Luminescent moss *Schistostega pennata* and mountain grapefern *Botrychium montanum* were found at a few sites scattered along moist riparian areas. Table 3-18 shows the location of these sightings with respect to proposed Gotchen units.

Schistostega pennata is known as the "luminescent moss" or "goblin's gold" because it forms "glow in the dark" protonema that reflect a greenish gold color when exposed to light. The ability of the protonema to reflect light allows this species to live in microhabitats too shady to support most other moss species; in habitats with more light, other moss species tend to out-compete *Schistostega*. For this reason, this species requires dense shade, high humidity and a source of reflection for light (such as a pool of water). This species typically grows on mineral soil in shaded, damp pockets created by overturned tree roots or around the entrance to caves or animal burrows .

Table 3-18. Location of Survey and Manage species found in The Gotchen Planning Area by treatment unit.

Species	SM Category	Location by Unit
Botrychium montanum	**A**	**BB** Located along Hole-in-the-Ground Ck within unit.
Schistostega pennata	**A**	**BB** Located on Hole-in-the-Ground Ck within unit. **Q** Site near Gotchen Ck below road 8225060 may affect portion of unit. **V** Site located within or adjacent to unit. **Y** Site near Gotchen Ck on opposite side of road 8225 may affect portion of unit. **Z** Sites in area between Aiken Lava Bed and Gotchen Creek Guard Station, and site near Gotchen Ck below road 8225060.

The management objective for category A species is to "manage all known sites and minimize inadvertent loss of undiscovered sites, in accordance with the Management Recommendations for the species, which specify the following actions: maintain decay class 3, 4, and 5 logs, leaving windfalls in place to provide structurally diverse habitat at known sites; maintain microclimate at known sites, including high humidity and dense shade; retain overstory with greater than 70 % closed-canopy forest; maintain caves, root wads, and moist, dark microsites to provide suitable substrate.

Noxious Weeds

The existence and potential spread of noxious weed and invasive species in the Gotchen Planning Area and adjacent areas poses a serious threat to botanical resources in planning area. These species can cause considerable damage by competing for space and nutrients with native plants. This can be particularly threatening with regard to rare native species

where increased competition of weedy species could lead to their extirpation. Systematic noxious weed surveys of road corridors were conducted in the White Salmon watershed in 1989 and 1995, and spot surveys have been recorded from 1995 to present. Noxious weed surveys were also conducted during Sensitive and Survey and Manage species surveys to all Gotchen units.

The three types of weed classifications in Washington State are described briefly as follows. Class A weeds are considered to pose a serious threat to resources and require immediate eradication and prevention efforts. Class B weeds also pose a serious threat to resources, but are widespread and the management goal is containment and eventual eradication. Class C weeds are usually widespread and are managed at the discretion of individual counties. Active control efforts are not required. Current weed management activities on the District are aimed at Class A and B weeds. Table 3-19 summarizes the species of noxious weeds known to occur in the Gotchen Planning Area and gives their classification and estimated abundance.

Table 3-19. Noxious weed species known in the Gotchen planning area.

Species	Common Name	Weed Class	Abundance
Centaurea nigrescens	vochin knapweed	A	very low
Centaurea diffusa	diffuse knapweed	B	low
Centaurea maculosa	spotted knapweed	B	low
Centaurea nigra	black knapweed	B	low
Chysanthemum leucanthemum	oxeye daisy	B	moderate
Cytisus scoparius	scotch broom	B	very low
Hypochaeris radicata	catsear	B	moderate
Kochia scoparia	kochia	B	low
Lepidium latifolium	pepperweed	B	low
Senecio jacobaea	tansy ragwort	B	low
Circium arvense	canada thistle	C	moderate
Circium vulgare	bull thistle	C	moderate
Hypericum perforatum	st. johnswort	C	moderate

Based on the limited survey data for the Gotchen Planning Area it would appear that the degree of infestation of Class A and B weeds is low to moderate (few occurrences consisting of few individuals). Catsear *Hypochaeris radicata* and oxeye daisy *Chrysanthemum leucanthemum* were the most common and abundant species in these Classes, and are found primarily on roads and landings. The knapweeds *Centaurea spp*. were not reported from any of the units, but a two small patches of diffuse knapweed *C. diffusa* and spotted knapweed *C. maculosa* were found on road shoulders in the area.

Class C weeds tend to be more widespread and common in the area, and are depicted as having moderate to high degrees of infestation in the area. Bull thistle *Circiuim vulgare* and Canada thistle *Circium arvense*) were found thinly scattered within units on disturbed ground such as skid roads, cattle trails and gopher mounds. St. Johnswort *Hypericum perforatum* was found in rather thick patches on road shoulders. It is very likely that the weed situation in the

Gotchen Planning Area, as is the case for many other areas on and off the Forest, is worsening.

Motor vehicles, cattle, and people are primary means of introduction for noxious weeds to an area. Mt. Adams Cattle and Horse Allotment encompasses much of the Gotchen Planning Area. Cattle use of the area is widespread, with areas of heavy utilization occurring in localized relatively small sites, often near water sources. Disturbed soils associated with roads, skid roads, landings, harvest units, high use areas by cattle, and gopher mounds are the most common sites for weed establishment.

Research Natural Areas

The Smith Butte, a prominent cinder cone in the midst of the Gotchen Planning Area, has been proposed as a Research Natural Area (RNA). A draft establishment report was prepared in 2001. The RNA consists of 175 acres circling the cinder cone. The area was proposed for its relatively intact condition and representative plant communities, including: grand fir/elk sedge and grand fir/vine maple communities. At the summit of Smith Butte, on the western flank is a pristine grassland meadow of 2.5 acres. Unlike many of the meadows in the watershed, little, if any cattle grazing has occurred there. Sheep probably grazed there until sometime in the 1940's. The area also includes a patch of old-growth forest.

With the budworm infestation, fire risk to these grand fir stands is heightened. Once the Smith Butte RNA is officially established, a management plan will specify what type of fire management would be appropriate in the RNA.

Botanic Special Interest Sites

Within the Gotchen Planning Area, there are two Management Category 9L special interest sites that are recognized in the 1990 Gifford Pinchot National Forest Management Plan, and the 1995 Amendment 11 to the Forest Plan. The first is a fringed-pinesap (*Pleuriscospora fimbriolata*) site (field unit number 3114) that was designated with a 20 acre buffer. Since the time that this designation was given to this site, research has determined that *Pleuriscospora fimbrolata* is not as rare as was once thought, and this species has been removed from the Northwest Forest Plan Survey and Manage list (USDA & USDI 2001). For this reason, no specific mitigation is presently recommended for this site. The second site is for the Trout Lake Big Tree (field unit number 3047). This site is for a very large ponderosa pine, located in the southern portion of the Gotchen Planning Area.

Other Botanical Features

Meadows

Meadow habitats provide for a unique assemblage of herbaceous plant species that are not found in the forest understory. Meadows provide potential habitat for sensitive species such as pale blue-eyed grass *Sisyrinchium sarmentosum*, as well as several other Sensitive plant species that are suspected to occur in these types of meadow habitats (See list in Sensitive

Plant Species surveyed for but not found, Table 3-17). Meadow habitats were noted within or adjacent to 16 Gotchen units. Most of these were described as small openings in the forest.

Meadows are relatively uncommon and inconspicuous in the Gotchen Planning Area. This is, in part, a consequence of the highly porous nature of the bedrock of the area, such that few areas are moist enough to inhibit conifer establishment, and because of the reduction in the occurrence of fire which has allowed for the encroachment of conifers. Other than the meadows around Gotchen Creek Guard Station, meadow habitats in the Gotchen Planning Area are rather difficult to delineate, and tend to occur as small openings scattered within the predominantly forested landscape. Ponderosa pine *Pinus ponderosa*, quaking aspen *Populus tremuloides*, and black cottonwood *Populus trichocarpa* are often associated with meadows in the area. Typical meadow flora include: rabbitbrush goldenweed *Haplopappus bloomer*, common snowberry *Symphoricarpis albus*, subalpine daisy *Erigeron peregrinus*, tawny horkelia *Hokelia fusca*, tall cinquefoil *Potentilla arguta*, showy phlox *Phlox speciosus*, Thompson's paintbrush *Castilleja thompsonii*, mountain mariposa *Calochortus subalpinus*, Idaho fescue *Festuca idahoensis*, and log-stolon sedge *Carex pennsylvanica*; some species of which are indicative of drier ponderosa pine and shrub steppe communities

Meadows throughout The Gotchen Planning Area are diminishing in the face of encroaching conifers, especially lodgepole pine and grand fir.

Lava Bed Communities

The southern tip of Aiken Lava Bed touches the northern edge of the Gotchen Planning Area. Other smaller exposures of lava beds and numerous small outcroppings are found throughout the area. These areas are unique habitats that are often remarkably rich floristically with vascular plants, mosses and lichens. Vascular plants include: shrubby penstemon *Penstemon fruticosus*), northern buckwheat *Eriogonum compositum*, Leiberg's fleabane *Erigeron liebergii* and rock-brake *Cryptogramma crispa*. Lodgepole pine, quaking aspen, and remnant old-growth ponderosa pine and Douglas-fir are often found in and on the margins of open sites. A seven-foot diameter Douglas-fir was noted at one site. These small outcroppings may provide potential habitat for some Sensitive species, although none are documented in the area, and none were found during surveys of the project. There are only a handful of relatively large exposures of lava beds in the vicinity of Gotchen units. Small outcropping were noted within 14 of the units.

Aspen Clones

Quaking aspen *Populus tremuloides* occurs sporadically throughout the Gotchen Planning Area where it is found on seasonally damp flat or gently sloping terrain interspersed within the conifer-dominated landscape. The presence of aspen was reported in 15 Gotchen units. Aspen is unusual in that it rarely reproduces from seed (Mitton and Grant 1996). Reproduction is almost solely asexual by means of root suckers. The result is that an individual commonly consists of numerous genetically identical trees, referred to as a clone. aspen seedbed and germination requirements are so limiting that seedling establishment in nature may only occur at intervals as much as 200 to 400 years or more (Jeliski and Cheliak 1992), and possibly even intervals of thousands of years (Mitton and Grant 1996). Because of their longevity, the presence and distribution of aspen seen today in the Gotchen Planning

Area can be a good indicator of past ecological conditions and processes. For aspen, these conditions and processes would include a dominance of more open coniferous forests of ponderosa pine and Douglas-fir, maintained by fire.

aspen are long-lived and grow to have quite extensive root systems such that it is common for a clone (a single genetic individual) to be an acre or more in size (Kay 1990). One clone in Utah contained an estimated 47,000 trees and covered 106 acres (McLean 1993). Given their longevity and size, it is likely that the aspen trees seen in the Gotchen Planning Area today represent only a relatively few individual clones, and these clones could be several hundreds of years old.

Many aspen clones in the Gotchen Planning Area appear to be in a state of distress or deterioration as a result of encroaching and overtopping conifers, and predation by cattle, elk and deer. The current condition of aspen in the Gotchen Planning Area would suggest that existing clones have been in decline for many years and are remnants from pre- and early-European settlement times. During those times low intensity fires occurred more frequently, and large herbivores such as elk and deer, as well as cattle and sheep, were less abundant or nonexistent, as in the case of domestic livestock. Periodic wildfires, and burning by Native Americans, were important in maintaining and perpetuating aspen in the past (Kay 1997). The advent of fire suppression practices and the elimination of burning in the past century have resulted in the gradual encroachment of conifers, especially grand fir and lodgepole pine, into what was previously aspen habitat. In many instances this encroachment is nearly complete, as older aspen trees have become overtopped by conifers, and are either dead or struggling in the understory. New growth in the form of root suckers, are also struggling in the forest understory where they, too, are likely to be shaded out, and are often stunted or killed by browsing cattle, deer and elk. The noticeable lack of intermediate age classes of aspen throughout much of the area is a strong indicator of how poor conditions are for growth and regeneration of aspen. The combined effects of encroachment and browsing have severely damaged, and killed, aspens over much of the Gotchen Planning Area. The continuation of current trends is likely to result in the irretrievable loss of more aspen clones in the area. Restoration activities aimed at reducing conifer competition and animal browsing would be needed to maintain and perpetuate aspen in the Gotchen Planning Area.

Oregon White Oak Woodlands

Oregon white oak (*Quercus garryana*) woodlands are present in The Gotchen Planning Area on warm forested sites near the southern boundary of the National Forest. These small woodlands, along with their associated communities, typically occur on south-facing slopes with shallow soils, including open areas and open ponderosa pine and Douglas-fir forests. Although not abundant in the area, oak woodlands exemplify some of the driest forest communities on the Forest, and are associated variously with shrubby and herbaceous understories, which include: oceanspray *Holodiscus discolor*, California hazel *Corylus cornuta*, creeping snowberry *Symphoricarpos mollis*, Carey's balsamroot *Balsamorhiza careyana*, pinegrass *Calamagrostis rubescens* and Idaho fescue *Festuca idahoensis* among others.

Being one of the only hardwood species in the Gotchen Planning Area, oaks provide unique habitat for epiphytic mosses and lichens that are not common on conifers in the area, such as

Lobaria pulmonaria, which was found exclusively on oaks in upland situations. Oak woodlands are also potential habitat for several Sensitive plant species, which include: Pulsifer's monkey flower *Mimulus pulsiferae* and clustered ladyslipper *Cypripedium fasciculatum.* Small oak woodlands were noted in two Gotchen units, but no Sensitive species were found in the area.

Oak woodlands in the Gotchen Planning Area are primarily early seral communities that are maintained and perpetuated by periodic low intensity fires that inhibit conifer establishment and competition. With the lack of such fires occur due to fire suppression practices, many of the oak woodlands in the area are severely threatened by conifer competition. Fire and timber management would need to play a role if these woodlands are to be maintained.

ROAD SYSTEM

There are approximately 100 miles of roads in the Gotchen Planning Area. Table 3-20 illustrates the approximate miles of road, by maintenance level, with the Matrix and LSR.

Maintenance Levels 3 through 5 are considered highways, and are subject to regulation of the National Traffic Standards Safety Act. These standards required signing; brushing to maintain sight distance; and other maintenance required for user safety.

All roads proposed for closure or decommissioning in this Statement are Level 2 and Level 1 Forest Roads.

Table 3-20. Existing forest road miles in the Gotchen Planning Area by maintenance level .

MAINTENANCE LEVEL	Road Miles	
	Matrix	LSR
Level 5: Open and maintained for passenger cars; high level of comfort	0	0
Level 4: Open and maintained for passenger cars; moderate level of comfort	2	1
Level 3: Open and maintained for passenger cars; low level of comfort	3	8
Level 2: Open and maintained for high-clearance vehicles	25	36
Level 1: Closed to all traffic	10	15
Total Miles	**40**	**60**

RECREATION

Within the Gotchen Planning Area there are numerous recreation resources. There are also important recreation destinations just outside of the Gotchen Planning Area that are accessed by roads passing through the Gotchen Planning Area.

Public Road Access and Dispersed Recreation

Dispersed recreation describes public use of the forest that is occurring outside of developed facilities and trails. Dispersed recreation is highly dependent on the open road network. The Gotchen Planning Area is used for dispersed camping, hunting, hiking, mushroom picking, and other leisure pursuits. Dispersed campsites occur at former log landings and the ends of

most all roads. There are 30 campsites that are used repeatedly, year after year. The most popular camping area is “Cherry Flats” located west of the junction of Forest Road 8040 and 8040-020. Vegetation projects proposed for the Gotchen Planning Area are located around Cherry Flats. The proposed road actions, in particular closing roads to the public, would have a direct impact on opportunities for dispersed recreation.

Designated Wilderness, Inventoried Roadless Area, and Unroaded Areas

The Mt. Adams Wilderness is north of the Gotchen Planning Area. Nearly all of the Gotchen Creek Inventoried Roadless Area (7,500 acres) lies within the Gotchen Planning Area. There is also a large (1,190 acre) unroaded area contiguous to the Gotchen Creek Inventoried Roadless Area that is within the Gotchen Planning Area.

Wilderness and roadless areas are often evaluated by the extent to which they meet the following criteria, referred to collectively as "Wilderness Capability":

- ***Natural Integrity*** - the extent to which long-term ecological processes are intact and operating.
- ***Natural Appearance*** - the extent to which the natural environment appears to be free of evidence of human activity; where the landscape appears to be shaped primarily by the forces of nature.
- ***Opportunities for Solitude*** - an intangible, subjective value defined as isolation from the sight, sounds and presence of others, and from developments/evidence of human activity.
- ***Opportunities for Primitive Recreation*** - opportunity to experience solitude, along with a sense of remoteness, closeness to nature, serenity, spirit of adventure, and self-reliance through the application of outdoor skills in an environment that offers a high degree of challenge and risk. The term Primitive is defined per the Recreation Opportunity Spectrum (see LRMP, Amendment 11, p. 2-43).
- ***Challenging Experiences*** - Self-reliance, initiative and survival skills can be utilized in an environment that offers a high degree of challenge and risk.

Mt. Adams Wilderness (South section between Morrison Creek Campground and Cold Springs)

The Mt. Adams Wilderness is located to the north of the Gotchen LSR. For the purposes of this assessment, the wilderness capability of the southern section of Mt. Adams Wilderness between Morrison Creek Campground and Cold Springs is described. From Morrison Creek Campground to Cold Springs Campground, the wilderness boundary is located 200 feet north of Forest Road 8040-500. This portion of the Mt. Adams Wilderness was designated in 1984.

Natural Integrity. The area shows little evidence of use by wheeled vehicles. The exception is the South Climb Trail, which follows an old road out of Cold Springs, to the junction with Round-the-Mountain Trail, and on into the Wilderness where it terminates at Morrison Creek.

To a large extent, long-term ecological processes are intact and operating. The forest conditions surrounding Forest Road 8040-500 and continuing into the southern portion of the Mt. Adams Wilderness are similar. It is a continuous stand of mature subalpine fir and lodgepole, with minor amounts of Douglas-fir, Englemann spruce, mountain hemlock, and white bark pine. These stands are over 100 years of age and have substantial amounts of mortality to lodgepole pine and subalpine fir. This mortality is due to a number of insects that are capitalizing on the decreased vigor of these senescing trees. Spruce budworm has caused only light defoliation of subalpine fir, but is a contributing factor.

Two significant non-native agents are likely present and affecting trees. Balsam wooly adelgid is an introduced insect that infests subalpine fir. It is a sucking insect that feeds on new needles and stems. It reduces the growth and vigor of infested trees. It modifies the foliage and crown shape. White pine blister rust, an introduced fungal disease, kills both mature and immature white bark pine trees. The Gotchen Risk Reduction and Restoration Project does not address this situation, nor does it influence it.

Natural Appearance. The natural environment appears to be free of evidence of human activity except for trails; the landscape appears to be shaped primarily by the forces of nature.

Opportunities for Solitude. Approximately 7000 people (3500 vehicles) travel Forest Road 8040-500 on their way to the Cold Springs, which is the trailhead for the South Climb Trail (#183) and Cold Springs Trail (#72). This volume of vehicle traffic prohibits solitude along this edge of the Wilderness. Use is concentrated along the South Climb Trail, which goes uphill and away from the road terminus at Cold Springs. There is little opportunity for solitude on the South Climb Trail during summer weekends due to the volume hikers. Solitude can be found off trail, and away from the roads and trailheads.

Opportunities for Primitive Recreation. There are settings for primitive recreation in this area when away from trails.

Challenging Experiences. Self-reliance, initiative, and survival skills are generally not required for on-trail travel on the lower slopes of Mt. Adams. Challenge can be had above timberline to the summit of Mt. Adams.

Gotchen Creek Inventoried Roadless Area

The Gotchen Planning Area includes nearly all of the Gotchen Creek Inventoried Roadless Area. It is listed both in the Forest Plan (Appendix C – p. 106) and RARE II (#B6069). The Washington State Wilderness Act contained release language, which permits management activities to proceed in roadless areas that are not included in designated wildernesses. Under the Forest Plan the management area category is Unroaded Recreation without Timber Harvest (UD). Per amendment by the Northwest Forest Plan, the Gotchen Late Successional Reserve overlaid most of the Gotchen Creek Inventoried Roadless Area (except Aiken Lava Bed). These allocations have maintained the potential for this area to be legislated Wilderness.

Forest Road 8225-150 defines the southern boundary of the Gotchen Creek Inventoried Roadless Areas. No new road construction is proposed in this area and several open roads along the perimeter of the area are proposed to be closed or decommissioned.

Natural Integrity. Forest Road 8040 bisects the Gotchen Creek Inventoried Roadless Area. There are a number of spur roads that branch off Forest Road 8040 a short distance. These spurs facilitated light partial cutting. Additional spur road construction and partial cutting occurred north of Pineway Trail (#71). Pineway Trail itself follows an old wheel track and was a motorized trail until 1990. In spite of partial cutting, the forests still classify as late-successional. Most of the Gotchen Creek Inventoried Roadless Area has not had any management activity

Natural Appearance. System roads and spur roads have altered the natural appearance. Many of the lesser spur roads can no longer be driven due to fallen trees and tree regeneration within the road. Stumps from selective trees harvest are rotting. Time is erasing these indicators of past entry. From a distance this area appears natural. Most of this area has not had any management activity for decades.

Opportunities for Solitude. There are many opportunities for solitude. This area is little used as compared to Mt. Adams Wilderness. While Aiken Lava Bed may draw use, there are no lakes or other outstanding features.

Opportunities for Primitive Recreation. Due to its small size and proximity to roads, there are no settings for primitive recreation. Opportunities for Semi-Primitive Non-Motorized recreation exist. The Cold Springs, Snipes, Pineway, Gotchen Creek, Morrison Creek and Crofton Ridge Trails traverse this area.

Challenging Experiences. Self-reliance, initiative and survival skills are not required for trail travel in this area. Aiken Lava Bed offers some challenge to those who traverse its length, especially in the winter when it serves an access route between Smith Butte Sno-Park and alpine terrain on Mt. Adams.

Unroaded Areas

There is an unroaded area (1,190 acres) southeast of the Gotchen Creek Inventoried Roadless Area and northwest of Road 82. The unroaded area is not part of Gotchen Creek Inventoried Roadless Area. Although it contains similar forest vegetation it is separated from Gotchen Creek Inventoried Roadless Area by a system road. No new road construction or road decommission is proposed within this unroaded area.

Within the Gotchen Planning Area, there are no other unroaded areas of significant size (<5,000 acres), or of lesser size (<1,000 acres) with the potential for Wilderness designation due to being adjacent a Wilderness or inventoried roadless areas.

Natural Integrity. Spur road construction and partial cutting occurred near the Pineway Trail (#71). Pineway Trail itself follows an old wheel track and was a motorized trail until 1990. In spite of partial cutting, the forests still classify as late-successional. Most of this unroaded area has not had any management activity.

Natural Appearance. Partial cutting has occurred, but it happened well over 40 years ago. Most of the area appears natural, with no obvious signs of vegetation management.

Opportunities for Solitude. There is little opportunity for solitude due to the proximity to roads, principally Forest Roads 82, 8225-060, and 8225-071. This area does provide a buffer for the Gotchen Creek Inventoried Roadless Area.

Opportunities for Primitive Recreation. There are no settings for Primitive recreation in this area. It is not remote, though no trails pass through this area. Recreation opportunities fall within the Semi Primitive Non-Motorized Recreation Opportunity Spectrum Class.

Challenging Experiences. Due to its small size, and proximity to roads, travel through this area does not require self-reliance, initiative, or survival skills.

Scenery

Forest Road 80 and 82 Scenic Corridors

There is abundant public travel through the Gotchen Planning Area. Over 7,000 people annually drive through the Gotchen Planning Area on Forest Roads 80 and 8040 seeking the South Climb and other trails in the Mt. Adams Wilderness. A similar volume of traffic follows Road 82 to access Bird Creek Meadows on the Yakama Indian Reservation.

The Forest strives to provide a natural or near natural appearance along these major roads. These same is true along trails. Within a forested setting, the bias is for views of mature forest with large trees. Specific scenic objectives have been established in the LRMP. Roads 80 and 8040 have a "retention" scenic objective. Forest Road 82 has a "partial retention" objective within Matrix lands, and a "retention" objective within the LSR (see map of LRMP allocations). Scenic objectives are attained in limiting human disturbance, namely created openings resulting from timber harvest and associated landings, slash, and stumps. Created openings are defined as near to total clearcut harvests, and they remain openings until regenerating trees are 20 feet tall.

Currently, the scenery along Forest Roads 80, 8040, and 82 is primarily mature forest. Trees dominate the foreground and prohibit background views. The Road 80/8040 corridor has 37 acres of created openings within the National Forest. This is 2% of the area within about _ mile of the road. Forest Road 82 has 12% in openings within Matrix lands (partial retention) and 3% in openings within LSR (retention). These percentiles are within the levels specified in the LRMP.

East Timber Sale thinned grand fir trees along both sides of Forest Road 80 and 82 within Matrix lands. Thinning increased viewing distance into the stand and allowed more of the picturesque old-growth ponderosa pine to be seen from the road. Where these roads cross into the Gotchen LSR, stem density increases, as does the amount of dead and downed trees.

Trails

Scenery along trails is also managed. Trail management levels specify a visual quality objective (see following tables). With their slow speed, trail users scrutinize the scenery much more than do car passengers, and disturbance to foreground vegetation cannot be obscured. There has been little recent (last 30 years) timber management around the established system summer trails, with the exception of the Morrison Creek Trail. Along most system trails, vegetation does not appear to have been manipulated.

Public Safety and Recreation Facilities

Recreation Facilities

The following facilities are located within the Gotchen Planning Area:

Mt. Adams Horse Camp – This is a new facility. Construction is nearly complete. It is located within the White Salmon Seed Orchard (Management Area [MA] 3W). No actions associated with the Gotchen Risk Reduction and Restoration Project would occur proximate to this campground.

Sno-Parks – There are three designated sno-parks along Forest Road 82: Pineside, Snow King, and Smith Butte. Pineside Sno-Park is located near the junction of Forest Road 8225. It consists of a graveled parking lot and a small kiosk/shelter for a portable toilet and information signs. Snow King Sno-Park is located at the junction of Forest Road 8200-101. It has a gravel parking lot and small kiosk/shelter. Smith Butte Sno-Park is located at the junction of Forest Road 8200-200, and has a small kiosk/shelter.

Big Tree Interpretive Site – Big Tree Interpretive Site celebrates the Trout Lake Big Tree, a ponderosa pine tree 7' in diameter and 230 feet tall.

Wicky Creek Shelter – This historic shelter is located near the junction of Morrison Creek and the Morrison Creek Trail.

Gotchen Creek Guard Station – This historic ranger station is not a recreation facility, but skiers and snowmobilers do stop here in winter.

Cow Camp – This historic camp is used by the allotment permittee as base for operations. It is not a recreation facility *per se*, though horseback riders do visit it.

Trails

There are a number of existing summer trails that are wholly or partially within the Gotchen Planning Area. There are also several new trails that have been proposed (see Proposed Action Eastside Trail Extension, July 10, 2001). Finally there are several roads in the Gotchen Planning Area that are groomed as cross-country ski trails in the winter. The following tables elaborate.

Table 3-21. Gotchen Planning Area Existing Summer Trails.

Trail Name	Length (miles)	Uses	LRMP Mgmt Level
Buck Creek (#54)	2.4	Horse/Hiker/Bicycle	I
Cold Springs (#72)	3.7	Horse/Hiker	I
Crofton Ridge (#73)	2.7	Horse/Hiker	I
Gotchen Creek (#40)	3.0	Horse/Hiker/Bicycle	I
Morrison Creek (#39)	6.0	Horse/Hiker/Bicycle	III
Pineway (#71)	2.7	Horse/Hiker/Bicycle	I
Snipes (#11)	2.7	Horse/Hiker/Bicycle	I

Table 3-22. Gotchen Planning Area Proposed Summer Trails.

Trail Name	Length (miles)	Uses	LRMP Mgmt Level
Buck Creek Extension	2.4	Horse/Hiker/Bicycle	III
Big Tree	3.7	Horse/Hiker/Bicycle	III
Wicky Creek	2.7	Horse/Hiker/Bicycle	III

Table 3-23. Gotchen Planning Area Winter Cross Country Ski Trails.*

Trail Name	Length (miles)	Uses	LRMP Mgmt Level
Big Tree XC	5.7	Cross Country Ski	Unspecified
Pipeline XC	3.4	Cross Country Ski	Unspecified
Eagle XC	2.0	Cross Country Ski	Unspecified

***** These ski trails are located on system roads.

Trails receiving level I management have a **retention** visual quality objective within a 500-foot foreground. Scheduled timber harvest (solely to meet timber output objectives) is not permitted adjacent these trails. Tree removal to meet recreation objectives may be permitted. No new road crossings are permitted, and other roads should be closed if circumstances permit it.

Trails receiving level III management assume the visual quality objective of the underlying land allocation. Permanent road crossings should be minimized and temporary roads should be obliterated after the activity is completed.

Roads that serve as winter ski trails have no specified level of trail management.

SOILS

Summary of Existing Conditions

This section focuses on the soils resources that would be most *directly* affected by proposed activities; this differs from the other resource descriptions in the Section where the larger landscape perspective is equally, or more pertinent to the analysis.

The detrimental conditions are generally spread out across the Gotchen Planning Area, so problem areas are sporadic. Units A and C, however, are a problem in that parts of the units have concentrated areas of compaction and displacement at road and landing intersections. Severe compaction is likely to last for longer than 50 years, to the extent that it impairs vegetation growth.

A locally concentrated decrease in soil productivity may have occurred in areas where compacted and displaced soils remain, given the cumulative effects of past damage to the soil resource. Compaction from dispersed skidding may have had an effect on the current insect and disease conditions.

Physiographic Setting

Large-scale geologic mapping by Paul Hammond (1980) indicates the Gotchen Planning Area is underlain by Quaternary and Tertiary basalts, andesites, and a minor amount of Pleistocene glacial deposits. The fractured bedrock promotes rapid infiltration of water.

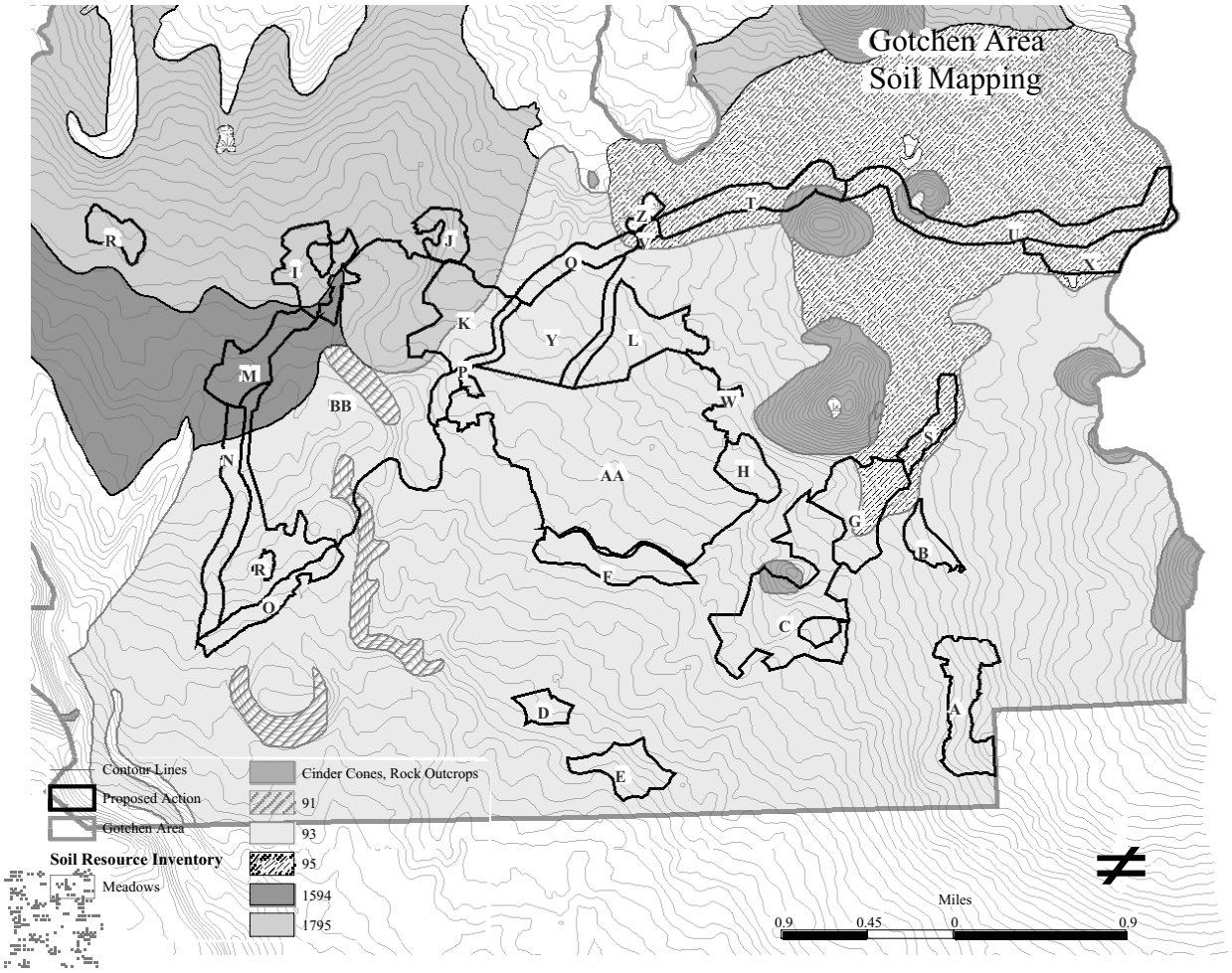
Large-scale geomorphic features are characterized by the Gifford Pinchot National Forest Land Type Association (LTA) mapping, available on the Gifford Pinchot National Forest Internet site. The flanks of Mount Adams have been shaped by volcanic and glacial activity followed by erosion. Glacial till forms a part of the soils in the northwest corner of the Gotchen Planning Area, including Units I, J, K, M, R, and parts of BB, CC (Alternative C only), and N (Alternative B only).

Soil temperature and moisture in the Grand Fir Zone (Topik, 1989) can be characterized as cool and dry for most of the year. Cold average temperatures in soils suppress chemical and biological activities, resulting in soils with limited nutrient supply.

The eastern 0.5 kilometers translate to miles of Units S, U, and X have soils that experience colder temperatures and receive more moisture. These soils, delineated by the Pacific Silver Fir Zone (Brockway, 1983), are relatively less resilient than the rest of the Gotchen Planning Area to disturbance by fire and physical soil disturbance.

Slopes of less than 20% dominate the majority of the landscape. Slopes of 30% are exceeded on or near the cinder cones and on a few rises between flatter terraces (Soil Mapping Unit 91, see Table 3-24 Selected Soil Mapping Interpretations.). Soils in the area are one to six feet deep and derived from material ejected during volcanic eruptions. In the northwest corner of the Gotchen Planning Area, some soil mapping units contain combinations of these soils and deeper, more loamy. Ash and pumice derived soils occur in combination with soils derived from glacial till northwest of the area. On steeper slopes there are shallower soils derived from the same volcanic tephra, often among rock outcrops. Map 3-5 delineates the cinder cones where loose tephra may dominate the soils. These and other soils in the area that occupy steeper slopes are more susceptible to displacement by ground disturbing activities. Selected interpretations of the local soils include generally low to moderate fertility ratings. No data are available to characterize nutrient cycling in these soils.

Map 3-5. Gotchen Planning Area Soil Mapping.



(Refer to table 3-24 for soil mapping interpretation.)

Soil Productivity

The extent and distribution of detrimental soil impacts – such as compaction, displacement and severe burning – measured in percent of each activity area are used to analyze the effects of management activities on long-term soil productivity. National Forest System roads were calculated using Geographic Information Systems (GIS) technology. Skid roads and landings were estimated from aerial photos to evaluate compaction and displacement and verified by results from transect data that was collected in field investigations.

Soils of the Gotchen Planning Area were mapped as part of the Gifford Pinchot National Forest Soil Resource Inventory (Wade, et. al. 1992). Field transects of representative areas of each unit were used to assess the occurrence of displacement, compaction, and other ground disturbance and to verify the existing mapping. The transects, using a methodology modified from Howes, et al. 1983, found soils to be consistent with mapping by the Soil Resource Inventory. This information is available at the Gifford Pinchot National Forest Headquarters.

Forest Service Region 6 defines detrimental compaction in volcanic soils as a measured increase in soil bulk density of 20% or more compared to the undisturbed level (USDA 1998). Compaction in the Gotchen Planning Area has not been measured for bulk density in a laboratory. Detrimental compaction in the Gotchen Planning Area was assessed by comparing structure, density and root growth of a soil with a nearby undisturbed soil. A common observation of soil compaction is coarse, platy structure, difficulty in digging, and evidence of shallow horizontal roots.

Detrimental displacement is the lateral movement of more than 50% of the organic rich topsoil from an area greater than 100 square feet and at least 5 feet wide (USDA 1998). Soil displacement occurs by mechanical forces such as equipment blades, vehicle traffic, or logs being yarded. Mixing of surface soil layers by disking, chopping, or bedding operation is not considered displacement. Evidence of displacement is a measured reduction of at least half the thickness of the topsoil layer. Detrimental displacement in the Gotchen Planning Area was assessed by comparing topsoil layer depths with undisturbed layers in a soil nearby.

Soils are considered to be detrimentally burned when the mineral soil surface has been significantly changed in color, oxidized to a reddish color, and the next one-half inch blackened from organic matter charring by heat conducted through the top layer (USDA 1998). The detrimentally burned soil standard applies to an area greater than 100 square feet, which is at least five feet in width.

Relationship to Wildfire

Fire has had a strong influence on most of the Gotchen Planning Area. Historically on the central and southern portions of project area, low intensity, patchy fires were common (Agee 2001). Slow burning surface fires, based on the fuel models for the majority of the Gotchen Planning Area, are common. There is no data specific to the area to characterize the effects of fire on the soils.

Relatively low amounts of topsoil organic matter in the Lodgepole Pine (Pinus contorta) stands of Units U and X may be associated with wildfires as well as the coarse texture of the topsoil.

A fire event has the highest potential to reduce ground cover below standards where crown cover is lost in combination with a complete consumption of ground cover. The effects of wildfires over a given area are difficult to quantify due to their highly variable nature, and an even greater variability over a landscape.

The southern portion of the landscape is currently at an increased risk of a stand-replacing fire event. A potential for significant amounts of severe burning of the soil exists here because surface fuel loading is high. A low threat of erosion exists in these areas, in spite of the common concern after wildfires, because of a combination of gentle slopes, soil types and relatively low amounts of precipitation.

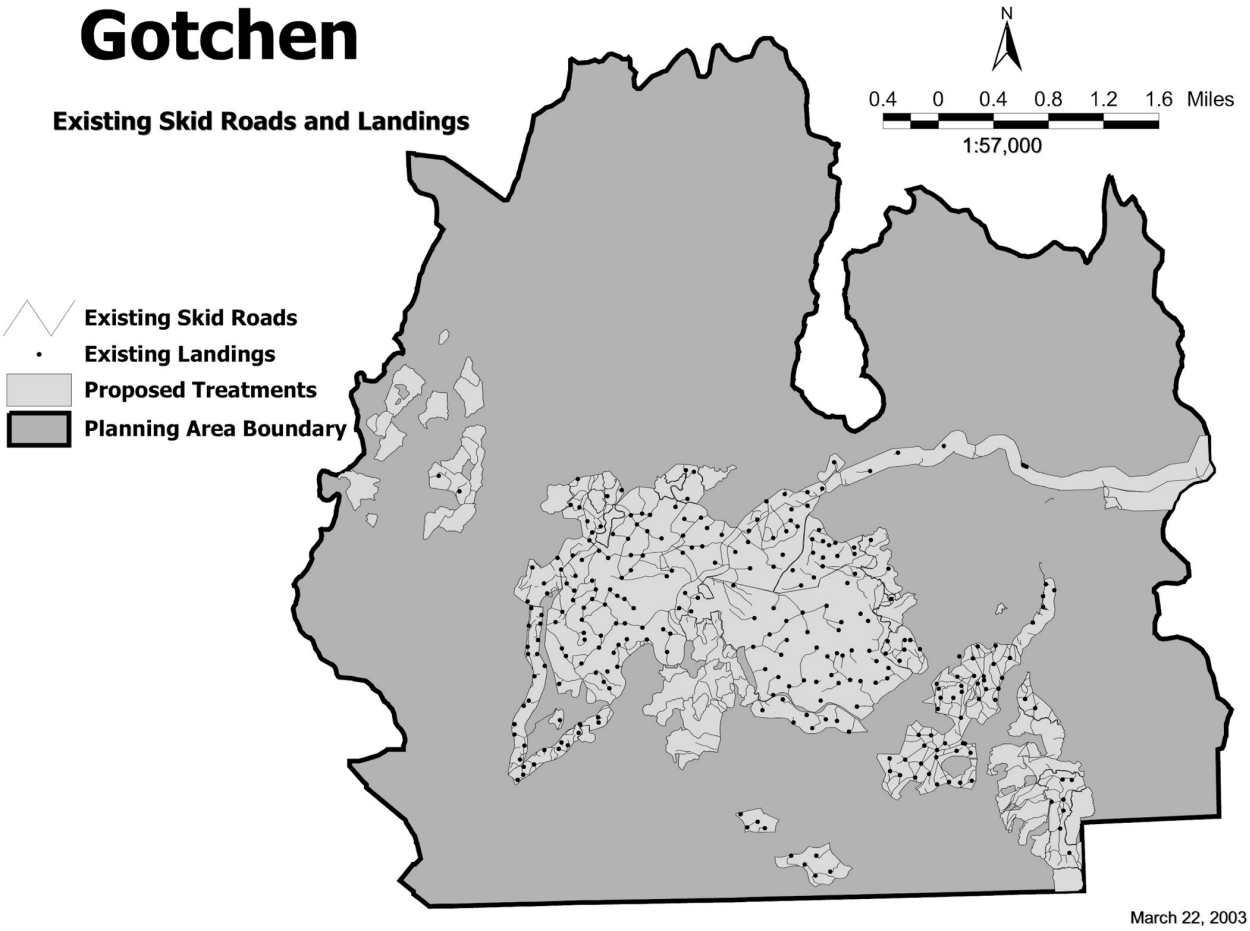
A risk of losing some soil productivity over this southern portion of the Gotchen Planning Area exists in the event of a stand-replacing fire. In areas of NFFL Fuel Model 10 (see Fire section) intense fires may destroy soil organic matter, volatilize excessive amounts of nitrogen and other nutrients, disrupt soil structure, and induce water repellency compared to the natural regime as described above.

Soil Conditions Related To Timber Harvest

Skid Roads and Landings

Previous ground based timber harvests compacted and displaced soils in the area. Map 3-6 depicts the identified existing skid trails/temporary roads and landings within the areas that have activities proposed in this Statement. Landings and skid trails occupy between 0 and 13.8% of individual activity areas for Alternative B and D, and between 0.3 and 10.3% of individual activity areas for Alternative C.

Map 3-6. Past harvest skid roads and landings.



Soil compaction and soil displacement are the two most prominent processes affecting soil productivity. Soil compaction is an increase in soil bulk density, a decrease in soil porosity, or an increase in soil strength caused by application of mechanical forces such as weight and vibration. Compaction research found reduced growth of ponderosa pine in compacted tractor skid trails 16 years after logging (Froehlich, 1979).

Native soils are relatively low to moderate in fertility. Availability or quantities of soil nutrients are generally limited by one or more soil factors. Factors that limit soils in the area include coarse textures and relatively low levels of organic matter.

Table 3-24. Selected Soil Mapping Interpretations.

Soil Mapping Unit	Occurs in Unit	Landform	Surface Erosion Potential[2]	Displacement Potential	Compaction Potential	Fertility	Potential for Regeneration
3	Z, FF	Wet Meadows	Slight	Low	**High**	Moderate	Not Commercial
5B	C, T, & U	Steep Slopes of Volcanic Cinder Cones	Slight to Moderate	N/A[3], **High**	N/A[1], Low	Low	**Low**
91	BB & CC	Steep side slopes	Moderate	N/A[1], **High**	N/A[1], **High**	Low	Moderate
93	A, B, C, D, E, F, G, H, K, L, N, O, P, Q, R, W, Y, AA, BB, CC, DD, & FF	Gentle slopes, benches	Moderate	Moderate	**High**	Moderate	Moderate
95	G, Q, S, T, U, V, X, Z, DD, EE, & FF	Gentle slopes, benches	Moderate	Moderate	**High**	Low	Low to Moderate
1594	I, M, N, BB, & CC	N/A[4], various landforms	Slight	Moderate	**High**	N/A[1], Low to Moderate	Moderate
1795	I, J, K, R, BB, & CC	N/A[2], various landforms	Moderate	Moderate	**High**	N/A[1], Low	Low to Moderate

The compaction potential is relatively high in over 70% of the Gotchen Planning Area, considering the fine soil textures, thin duff layers, and weak soil structure. Soils are most often compacted on main skid roads; where it may be severely compacted for the width of each vehicle track. Severe compaction has been known to last for longer than 20 years in volcanic ash soils (Geist 1989).

The distribution of the skid road network is generally spread out over most of the areas, except where they converge at intersections. Map 3-6, Existing Skid Trails and Landings depicts the approximate location of existing skid trails/ temporary roads and landings in areas proposed for treatment in this Statement. It is likely that other skid trails/temporary roads exist within these areas that are not shown on the map.

[2] Assuming a complete loss of ground cover; bare soil.
[3] Interpretation derived from professional judgement and logic. SRI mapping does not address this characteristic.
[4] Mix of landforms of two mapping units combined.

Unit A has concentrations of displacement combined with compaction in concentrated areas. On these areas, soils tend to be shallow enough to make subsoiling (soil tilling to remediate compaction) inadequate. The problem may be exacerbated by ongoing recreational activity, as the trails still seem fresh in areas. Unit C also has these concentrations, though its soils are apparently recovering quicker, judging by the vegetation growth.

Soils in the activity areas are suitable for timber harvest in alignment with timberland suitability classification (FSM 2415.2), with the exception of Unit Z where wet meadows are present.

Soils are recovering from the effects of past disturbances through natural processes such as biological activity and weathering, though these tend to work slowly (Froehlich, et. al. 1985). For example, some roads are being decommissioned through growth of grand fir roots breaking up compacted soil.

Slash Burning

Transects of the area did not detect any detrimental burned soil, as described by the standard (USDA 1998). Concerns with slash burning in the Gotchen Planning Area include the high elevation (above 300'), loose thin duff layers, relatively dry forest, southwest aspect, and coarse textured soil (because of higher heat transfer). All of those factors apply in parts of the highest elevation units S, T, U, and X.

Soil Conditions Related To Roads

National Forest System Roads constitute a conscious decision to dedicate areas to the transportation system, and soils are essentially converted to a non-productive condition. Approximately 99 – 100 miles of roads are currently dedicated to the transportation system in the Gotchen Planning Area, equating to roughly 2% of that area. Most of the precipitation that falls on compacted road surfaces becomes surface runoff. Less than 7% of each activity area is occupied by or adjacent to a system road (Table 3-25. Existing Detrimental Soil Conditions – Alternatives B and D).

Table 3-25. Existing Detrimental Soil Conditions – Alternatives B and D.

Unit	Unit Acres	Dedicated System Roads (Acres)	Skid Roads, Landings (Acres)	% Detrimental Conditions
A	89	0.5	6.8	8.2%
B	29	1.1	2.1	11.1%
C	206	2.2	21.7	11.6%
D	23	1.2	1.4	11.2%
E	54	1.9	2.9	8.9%
F	73	1.8	3.4	7.1%
G	102	1.8	11.9	13.4%
H	44	1.3	4.0	12.1%
I	66	1.0	6.0	10.7%
J	34	0.4	1.2	4.7%
K	108	0.7	4.9	5.1%
L	112	1.3	6.6	7.1%
M	68	3.4	4.6	11.6%
N	75	3.9	7.4	15.0%
O	51	2.8	6.5	18.3%
P	34	2.0	1.1	9.0%
Q	44	2.1	3.4	12.5%
R	38	0.7	1.1	4.7%
S	33	2.1	2.1	12.6%
T	82	2.2	1.3	4.3%
U	146	6.0	1.0	4.8%
V*	7	0.1	0.0	1.3%
W	3	0.1	0.4	19.2%
X	57	0.0	0.3	0.4%
Y	162	1.3	7.1	5.1%
Z	11	0.0	0.5	4.5%
AA	663	6.7	23.4	4.5%
BB	662	4.5	37.6	6.4%

* (Alternative B only)

Conditions are worth noting for the smaller units where amounts of existing road per unit area are high (Table 3-25. Existing Detrimental Soil Conditions – Alternatives B and D and Table 3-26, Existing Detrimental Soil Conditions – Alternative C: Differences Highlighted vs. Alternative B). In Alternative C, Unit FF is near the threshold for standards and guidelines. Changes between Alternative B and C are highlighted, and Units N, O, P, Q, T, U, V, and W are dropped in Alternative C.

For Alternative D, the only difference in condition from Alternative B with respect to soils is the exclusion of Unit V.

Table 3-26. Existing Detrimental Soil Conditions – Alternative C: Differences Highlighted vs. Alternative B.

Unit	Unit Acres	Dedicated System Roads (Acres)	Skid Roads, Landings (Acres)	% Detrimental Conditions
A	89	0.5	6.8	8.2%
B	29	1.1	2.1	11.1%
C	206	2.2	21.7	11.6%
D	23	1.2	1.4	11.2%
E	54	1.9	2.9	8.9%
F	73	1.8	3.4	7.1%
G	102	1.8	11.9	13.4%
H	44	1.3	4.0	12.1%
I	66	1.0	6.0	10.7%
J	34	0.4	1.2	4.7%
K	129	0.7	5.1	4.5%
L	112	1.3	6.6	7.1%
M	68	3.4	4.6	11.6%
R	38	0.7	1.1	4.7%
S	144	2.1	2.7	3.3%
X	57	0.0	0.2	0.4%
Y	278	2.3	10.6	4.6%
Z	11	0.0	0.5	4.5%
AA	571	7.2	20.4	4.8%
BB	354	2.8	23.2	7.4%
CC	293	2.1	14.1	5.5%
DD	25	0.2	1.0	4.6%
EE	30	0.1	0.0	0.3%
FF	6	0.5	0.6	18.5%

Soil Conditions Related Livestock Grazing And Recreation

Livestock disturb soils in localized areas of concentrated use such as major travel routes. The entire Gotchen Planning Area is in the Mt. Adams Allotment. Soil displacement, soil mixing, and compaction exist across the Gotchen Planning Area, particularly on trails, watering, and salting areas. In field reviews during Bull Trout consultations, the U.S. Fish and Wildlife Service found negative grazing activities to be generally minor over the allotment (Joseph Esteves 2001, pers. com.).

Photo monitoring of grazing activities of the approximately 516 head of livestock in the area (over 34,000 acres that include the Gotchen Planning Area) has indicated changes in forage vegetation. No significant increase in soil damage has been observed in the six years since the monitoring began, (Joseph Esteves 2001. pers. com.). Field reviews of FY 2002 by a Forest Service soil scientist support the findings.

National Forest System campgrounds and trails constitute a conscious decision to dedicate areas to the trails system and soils are necessarily converted to a non-productive condition. An insignificant percentage of the Gotchen Planning Area is dedicated to campgrounds and trails. Human and livestock activity in undeveloped recreation sites can displace and compact

soils. Off road vehicle use, camping and collection of forest products has contributed to the network of non-system roads. Assuming sufficient snow pack depths, snowmobile traffic is presumably having minimal effects on soil productivity and biological processes. Recreational trails, such as those used for horseback riding, have had a greater impact than cattle in the area, but are still minor in extent.

Mass wasting

Field visits to the units in Alternative B (proposed action) did not detect any areas of slope instability or potential for instability. In the Gotchen Planning Area, no areas of slope instability are designated with the Forest GIS layer that delineates Riparian Reserves. The gentle slopes and well-drained soils are generally not conducive to landslides. Features such as hummocky topography; leaning and twisted trees; bare scarps; sag ponds; pressure ridges and tension are evidence of potential slope instability. Usually, slopes with two or more of these features are considered potentially unstable, although other factors such as the presence or absence of landslides in adjacent areas are considered.

Soil Organisms/Soil Biology

Soil biological processes are important to nutrient cycling and maintenance of soil structure. Data are not available to characterize populations of bacterial and arthropod populations in the area. The importance of soil organisms, notably mycorrhizae, to overall soil productivity is widely recognized. Although no data for the Gotchen Planning Area can support the extent or duration of effects, it is reasonable to speculate that past disturbance has had an adverse effect on soil organisms, their habitat, and therefore the diversity of soil organisms that determine long-term forest productivity (Amaranthus 1989). Armillaria and Annosus root rot exist in the Gotchen Planning Area. Compaction from dispersed skidding, shown in 1940's photographs of the area, may have had an effect on the current insect and disease conditions.

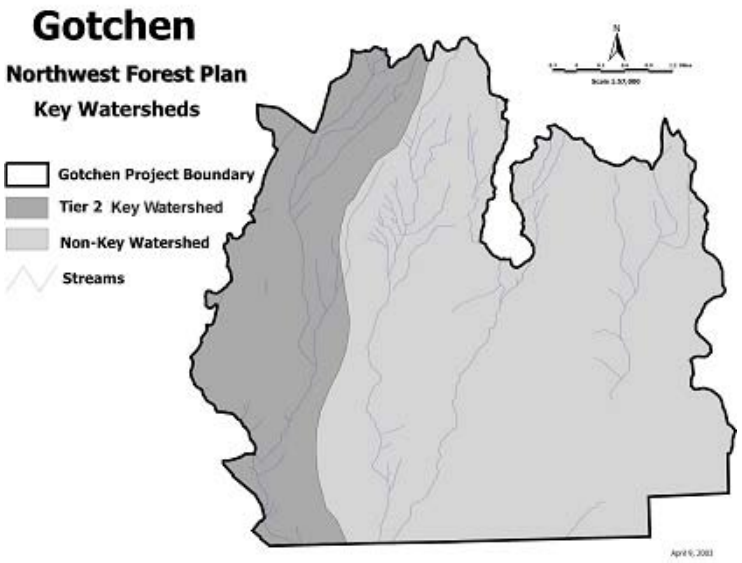
Biological soil crusts—living communities of cyanobacteria, algae, mosses, liverworts and/or lichens growing on the soil surface and binding it together—may be important in carbon and nitrogen fixation and in determining water infiltration rates. Commonly found in arid or semi-arid environments (USDA 1997) they are not known to exist in the activity areas.

HYDROLOGY

Scale of Analysis and Definition of Watershed Units

The Gotchen Planning Area lies within the White Salmon River watershed. Portions of the White Salmon River watershed have been designated as a Key Watershed under the Northwest Forest Plan, though most of the proposed treatments in the Gotchen Planning Area lay in non-Key portions of the watershed, Map 3-7.

Map 3-7. Northwest Forest Plan Key Watersheds.



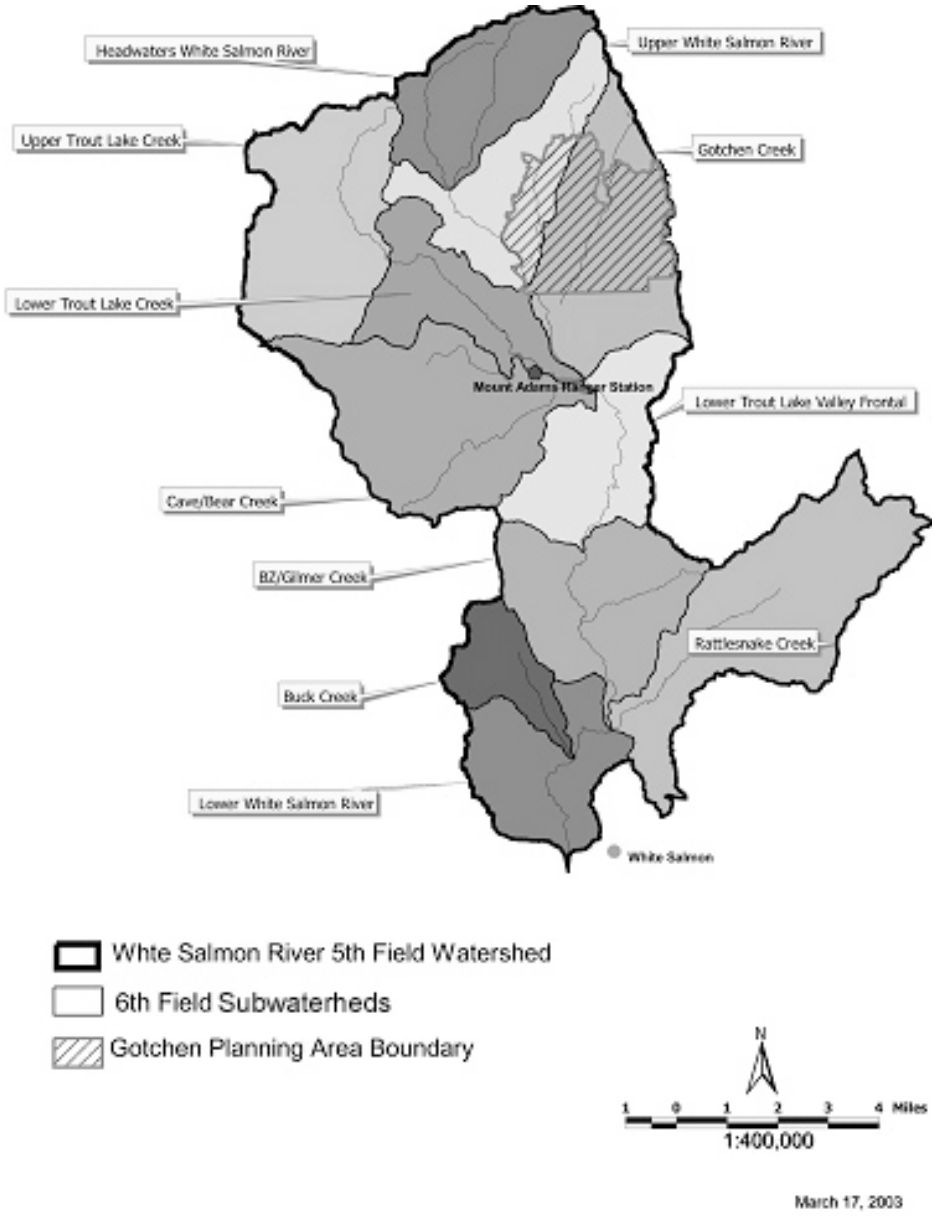
Based on its size, 250,000 acres, the White Salmon River watershed is identified as a ***5th field watershed.*** Within that watershed are a number of smaller "sub" watersheds, which are referred to as ***6th field subwatersheds***. The Gotchen Planning Area falls into two of these: the Upper White Salmon River and Gotchen Creek subwatersheds (Map 3-8). The 6th field subwatersheds are the primary analysis units used for hydrologic effects determinations in this document, although both smaller and larger scales are addressed where appropriate.

Each 6th field subwatershed is comprised of one or more ***7th field drainages***. Map 3-9 displays the 6th field subwatersheds and the 7th field drainages in the upper potion of the White Salmon River watershed. The 7th field drainages comprise the primary analysis units for the fisheries analysis, which follows the Hydrology section of this report. The level of resolution provided by the smaller 7th field drainages is required in the fisheries analysis to delineate fish distributions and fish presence. Table 3-27 summarizes the 6th field subwatersheds and their associated 7th field drainages in the vicinity of the Gotchen Planning Area, and Map 3-9 shows how the Gotchen Planning Area overlays them.

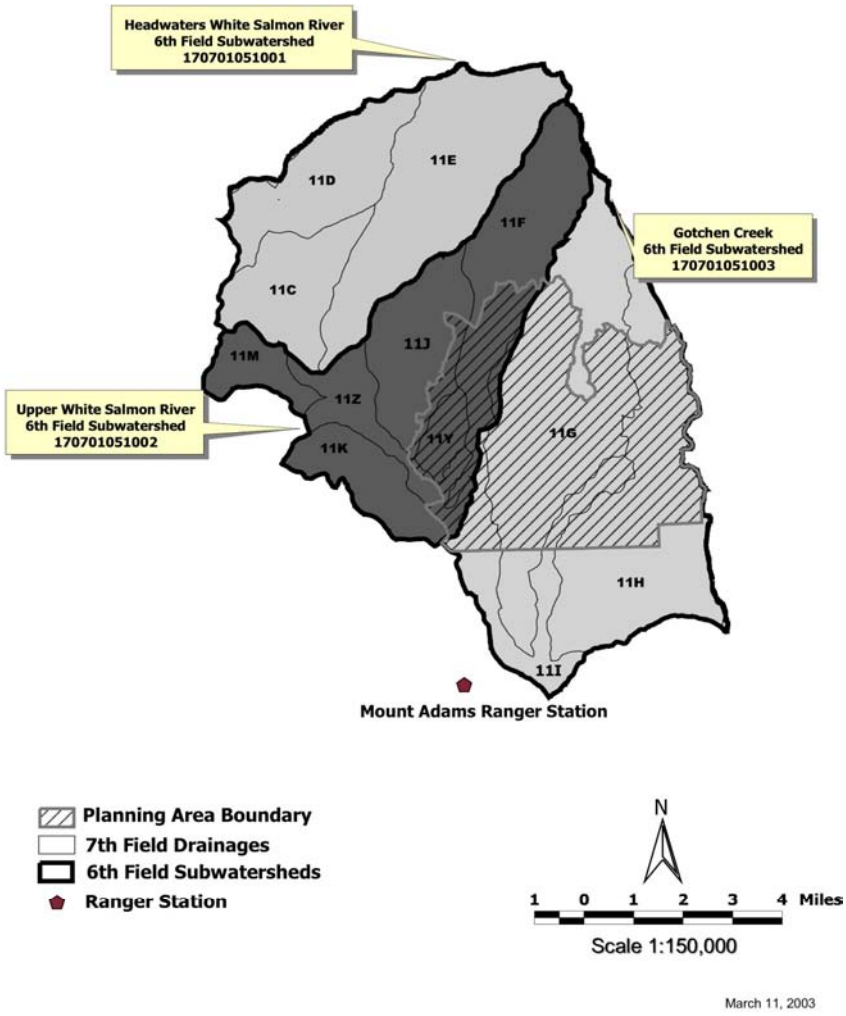
Table 3-27. 6th Field Subwatersheds and 7th Field Drainages in the vicinity of the Gotchen Planning Area.

6th Field Subwatersheds		7th Field Drainages	
Name	**Number**	**Name**	**Number**
Headwaters White Salmon River	170701051001	Headwaters WSR Upper WSR Cascade/Salt	11C 11D 11E
Upper White Salmon River	170701051002	Wicky/Morrison Buck Green Canyon Ninefoot **Cait** Middle WSR	11F 11J 11K 11M 11Y 11Z
Gotchen Creek	170701051003	Gotchen King Mt Lower WSR	11G 11H 11I

Map 3-8. White Salmon River watershed and its 6th field subwatersheds, with the Gotchen Planning Area superimposed.



Map 3-9. Gotchen Planning Area and 7th field drainages in the upper portion of the White Salmon River watershed.



Hydrography

At approximately 66,509 acres in size, the Headwaters White Salmon River, Upper White Salmon River and Gotchen Creek 6th field subwatersheds combined represent approximately 27% of the entire White Salmon River (5th field) watershed (Map 3-9). This upper portion of the watershed has a dendritic drainage pattern, with the mainstem of the White Salmon River flowing generally from north to south from the upper elevations of Mt Adams to where it meets Trout Lake Creek, a major tributary to the White Salmon River.

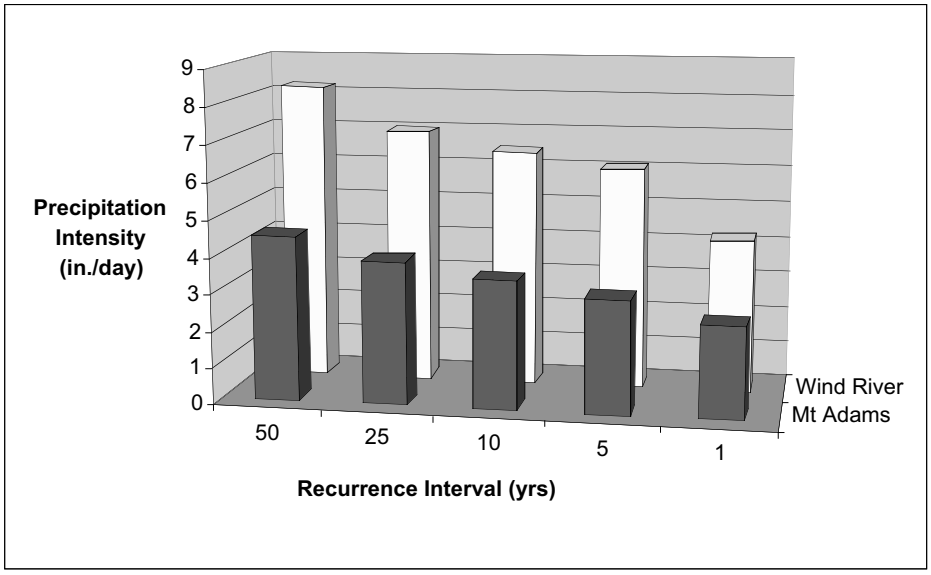
Elevations in the hydrologic analysis area (described above) range from 12,276 feet at the top of Mt Adams to approximately 1,800 feet at the confluence of the White Salmon River with Trout Lake Creek. The Gotchen Planning Area lays near the lower end of this range, with elevations ranging from 2500 to 5600 feet. The mainstem of the White Salmon River is approximately 23 miles long from its headwaters on Mt. Adams to its confluence with Trout Lake Creek near the town of Trout Lake. The river is fed by the White Salmon and Avalanche Glaciers which lie above 7,000 feet elevation on Mt. Adams. It is a relatively high gradient system throughout most of this reach. With the exceptions of Ninefoot Creek and

Green Canyon Creek, which enter the White Salmon River from the west, all of the major tributaries drain the south slopes of Mt. Adams and enter the mainstem of the White Salmon River from the northeast, or mountain side. Channels in the eastern portion of the area (i.e. Gotchen Creek, Hole in the Ground Creek) tend to be dry at the lower elevations throughout much of the year, while those in the north and central portion (i.e. Cascade Creek, Headwaters White Salmon River) are more directly fed by glaciers and have substantial flow throughout the entire year.

Precipitation

The Gotchen Planning Area lies on the east side of the Cascade crest, and on the easternmost edge of the White Salmon River watershed. As such it receives less precipitation, and less intense periods of precipitation than other nearby areas. Over the past 50 years or more, precipitation has been measured at the Mt Adams Ranger District, which is located approximately 3 miles from the lower boundary of the Gotchen Creek subwatershed. During the same period, precipitation was measured at the Carson National Fish Hatchery, located in the Wind River watershed just west of the White Salmon River watershed. Over that period of monitoring, the largest volume of precipitation to occur in a 24-hour period at the Mt Adams station was 4.5 inches, while at the Wind River station, the largest event delivered 8.2 inches over 24 hours. Figure 3-2 shows the recurrence frequencies for precipitation at both stations.

Figure 3-2. Precipitation intensities and recurrence intervals at the Mt Adams Ranger Station (the dark colored bars) and Carson National Fish Hatchery (the light colored bars).



The fact that precipitation intensities in the vicinity of the Gotchen Planning Area are in the neighborhood of one half of those in a neighboring watershed indicates that this area simply doesn't experience the same precipitation intensities that are seen in nearby watersheds. With lower volumes and intensities of precipitation, the necessity of a well developed surface drainage network to rapidly process water inputs is not as great in the Gotchen Creek subwatershed, so much of the "runoff" can occur through other avenues.

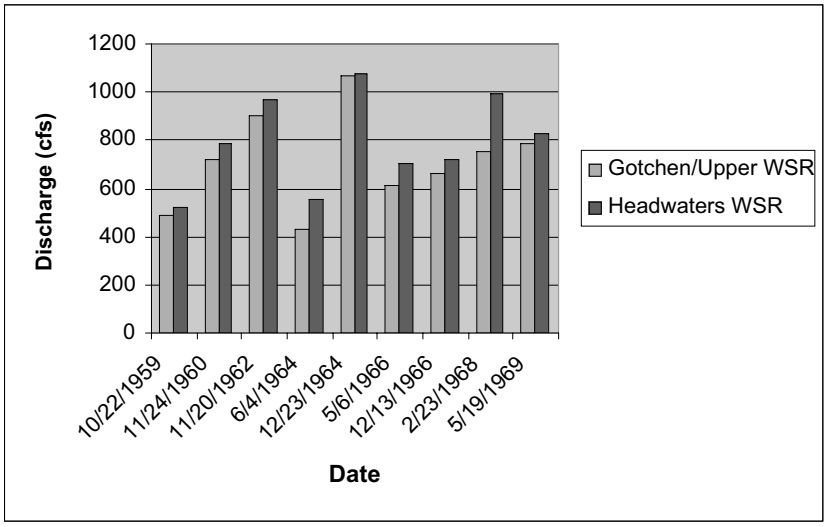
In addition to receiving less precipitation and lower intensities of precipitation, the Gotchen Creek subwatershed appears to route water largely through subsurface pathways as opposed to through surface channels. In fact surface stream drainage densities in this subwatershed are on the order of 2.1 miles of stream per square mile of drainage area. For comparison, drainage densities in the Wind River watershed, a neighboring watershed to the west of the White Salmon River watershed, range from 3.8 to 6.8 miles of stream per square mile of drainage area.

Field surveys confirm that there are very few definable tributaries to Gotchen Creek. The mainstem of Gotchen Creek itself actually appears to get smaller in a downstream direction instead of larger, suggesting that Gotchen Creek is fed by sources higher on the mountain, and is actually losing water as it flows through the lower reaches. Reconnaissance of the lowermost reaches of Gotchen Creek indicates that there is no definable location at which the stream discharges directly to the White Salmon River. In fact the stream appears to terminate where it hits the Trout Lake valley floor. Although farming practices may have obscured any historic channel connection in this area, there is still no evidence of an annually used channel across the valley floor, further suggesting that discharge from Gotchen Creek is not consistently significant at this point. Local residents confirm that over the past 20 years, only twice has Gotchen Creek delivered significant discharge to the valley floor, and these occasions were during major flood events including the February, 1996 flood.

The poorly developed drainage network in the Gotchen Creek subwatershed is due to a number of factors. Of great importance are the high rates of infiltration and capacity for subsurface water movement in this drainage. The coarse soils and relatively porous underlying basalts permit rapid infiltration of water, and numerous pathways for movement of water through the subsurface. In addition, as pointed out above, this drainage doesn't appear to receive the same intensities of precipitation as nearby watersheds. With lower rates of precipitation, and much of the incident precipitation moving quickly into the subsurface, there doesn't appear to be the accumulation of water necessary to form channels. Moreover, the relatively muted topographic relief—particularly in the lower portion of this watershed—doesn't provide the necessary slope to promote channel development when other avenues are more available for the water.

An examination of streamflow records for two locations on the White Salmon River finds support for the belief that Gotchen Creek discharge contributions to the White Salmon River are not significant. Figure 3-3 shows annual flow peaks on the White Salmon River upstream from Gotchen Creek (labeled "Headwaters WSR") and downstream of the confluence with Gotchen Creek (labeled "Gotchen/Upper WSR"). Over the 10-year period displayed, discharge was actually lower downstream of Gotchen Creek than upstream of Gotchen Creek.

Figure 3-3. Annual flood peaks at two locations on the White Salmon River during the 1950's and 1960's.



Discharge from the Headwaters of the White Salmon River watershed was measured at the gauging station just below the confluence of Cascade Creek with the White Salmon River. Discharge from Gotchen Creek and the Upper White Salmon River was measured on the White Salmon River upstream of the confluence with Trout Lake Creek. Although the drainage area for Gotchen Creek and the Upper White Salmon River is much larger than that of the Headwaters White Salmon River, a very small proportion of the discharge during these events appears to be coming from Gotchen Creek and the Upper White Salmon River subwatersheds. Although the fate of precipitation falling on the Gotchen Creek subwatershed has not been studied, it appears from this analysis that much of the water delivered to this system does not reach the White Salmon River directly through surface channels—even during storm flow events.

Beneficial Uses and Key Water Quality Parameters

All streams in the project vicinity are rated by the Washington State Department of Ecology (WDOE) as either Class AA (extraordinary), Class A (excellent). Stream segments on National Forest lands are rated as Class AA, as are all streams that feed lakes within the watershed. Specific water quality criteria have been established by WDOE for each of these classes in conformance with the present and potential uses of the water. The purpose for these criteria and the state water quality standards is to ensure that water quality is maintained at levels that continue to support beneficial uses of those waters. The White Salmon River watershed has a number of important beneficial uses that drive the need for water quality protection. Table 3-28 identifies the beneficial uses that occur in the general vicinity of the Gotchen Planning Area, the subwatersheds they are located in, and the primary water quality parameters of concern. The table is not inclusive of all water quality parameters that may affect the identified beneficial use, but identifies the dominant parameters of concern on National Forest portions of these subwatersheds.

Table 3-28. Beneficial uses and primary water quality parameters of concern in the Upper White Salmon River subwatershed.

Beneficial Use	Location	Primary Parameters of Concern
Community and Domestic Water Supply	Gotchen Cr subwatershed	Fecal Coliform, Turbidity
Resident Fish	Mainstem White Salmon River only	Temperature, Turbidity
Wild and Scenic River	Mainstem White Salmon River and Cascade Creek	Fecal Coliform, Turbidity

Beneficial Use: Community and Domestic Water Supply

Although the town of Trout Lake lies outside of the analysis watershed, most of the residents get their drinking water from the Glacier Springs Water District, which uses water sources along the White Salmon River in the Gotchen Creek subwatershed. The Water District has approximately 320 subscribers in the community. Water used by the Glacier Springs Water District is of excellent quality according to District staff, and currently is neither chlorinated nor filtered. A number of private landowners in the valley have their own water sources as well. These sources are for domestic use, irrigation and stock watering, and come from either groundwater, springs, or from surface channels.

Beneficial Use: Resident Fisheries

The White Salmon River watershed has a resident fishery that is described in the Fisheries section of this document. In essence, fish are known to reside in the mainstem of the White Salmon River only, and not in the tributaries within the Gotchen Planning Area

Beneficial Use: Wild and Scenic River

The upper reaches of the White Salmon River (the portion of the river that lies on National Forest lands) has been proposed for Wild and Scenic River designation. Lower reaches of the river (several miles downstream of the National Forest boundary) have already been designated as Wild and Scenic. Water quality is one of the important features of rivers designated as Wild and Scenic, and the high levels of recreation that occur on the White Salmon River provide additional impetus to maintain high water quality. The Gotchen Creek and Upper White Salmon River subwatersheds, which contain the Gotchen Planning Area, are approximately 47,754 acres in size. This represents nearly 20% of the entire drainage area for the White Salmon River, so changes in water quality or discharge from this area could strongly influence those characteristics of the White Salmon River.

Climate

The White Salmon River watershed lies in the climatic transition zone just east of the crest of the Cascade Mountains. As such, there is a strong moisture gradient going from the west side to the east. Similarly, because of the elevation difference from the lower end of the watershed

to the upper elevations on Mt. Adams, there is a strong moisture and temperature gradient from north to south.

Generally, the climate is typified by cold wet winters and warm, dry summers. Air temperatures at the Mt. Adams Ranger Station, just 3 miles south of the project boundary, range from an average maximum of 36ºF in January to 82ºF in July. Precipitation in the project vicinity ranges from over 140 inches at the upper elevations of Mt. Adams to less than 40 inches near the southeast portion of the Gotchen Planning Area. Approximately 85% of the watershed's precipitation is delivered from October through March, with the majority of that falling as snow during the middle winter months. Typically, much of the Gotchen Planning Area is under snow cover throughout a majority of the winter and early spring months.

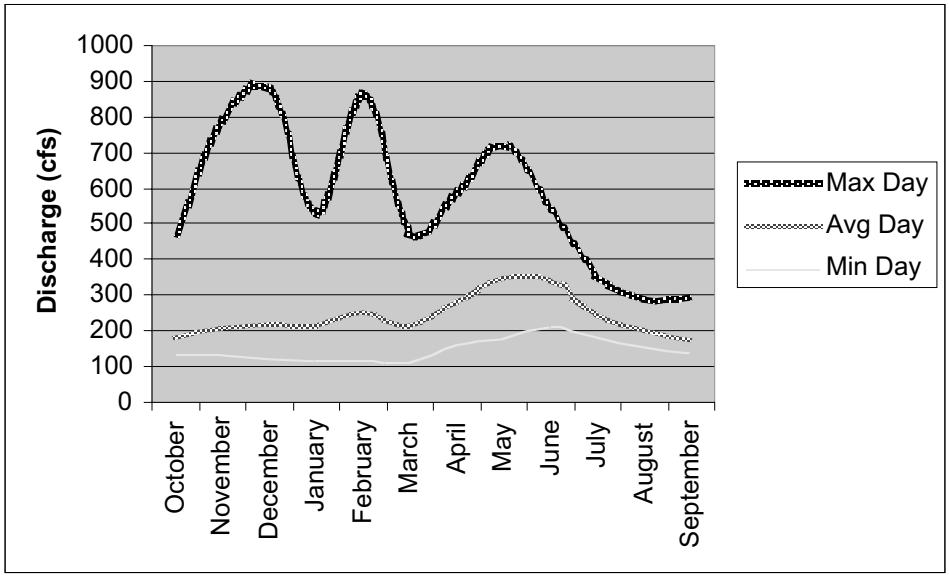
Landscape Features

Landscape-scale features that dominate the Gotchen Planning Area include Mt Adams and its associated volcanic cones (e.g. Snipes Mt., Smith Butte, King Mt.), the Aiken Lava Bed, and the White Salmon River. Past eruptions of the mountain and from other vents in the area laid down layer upon layer of volcanic rocks, that have since been shaped and eroded by glaciation, mass wasting, and weathering. The highly fractured and porous layers of basalt and andesite allow for rapid infiltration and migration of water. It is largely because of this porous geology that most of the Gotchen Planning Area is free of surface water throughout much of the year, and that the White Salmon River is bordered by such a number of prolific springs.

Steamflow Hydrology

The largest peak flows on the Upper White Salmon River typically occur in the late fall and winter months in response to heavy, prolonged rainfall or rain-on-snow conditions (Figure 3-4). Average discharge however, is greatest during the late spring months of April and May, as snowpacks at all elevations of the upper watershed begin melting in response to spring and summer warming. Summer flows in the White Salmon River near its confluence with Trout Lake Creek are largely maintained by melt from glaciers and high elevation snowpacks, springs, and other subsurface storage. However, across the watershed, sources and levels of flow during the summer months vary considerably.

Figure 3-4. Maximum, average, and minimum daily discharge on the White Salmon River (1912-1994).



Throughout most of the Gotchen Planning Area, surface water is scarce throughout much of the year. The only stream reaches known to have perennial flow in the Gotchen Planning Area are the mainstem of the White Salmon River, short segments of Gotchen Creek and Hole in the Ground Creek, Wicky/Morrison, and spring systems along the White Salmon River, some of which are used for the Glacier Springs Water District.

Ninefoot and Green Canyon Creeks, the two streams that drain to the White Salmon River from the west side, do not have glacial influence, but are fed by subsurface recharge and water stored in wetlands and wet meadow systems. Streams in the northern and middle portion of the watershed, including the Mainstem White Salmon River, Cascade Creek, Salt Creek, and the Wicky/Morrison system all have more direct influence of the glaciers and high elevation snowmelt from Mt. Adams. These streams maintain substantial flow throughout the summer months. Daily mean discharge on these streams is typically at an annual low in the fall or winter, with extreme minimums occurring later in the winter when air temperatures have dropped and little water is being released from glaciers and snowpacks. Even during summer months when non glacially-influenced systems are at annual low flow levels, these glacially-fed streams maintain relatively high discharge due to the continued contribution of glacial and snow melt. It is this continued source of late season water inputs, combined with the spring systems lower in the watershed, that is in large part responsible for maintaining summer flows in the White Salmon River.

The Gotchen Creek subwatershed represents the eastern portion of the hydrologic analysis area. This subwatershed lacks the strong signature of glacial melt runoff from the higher elevations on Mt. Adams. Spring systems and water from high elevation snowmelt and subsurface storage in meadows contribute to discharge in summer months, but the perennial flow found in some of these streams at higher elevations diminishes in a downstream direction. This loss of surface water is presumably due to the excessive infiltration capacity of the sandy soils and underlying volcanic rocks in this part of the watershed, and the presence of lava tubes and caves which route water underneath the ground surface. In

addition, extractions and water diversions reduce instream flows on many streams in the watershed. In and around the Gotchen Planning Area, water is diverted from Gotchen Creek and a tributary to Gotchen Creek and is piped or ditched to locations outside of the Gotchen Planning Area. These diversions have been in place for decades and are not know to be gauged. Although the fate of water draining through subsurface pathways is unknown, it is thought that much of the water from this portion of the watershed is re-emerging as springs along the White Salmon River downstream.

Water Quality

Water quality is generally good in the analysis watershed. Maximum water temperatures have been measured on the White Salmon River for the past decade or more, and indicate that water temperatures consistently meet state standards for temperature. No streams within the Gotchen Planning Area are currently on the Department of Ecology's 303(d) list for water temperature.

Lesser monitoring has been conducted for fecal coliform, but the monitoring that has been accomplished indicates that where the river flows across National Forest lands, state water quality standards for coliform are consistently achieved. However, the White Salmon River is listed on the 303(d) list for exceeding state coliform standards in two locations downstream of the National Forest boundary: one is in the Trout Lake Valley, upstream of the confluence of Trout Lake Creek and the White Salmon River; the second is on the White Salmon River in the vicinity of the town of BZ Corners.

Turbidity in streams draining the watershed is highly variable both temporally and spatially. No data has been collected to allow quantification of turbidity levels in the White Salmon River near the Gotchen Planning Area. During months when glacial melt is high, turbidities are also high in those streams strongly influenced by this runoff. Turbidity in these systems rises and falls diurnally, but remains high for relatively extended periods. In those streams that do not have the glacial influence, turbidities are at annual lows during summer months, and have more discrete peaks during the winter months in response to major precipitation or rain-on-snow events.

In terms of water quality at the Glacier Springs, the Forest Service has no data to characterize these springs. However according to Glacier Springs Water District personnel, water quality at the source of the springs is excellent. In fact, this source currently undergoes no treatment before being delivered to consumers.

FISHERIES

The Gotchen Planning Area encompasses two 6th field subwatersheds and seven 7th field drainages, as shown in Table 3-29. The 7th field drainages are currently used to delineate the boundaries for potential bull trout habitat, and would be used in this document to analyze the potential effects to fisheries and fish habitat.

Table 3-29. 6th Field Subwatersheds and 7th Field Drainages encompassed by the Gotchen Planning Area.

6th Field Subwatersheds		7th Field Drainages		
Name	Number	Name	Number	Acres
Upper White Salmon River	170701051002	Wicky/Morrison Buck Cait Middle WSR	11F 11J 11Y 11Z	6,791 4,663 922 2,824
Gotchen Creek	170701051003	Gotchen/Hole in the Ground King Mt Lower WSR	11G 11H 11I	12,733 11,065 4,010

Fish Populations

Anadromous Fish

There are no anadromous fish species present in the Upper White Salmon River subwatershed. Several migration barriers exist in the lower White Salmon River and include Condit Dam at river mile 3.3, a 21-foot waterfall at river mile 16.2, and several other falls greater than 8 feet in height. Condit Dam has blocked upstream migration of salmonids since 1913. There is no known official documentation of anadromous fish inhabitance above the falls at river mile 16.2, although anecdotal information exists claiming steelhead were found in Trout Lake prior to Condit Dam installation.

Fish inhabiting the Lower White Salmon River below the dam include coho, fall and spring Chinook, and summer and winter steelhead. The current coho population below the dam is believed to be low and predominantly hatchery strays from the Willard and Little White Salmon River hatcheries (NPPC 1994). Small numbers of pink salmon are also reported to use the lower river. Nehlsen, et al. (1991) indicate that the remaining native anadromous stocks in the lower river below the dam are at a high risk of extinction or are functionally extinct.

Resident Fish

Resident fish species in the Upper White Salmon River include rainbow trout and brook trout. No known proposed, endangered, threatened, or sensitive fish species have been documented on Forest Service lands within the Upper White Salmon River or Gotchen Creek subwatersheds. Extensive stocking of hatchery cutthroat, rainbow, and brook trout has occurred in the White Salmon River and began in the 1930's. Washington Department of Fish and Wildlife records show cutthroat trout inhabited the Upper White Salmon River in the 1930's, but it is unclear if these fish were native or stocked. Recent population inventories have not found cutthroat trout in the Upper White Salmon River or in any of its tributaries.

Of the seven 7th field drainages in the Gotchen Planning Area, only two, the Lower White Salmon (11I) and the Middle White Salmon (11Z), are known to inhabit fish. The only fish-bearing stream in these subwatersheds is the White Salmon River itself, which contains rainbow and brook trout. Two fingers of drainage 11I extend into the Gotchen Planning Area,

but there is no above surface water flow connection from these fingers to the White Salmon River.

At this time all of the fish-bearing streams on the District are considered habitat for coastal cutthroat trout, a Forest Service Sensitive species. Because the Middle White Salmon River (11Z) and Cait Creek (11Y) drainages have not been ruled out by the USFWS and USFS as potential bull trout habitat, streams within these drainages and the White Salmon River itself are currently considered bull trout habitat. However, no bull trout have ever been found in these streams. Comprehensive surveys in sections of the Mainstem White Salmon River that falls within the Gotchen Planning Area have not been completed due to inaccessible and hazardous survey conditions. Population surveys in the accessible reaches of the White Salmon River and its tributary streams, some which fall within the Gotchen Planning Area, have been conducted by the USFS, and most recently by the Washington Department of Fish and Wildlife (Thiesfeld et al, 2001, Byrne et al, 2001), and no bull or cutthroat trout have been found. Cait Creek only runs a very short distance, flowing out of a spring for approximately _ mile before meeting the White Salmon River. A 30-foot waterfall exists at the confluence of Cait Creek followed by 150 feet of steep stream gradient (20 – 40%). A 2002 electrofishing survey did not find fish present in Cait Creek, and this stream would likely be dropped as potential bull trout habitat in the near future.

In addition to Cait Creek, the other streams within the Gotchen Planning Area with above surface stream flow into the White Salmon River include Wicky Creek (11F) and Buck Creek (11J). Recent extensive population surveys in these streams by the Washington Department of Fish and Wildlife and the Forest Service have led to the conclusion that these drainages are non-fish-bearing. A waterfall is present at the confluence of Wicky Creek with the White Salmon River preventing upstream migration.

The Gotchen Creek (11G) and King Mt. (11H) 7th field drainages contain no fish-bearing streams or streams with any above surface connection to the White Salmon River. Several streams are depicted on Forest topographic maps in subwatersheds 11G, 11H, and 11I that do not exist. These spots were ground checked in 1999, 2000, and 2001 and were consequently eliminated from the Gifford Pinchot National Forest's aquatic GIS layer. The lack of surface flow in these subwatersheds is likely due to rapid infiltration through porous sands and underlying basalt, combined with gentle topography (Upper White Salmon River Watershed Analysis, 1998). Table 3-30 summarizes the drainages containing fish-bearing streams, potential bull trout habitat, and drainages with tributary streams that contribute surface flow into the White Salmon River.

Table 3-30. 7th field drainages containing potential bull trout habitat areas, fish-bearing streams, and tributary streams that contribute surface flow into the White Salmon River.

	Wicky/Morris.	Gotchen	King Mt	Lower WSR	Buck	Cait	Mid. WSR
	11F	11G	11H	11I	11J	11Y	11Z
Fish Bearing Streams	No	No	No	Yes	No	No*	Yes
Potential Bull Trout Habitat	No	No	No	Yes	No	Yes	Yes
Above Surface Flow to White Salmon River	Yes	No	No	No	Yes	Yes	Yes

* No fish found during 2002 survey; would likely be dropped as potential bull trout habitat in the future.
WSR = White Salmon River

Fish Habitat

The only fish-bearing stream in the Gotchen Planning Area is a section of the White Salmon River. The section of the White Salmon River within the Gotchen Planning Area boundary has never been habitat surveyed. This section of the river is a steep canyon (Rosgen stream type B), which is inaccessible in most areas and is too large to be surveyed by the Region Six Level II stream survey method. Much of the river is glacial fed and has substantial flow throughout the year. Sediment levels can be high during the snowmelt months due to glacial runoff from Mt. Adams. Much of the White Salmon River in this section has bedrock and boulder banks, therefore little channel meandering and bank cutting is occurring.

Summer water temperatures in the White Salmon River have been recorded intermittently for the last 20 years at the Forest Service baseline water quality monitoring station located in the Lower White Salmon River drainage (11I). Water temperatures are generally cold and have never exceeded state standards (see Water Quality analysis done for this project for detailed stream temperature monitoring results). Glacial melt and springs maintain substantial cold water summer flows in the White Salmon River, as well as in several tributary streams to the river. These cold glaciated streams are relatively biologically unproductive.

CULTURAL RESOURCES

Prehistory/Native Use

Several prehistoric sites have been documented within the Gotchen Planning Area. These include two isolated artifacts and two prehistoric camps. One of the isolated artifacts is a corner-notched obsidian dart point. It is assumed that this object was intended for use hafted to a foreshaft, in an atlatl-and-dart weapon system. The point is similar to types used in the Columbia Plateau from about 2500 to 1500 years B. P. The second isolated artifact is a jasper core, indicative of local tool stone procurement as seen throughout the White Salmon River drainage.

The camp sites appears to be low density lithic scatters, one situated in a meadow environment, and the other near a water source. All of these sites are consistent with a model of seasonal transhumance by small hunting and gathering groups, who move into the higher elevations out of low elevation winter residences, following resource availability.

A variety of warm season resources were available within the Gotchen Planning Area, including huckleberries, strawberries, raspberries, blackberries, gooseberries, currants, chokecherries, service berries, elderberries, hazelnuts, black lichen, white bark pine nuts, and animals such as deer, elk, bear and grouse. There are a number of references in the ethnohistoric literature to huckleberry collection and processing in the area around Mt. Adams.

Huckleberries grow best in high elevation areas that have been burned over by forest fires (Minore, et. al 1979). Without the intervention of fire, the huckleberries are eventually crowded out by competing vegetation. Prior to about 1910 it is likely that Indians purposefully maintained large burns by either leaving their drying logs smoldering after

leaving the berry fields or by directly setting fire to berry patches at the end of the berry season.

In August of 1878 Francis Marion Streamer joined a group of Yakama Indians traveling to huckleberry fields on Mt. Adams, and he described the expedition in some detail (Briley 1986). They entered the valley of the White Salmon River from the Glenwood area (then called Camas Prairie), most likely following the trail shown on the 1890 GLO Plat map, labeled "Trail from Camas Prairie to White Salmon River." They then proceeded approximately 9 miles northwest, to camp near a spring along a creek that Streamer referred to as Clear Creek, "in a beautiful cluster of firs, pines and alders." It is likely that this camp was located somewhere between the upper reaches of Wicky Creek and Cascade Creek. Streamer described over 100 Indian "tents" within a radius of two miles of their camp, which suggests that this was along the main route of travel to what were then the huckleberry fields. It also suggests a pattern similar to that seen in the more recently used huckleberry fields in the Indian Heaven area, where each family group had their own camp that they returned to year after year, in close proximity to the camps of other families. Streamer describes activities he observed at the camp, including the weaving of tule mats (probably procured from Trout Lake) and baskets, as well as the construction and use of a sweat lodge.

A 1914 report on land use within the National Forest (Hastings 1914) contains the following description for Township 7 North, Range 11 East: "In addition to sheep grazing and some cattle grazing in the extreme southeast corner, the area is annually visited by several hundred campers, mostly Indians, who congregate here to gather blueberries for domestic purposes."

There are several recorded peeled cedar sites in the Wicky Creek drainage, and these are probably directly related to huckleberry procurement, and most likely date to the late 1800's.

Figure 3-5. Peeled cedar tree along Wickey Creek.

Historic Grazing

Historic documents indicate grazing on the southern slopes of Mt. Adams dates to 1885, probably following an extensive forest fire in that year which burned thousands of acres on the southern slopes of Mt. Adams. Sheep were the first livestock brought into the area, with cattle following near the turn of the century. The first band of sheep belonged to Charlie and Alexander McAllister and William Smith, who were originally from New Zealand, but in the early 1880's were in the sheep business in the John Day Valley. Smith Butte was named for William Smith. They brought a band of 5000 sheep to the area between King Mountain and Bird Creek in 1885. According to an interview with Charlie McAllister in 1939, the range was excellent, with the timber quite open. In 1886 they took a new partner, Michael King from New Zealand, for whom King Mountain was named. King brought the second band of sheep to the area. The Gotchen (or Gotzen) family of Grass Valley, Oregon was the third family to bring sheep to the area, in 1887. They used the Gotchen Creek drainage, which was named for them. John O'Leary added a fourth band in 1888, which was also trailed from Grass Valley, Oregon.

From 1885 to 1892 the numbers of sheep brought to the area increased each year. Estimates of the number of sheep grazing on Mt. Adams before the turn of the century are staggering, ranging from 100,000 to 150,000 animals. A herder and a packer stayed with each band during the summer.

With the infusion of cattle into summer grazing lands, hostilities broke out between cattle ranchers and the sheepherders, both of whom were vying for the same range. This was exacerbated by both the overwhelmingly large numbers of sheep, and by the fact that many of the sheep were initially from Oregon, while the cattle were all from local Glenwood ranches. A family by the name of Bird, who immigrated from Germany, settled in the Glenwood Valley and was running cattle at this time. Bird Creek and Bird Mountain (later changed to Smith Butte) were named for this family.

According to McAllister, the "sheep and cattle war" resulted in camps and tents being burned, and two or three sheep employees were wounded by gunfire, but no one was killed. At this time the range was not administered; it was the establishment of the Forest Reserves in 1897 and the creation of separate sheep and cattle allotments administered by the early rangers that eventually eased these tensions.

According to Lloyd Hickey, a man from the Glenwood area who went to work herding sheep on the Forest in 1912, the pine timber at that time was very open, and the forage was good. He claimed the forests "were in this open state as a direct result of years and years of light burning when no one made any attempt to put out a fire in the forests or range lands. At this time there was very little underbrush, no mass reproduction of pine or other conifer seedlings" (Ladiges 1978:198). He recalled that even by 1912, the Forest Service had curtailed what he referred to as "broadcast burning".

The Glenwood Cattle Allotment was established in 1914, and included the easternmost portion of the Forest west to Hole-In-The Ground creek. Records indicate however that cattle have grazed on lands within this allotment since at least 1910, as indicated by a reference in the 1911 Grazing Report to cattle ranging "in the Hole-in-the-ground" (Stabler 1911). The Mt. Adams Cattle Association was organized in 1916, listing 26 charter members. District

records indicate that Association members obtained grazing permits on the Mt. Adams Cattle Allotment in 1917. The grazing season on the allotment generally lasted from early June to October. A range rider was hired for the summer months to monitor the grazing areas, restock salt logs, and mend fences.

A number of other sites within the project relate to grazing, including several corrals and loading chutes, stock drift fences, bridges, stock driveways, watering troughs, irrigation ditches, water pipelines, salt log locations, and camps. The majority of these date to after 1917, and were constructed by the Mt. Adams Cattle Association.

A water pipeline, referred to as the Gotchen Creek Pipeline, was installed in 1920. An extension was constructed in 1937. The pipeline, sections of which are currently maintained, carries water from Gotchen Creek (at Cow Camp) to the southern portion of the Mt. Adams Cattle and Horse Allotment. Forest maps dating from 1919 to 1959 indicate a water trough was located in section 30 of T7N, R11E. This is the hollowed pine log trough recorded as 7N11E-30/01. Maps from 1943 to 1959 indicate a second trough in Section 36 of T7N, R10E. This second trough is listed in the 1946 Project Work Budget Atlas as the Lower Trough, although no date of construction is given. This probably indicates it was added after 1946.

Stock drift fences within the area include the Bird Creek Boundary Fence, constructed in 1936 (T7N and T8N, R11E), the Wicky Creek Division Fence, constructed in 1919 and 1929 (T7N, R10E and R11E), Mt. Adams Cattle Range Boundary Fence (T6N and T7N, R10E and R11E), and the Gotchen Creek Division Fence, constructed in 1929 (T7N, R11E).

Dendroglyphs

Although there are a number of sites within the watershed boundary that relate to grazing, carved aspen sites are one of the most important, in that they provide a uniquely human perspective on grazing activities. Fifteen clusters of carved aspens have been documented within the area, all of which contain trees inscribed with names and dates that precede the establishment of the Columbia National Forest. At least eight of the trees exhibit dates that pre-date the establishment of the Mt. Rainier Forest Reserve. Of the 190 trees that have been documented, 11 exhibit dates ranging from A.D. 1875 to 1899, and an additional 39 trees are inscribed with dates ranging from A.D. 1900 to 1910.

Research has established the identities of several of the men whose names appear at these sites. The name of Link Jordan is inscribed into trees at five sites in the area, with dates ranging from A.D. 1887 to 1895. Lincoln Jordan was born in 1872 at Bickleton, Washington, and made his living “raising sheep and following the grazing” (May 1982: 256). The name of Will McGrath appears at three different sites, along with dates of 1903 and 1909. At one of the sites his name has been modified, so that each letter provides the first or second letter of a profanity. Although most of these words are still perceived as profanities today, the choice of “Muttonhead” for the letter M probably indicates that Mr. McGrath was a sheepherder. The McGrath family settled in the Glenwood area in 1891, and Will McGrath was probably one of the sons. The name of Tim Ward appears at site 7N10E-18/03, along with a date of 1907. Ward, who lived in Glenwood, ran sheep on King Mountain in the early 1900’s. William Jebe, whose name appears with dates of 1906 and 1908, was another Glenwood resident who

settled in Camas Prairie in 1883, and who later went to work for the Forest Service as a timber scaler in 1909.

The carved aspen sites provide a link to the overall picture of historic open range grazing activities on the Gifford Pinchot National Forest. While historic documents may identify particular individuals as stockmen and perhaps provide brief family histories, they do not provide the locations or dates of their grazing activities. Without the inscriptions noted at these carved aspen sites our knowledge of who utilized the early forest resources of the Mt. Adams District would be limited to generalizations. Viewed as one component of an agricultural theme based on open range grazing, these sites provide an historical perspective not attainable through maps, historic documents, or personal interviews.

Historic Trails

A number of old trails are shown on early maps for the area. The oldest is the trail shown on the 1886 GLO map of T. 7 N., R. 11 E. and labeled “Trail from Camas Prairie to Mt. Adams.” This is the route followed by C. E. Rusk in 1890 when he made his circuit of Mt. Adams, and was the route used by those wishing to climb the south side of Mt. Adams until the 1920’s.

Trails shown on the 1909 Columbia National Forest map include the “Morrison Trail”, connecting the town of Guler north to the Chain of Lakes area. It is possible that this was the route followed by Francis Marion Streamer in 1878.

The Dead Horse Trail and Stock Driveway appears on maps as early as 1909, and it was one of the stock driveways connecting between Glenwood and the Twin Buttes area. It crossed the White Salmon River near the confluence of Green Canyon Creek. Another stock driveway was the Hole-In-the-Ground trail, which went north from the Dead Horse Driveway to connect to the Morrison Trail.

The first road shown on maps is the road connecting Glenwood to the Gotchen Creek Guard Station. This is shown on the 1909 map as a wagon road, and is labeled as a road passable by automobile in 1912. A 1912 map labels this trail as the "Gotzen (sic) Creek Trail". It was not connected through to the town of Guler until 1920. The second road to be constructed was the road to Morrison Creek Camp, which existed as early as 1917, but which was improved by the Forest Service in 1921. This road followed the general route of the Morrison Trail. The road to Cold Spring Camp was completed in the mid-1920’s.

Forest Service Administrative History

One of the earliest Ranger Stations established on the Columbia National Forest was the Gotchen Creek Ranger Station, located along the wagon road from Glenwood. The station functioned as the headquarters for the Mt.Adams District from its construction in 1909 until 1916. The site was selected to allow the Ranger to administer grazing activities. A 1910 Special Fire Report discusses the need for this station: “The range of the greater part of the sheep that use this Forest is in this district, and more than one-half of the bands pass near Gotzen Creek in going to and from the forest, and…the District Ranger must of necessity keep in close touch with the sheepmen.”

A pasture fence was added to the site in 1928, a barn in 1932, a garage in 1933 and a corral in 1938. The cabin is the only structure remaining at the site, and it is the oldest standing structure on the Gifford Pinchot National Forest. The Gotchen Creek Guard Station has played an integral role in the history and development of the Mt. Adams Ranger District and is an excellent example of the type of construction undertaken by the Forest Service at its inception as a resource management agency.

Railroad Logging

According to District records and interviews with brakeman and engineer Louis Lorengel, the J. Neils Lumber Company began railroad logging in T. 7 N., R. 11 E. in June of 1942. The logging continued seasonally through 1946 and extended west to the White Salmon River. The sale was intended to selectively cut ponderosa pine, removing 50% of the volume. The operation consisted of tree length skidding by tractors. At the landing the logs were scaled and bucked, and then skidded to a McGiffert Steam Loader for loading onto rail cars. The loaded rail cars were hauled to Camp Draper where a second engine took over, hauling the logs to the mill at Klickitat. Once a particular area had been logged, the tracks would be picked up and laid elsewhere. Most of the railroad grades in the area were later converted to Forest Roads.

SOCIO-ECONOMIC

The Gotchen Planning Area is divided between Skanamia County and Yakima County, Washington however it is bounded on the south by Klickitat County, Washington. The nearest community is Trout Lake (Klickitat County), Washington. Klickitat and Skamania Counties have the nearest residential communities to the Gotchen Planning Area and provide representative demographic and economic profiles of this area.

Demography

Klickitat County has a population that is considered 80% rural. Skamania County is considered 100% rural. Private and Reservation lands to the south and east of the Gotchen Planning Area tend to be sparsely populated, except for the unincorporated town of Trout Lake.

The ethnicity of these counties is predominantly white. Klickitat County is 88% white. Skamania County is 92% white. In both counties, Hispanic/Latino people make up the largest component of the non-white population, followed by American Indian people.

Economy

The economy of Trout Lake is agricultural/natural resources based but trending to services largely in support of recreational visitation to the Gifford Pinchot National Forest. Even with the addition of low-wage service jobs and accounting for agricultural workers, the unemployment rate of Klickitat and Skamania Counties are nearly double that of Washington State, as a whole. Throughout the Pacific Northwest, rural communities adjacent to national forests have traded higher paid, family wage jobs for lower-wage service jobs with the

decline of national forest timber harvest. Loss of employment in the “farming, fishing and forestry” sectors is evident in Klicktat and Skamania Counties. Between 1990 and 2000 there was a 40% decline in employment in these occupations in Klickitat County and a 68% decline in Skamania County. Correspondingly, employment in the service sector increased 27% in Klickitat County and 143% in Skamania County. (Sources: 1990 U.S. Census, 2000 U.S. Census)

The percent of households now considered to be below the poverty level is 17% for Klickitat County, 14.8% for Yakima County, and 10% for Skamania County, as compared to 10.6% for all of Washington State. (Source: 2000 U.S. Census)

At the other end of the scale, the Trout Lake environs are desirable for location of affluent homes, both second homes and primary residences. These homes are sited in wooded areas and for aesthetic reasons are often are constructed using flammable materials (log or natural wood siding). Because of location they are as susceptible to fire as low-income households.

Use of the National Forest including the Gotchen Planning Area includes both recreational and subsistence hunting and gathering of forest products (firewood, mushrooms, berries, boughs, etc.) Besides the residents of the Trout Lake community, the Gotchen Planning Area is accessible from the east where it adjoins the Yakama Indian Reservation. Lands on the east side of the Gifford Pinchot National Forest are included in lands ceded from the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama Indian Nation). Treaty rights include the rights to fish, hunt, and gather traditional foods and medicines on ceded lands. There are no statistical records of the present use of the Gotchen Planning Area specifically for these purposes, however the area was identified as important for gathering plants for food and medicinal purposes (ref. Cultural Resources).

The Gotchen Planning Area adjoins private and state lands to the south and the Yakama Indian Reservation to the east. Early in the planning stages, both representatives of the Yakama Indian Nation and the largest private landowner identified a potential significant risk of economic and resource loss from fire originating within the Gotchen Planning Area and moving into adjacent non-federal lands.