CHAPTER 4. ENVIRONMENTAL CONSEQUENCES

This Chapter identifies the effects of implementing each alternative. Impacts to the resources are disclosed with applicable GP Forest Plan Standards and Guidelines, and Mitigation Measures identified in Chapter 2, in place. To aid the reader, the significant issues are summarized from Chapter I, and the corresponding Measurement Methods are repeated. In other resource sections, non-significant issues are stated, along with their respective Measurement Methods. The remaining effects disclosures are legal requirements and do not necessarily identify Measurement Methods.

References to the Project File throughout this chapter refer to specialists' reports that are on file and may be inspected at the Mount Adams Ranger District office.

The terms "effects" and "impacts" are used interchangeably in this analysis. An effect described as any change in physical, biological, social or economic factors, which directly or indirectly results from the implementation of an action. Impacts may be adverse or beneficial depending on the type of change. For analysis purposes for this Statement, environmental effects are disclosed at three points in time following implementation: 1-5 years (a span of time is used since the activities wouldn't realistically be implemented all at once); 10 years, and 50 years. The following definitions are used:

- Direct Effects caused by the action (activity) and occur at the same time and place as the action.
- Indirect Effects are reasonably foreseeable effects caused by the action, but occur later in time or are further removed from the project site.
- Cumulative Effects result from the incremental impact of the actions when added to other past, present, and/or foreseeable future actions, regardless of what agency or person undertakes such other actions.

Two tables illustrate the Forest Service-related actions that are included in the cumulative effects analysis. Table 4-1 compiles the past developments and the reasonably foreseeable future actions *not* associated with this decision. These actions are illustrated in Map Packet – Map13, Non-Gotchen Related Activities. Table 4-2 summarizes the potential future risk reduction activities that relate to the strategies identified in the respective Gotchen Alternatives. The figures from this second table are derived from and are shown on the tables in Appendix G. The values from both Tables 4-1 and 4-2 are incorporated into the cumulative effects analyses.

Future regulated timber harvest (PSQ), within the Matrix lands, within the Gotchen Planning Area, was determined based on the GP Forest Plan, as amended by the NW Forest Plan. Table 4.1 illustrates the outyear timber harvest schedule, by decade. It is assumed, for this analysis, that there would be no additional scheduled harvest (other

than proposed within the treatment alternatives) during the time period from 2003-2013, within the Gotchen Planning Area.

In addition to the potential projects shown on Tables 4-1, the Washington State Department of Natural Resources is planning to harvest approximately 300 acres of timber within the Gotchen Creek subwatershed within the next year (2003-2004). The silvicultural treatment would convert older forests to young second growth timber stands. Several resource areas also take these off-forest activities into consideration in their effects analysis in this Statement. These off-forest activities are not displayed in Tables 4-1 or 4-2.

Future regulated timber harvest (PSQ), within the Matrix lands, within the Gotchen Planning Area, was based on the GP Forest Plan, as amended by the NW Forest Plan. Table 4.1 illustrates the outyear timber harvest schedule, by decade. It is assumed, for this analysis, that there would be no additional scheduled harvest (other than proposed within the treatment alternatives) during the time period from 2003-2013, within the Gotchen Planning Area.

Table 4-1. Summary of baseline conditions and foreseeable future Federal activities considered in the Cumulative Effects Analysis.

Activity	Past & Present (Baseline Condition)	Foreseeable Future Activities
Grazing 516 head, 6/1-9/30	19,680 acres.	19,680 acres
Trails	4 miles	5.4 miles
Present Fuel Reduction Thinning	35 acres	40 acres
Timber Harvest Regeneration LFR	1,900 acres	1,052 acres
Young Forested Plantations (post 1960)	1,900 acres	
Young Stand Thinning/Underburning	471/0 acres	920 acres
Timber Commercial Thinning	212 acres	1,866 acres
Partial Harvest/Salvage	3,882 acres	
Existing Roads	100 miles	100 miles
Horse Camp	3 acres	3 acres
Snowparks	2 acres	2 acres
White Salmon Seed Orchard	37 acres	37 acres
Range Water Line	1.9 miles	01.9 miles

Table 4-2. Future Gotchen Risk Reduction Strategy Related Activities.

Future Gotchen Risk-Reduction Strategy-Related Activities	
Activity	**Acres**
Underburning, Alt B	1,710 acres
Underburning, Alt C	2,102 acres
Underburning, Alt D	1,672 acres
Young Stand Thinning, Alt B	722 acres
Young Stand Thinning, Alt C	711 acres
Young Stand Thinning, Alt D	696 acres
Commercial Thinning, Alt B, C, D	38 acres
Uneven aged management, Alt B,C,D	48 acres
Sanitation Thinning, Alt B, C, D	91 acres

FIRE

Significant Issue: Efficacy of Risk (Fire Threat) Reduction Activities

There is skepticism as to whether or not fuel reduction treatments are effective in reducing the threat of stand-replacing fires. In addition, the risk reduction activities have the potential to increase the amount of dead and down material, adding to the existing surface fuels, thus creating a more receptive fuel bed and increasing the potential of a fire ignition.

High levels of fire threat-reduction practices that include prescribed fire may also increase the risk of fire ignition (i.e. human-caused fire) and directly conflict with maintaining late- successional conditions.

Measurement Methods

Hazardous fuels reduction- number of acres of surface fuels treated resulting in a historic fuel load, fire spread and intensity level. Surface fuel treated includes snags and down wood existing on the forest floor, ladder fuel (crown base height) and live understory vegetation (shrubs and trees up to 8 ft tall).

Continuous fuel breaks created (fire risk reduction) Acres with modified surface fuel or canopy treatments.

Fire regime restoration- Acres treated and maintained utilizing prescribed fire in high fire frequency/low intensity areas.

Alternative A -- No Action

Direct, Indirect, Cumulative Effects (1-5 years)

Under the No Action Alternative, fuel reduction activities would not occur. A continuation of the existing fire management policy would require all fires within the LSR and Matrix lands to be actively suppressed. Fire frequency and occurrence would remain similar to that of the last thirty years. Human caused ignitions may increase as a result of the increased fire hazard conditions. Increased surface fuel buildup and crown fire threat would continue to be a primary threat to the high value habitat areas in and adjacent to the LSR.

Due to the spread and continuation of the western spruce budworm, areas of fire hazard from fuel build up would follow the progression of the infestation (Refer to Map Packet -- Map 3, Defoliation). Dead and dying trees would continue to add to the surface fuel load with Fuel Model 10 becoming a greater component of the LSR and in areas of high bug kill.

With the increase in fuel loads, fires occurring would be at greater intensity level, with increased rates of spread and a reduced ability to control by initial suppression forces. The potential fire behavior may be that of which control efforts are greatly reduced and the likelihood of stand replacement fires increases.

The potential for crown fire in the Gotchen Planning Area would remain unchanged in the high elevation areas and continue to increase in the mid to low elevation areas as more of the stand develops into dense multi-layered forest condition along with the increase of surface fuels.

Surface fuel flame lengths and fire intensity levels in areas of high mortality would increase the potential for fire spotting and spread. Independent crown fire (individual trees torching) may increase under these stands due to the increased fire intensity.

With the No Action alternative, the potential for fire to spread unimpeded across the landscape would remain unchanged. Forest fuel buildup within the contiguous stands would accumulate rapidly in the areas of high mortality. Fuel reduction treatments on adjacent private lands, within the forest on young stand thinning, and future timber sales would break up the continuity and arrangement of the surface and ladder fuels slowing the spread of unplanned fire.

Cumulative Effects (10 and 50 years)

A continuation of fire exclusion would have the greatest effect in the low elevation areas of the warm/dry Grand fir, Douglas-fir plant association group (shown as high and very high fire threat in the Composite Fire Rating, Map Packet – Map 4). Fire exclusion would continue to change the plant community from a historic fire resistant group to that of a high fire susceptible area (Agee 2001). With increased tree densities and competition from grand fir, ponderosa pine and other fire resistant species would continue to be replaced.

The majority of the trees killed by the western spruce budworm in the mid 1990"s would have fallen to the forest floor. A high percent of the Gotchen Planning Area would have doubled the surface fuel load to well over 50 tons per acre. Natural decay of the large diameter material would increase the receptiveness of fire ignition due to the increase surface to volume ratio caused from normal breakdown. A wildfire under a high to severe fire weather condition would most likely produce an intense, high mortality-type fire.

The effects of fire exclusion within the mid- to- high elevation areas in Gotchen would be less noticeable than that of the lower areas; assuming no large fire event, the natural fire cycle for the central and northern areas would be at or near 150 years of fire exclusion. The stands are within the natural range in the north and exceeding its range in the mid elevation areas (Agee 2001). Insects and disease would continue to spread in these areas increasing the fire hazard potential. Most fires would continue to remain small under the majority or "moderate" fire season. The potential for large severe fires would increase as more of the stand becomes homogenous over time, the average fuel bed depth continues to increase and the normal fire regimes continue to be altered.

Effects Common to All Action Alternatives

Under all of the action alternatives, fuel reduction treatments are proposed within the central and southern portions of the Gotchen Planning Area. This is the area that has been identified as having missed several natural fire cycles, is most changed from its natural distribution of vegetation and is at a moderate to high risk of stand replacement fire (Agee, 2001; Hummel et al, 2002). The effectiveness of the fuelbreaks proposed coupled with thinning and future underburning within the area would alter fire behavior. Both surface and crown fire behavior would be reduced under all of the proposed treatments. All of the action alternatives would increase the protection capability of wild fire suppression forces by altering fire behavior and effects, and creating areas with improved changes for successful suppression outcome.

The proposed activities would decrease the potential of stand replacement fire moving across the landscape by reducing the risk of crown fire initiation by reducing the surface fuel levels (reducing surface fire intensity and spread); by reducing the ladder fuel component; and by breaking up the continuity and arrangement of the existing surface and standing vegetation. All acres treated by burning would reduce the volume of available surface fuels and created slash

Treatments proposed include landscape-level threat reduction actions as well as site-specific hazard reduction proposals. All of the treatments would manipulate the existing vegetation and surface fuels in order to lessen its flammability, reduce the amount of fuel available to burn, and result in a landscape that has a range of vegetative and fuel mosaics that would isolate hazardous areas and reduce fire spread. An increase in forbs and shrubs would be expected to occur due to the openings of the stands treated and in high mortality areas. While this growth would have some effect on surface fuel moisture, minimal fire behavior changes would be expected.

The threat of fire would be reduced across the entire planning area in all action alternatives. Under high to extreme fire weather scenarios, the proposed activities would modify the fire behavior entering treated stands; however, the preventative actions may not be adequate in stopping a fire at specific locations.

All of the proposed activities are within areas of missed fire return intervals, and are designed to take advantage of existing roads and natural features in order to slow or change fire behavior and spread. In areas of treatment, the resulting fire behavior prediction based on BEHAVE would be at low- to-moderate intensity levels.

Under Alternatives B, C and D, 6.4 miles of forest roads would be decommissioned and access would be limited using gates and barriers on an additional 18.35 miles. These actions would reduce the potential for human caused fires. Other than these actions there would be no effect to ignition risk. Roads accessing untreated stands (high fire threat areas) would be gated or blocked and would be available as needed under fire emergency or prevention. The 6.4 miles of roads proposed to be decommissioned would not adversely affect the ability of fire suppression crews to respond to a fire or increase fire threat.

Under the action alternatives, all of the proposed treatments would alter the movement of unplanned fire by creating fuel breaks and treating surface fuels. Creating fuel breaks and removing heavy concentrations of surface fuels (created or natural) by pile burning and subsequent underburns over the proposed areas would reduce the likelihood of fire spread and high intensity burns. Wildfires that have burned into areas where fuel treatments have been completed are effective in reducing severity. The effectiveness is greater in short fire return ecosystems as compared to long fire return ecosystems. (Pollet, J., Omni, P., draft 2000)

The effectiveness of the proposed treatments in Gotchen Planning Area can be measured by the placement and location of the fuel break areas created, the reduction of the existing or potential Fuel Model 10 acres to a Fuel Model 8, and returning low intensity prescribed fire into areas where it was once common. Due to the gentle slope in the Gotchen Planning Area, Alternatives B and D would create a permanently modified fuel break adjacent to existing roads. Alternative C would create a modified fuel break along existing roads and forested areas tied to natural features that would alter fire behavior and spread. All of these proposals would modify vegetation so that it is less flammable during the fire season, reduce the amount of fuel that is available to burn, and create a vegetation and surface fuel mosaic with a range of fire behavior characteristics. All of these conditions would reduce the potential of crown fire initiation and spread common to stand replacement type fires. The action alternatives would slow the spread of fire coming onto the forest as well as of a fire moving off of the forest.

In all action alternatives, the initial fuel reduction treatments call for piling and burning of slash, followed by subsequent underburns to maintain desired fuel conditions. All of the action alternatives have potential to increase the surface fuel load and fire ignition potential following the initial piling; and prior to and during the subsequent prescribed fire treatments. Mitigations are included that would minimize unplanned events to address the short-term risks created during the fire season.

Existing forest requirements call for on-site fire suppression capability by all operators during the implementation phase. State Fire Precaution levels call for additional requirements throughout the fire season. In addition, forest fire prevention and fire closures may be implemented during periods of high fire danger. Access may be limited in the Gotchen Planning Area as needed during periods of high fire danger.

Initial fuel reduction treatments (pile burning) would be conducted during late fall or early winter when a low potential of fire escape exits. Subsequent underburns would be conducted in the spring and fall time periods in order to maintain a low surface fuel condition and to minimize potential escape. Emphasis would be placed on maintaining the integrity of the Fuelbreaks. Subsequent fuel reduction burns in the Fuelbreaks and in other underburn areas would not need to cover the entire ground; the objective would be to break up the fuel continuity.

The treated areas would remain a Fuel Model 8, with reduced surface fuel levels in the low moderate range. Fuel model 10 would continue to be created in areas outside of the treatment corridors at a reduced rate as compared to the No Action alternative.

Alternative B

Direct, Indirect, Cumulative Effects (1-5 years)

Alternative B's primary fire strategy is to create a Fuelbreak along existing roads around large areas of heavy fuels and dense stands that have missed several fire cycles. Within the Shaded Fuelbreak, trees up to 20" dbh would be cut and the surface fuel and vegetation would be modified utilizing prescribed fire to maintain conditions over time that more closely resemble historical forest within this area. The effectiveness of the Fuelbreak as an initial treatment is greatest under this alternative due to the level of thinning of trees and surface fuel reduction. A crown fire may not be initiated from a surface fire under these treated stands but an active crown fire may spread through the area if it initiates in an adjacent stand. Initial slash created would increase the surface fuel loadings until they were piled and burned in the fall. The probability of reducing the hazard and risk in a timely manner is high due to the time of the year the fuel is created and weather conditions under which the piles would be burned.

Other treatments complement the Fuelbreaks by directly treating strands with heavy surface fuel loads and returning prescribed fire in young reforested stands. Approximately 1,449 acres of slash would be machine (grapple) piled and burned, 197acres of slash would be hand piled and burned. Underburning would be conducted on 384 acres that include acreages initially treated by pile burning.

The Shaded Fuelbreaks would provide the highest potential, compared to Alternatives C and D, in slowing and changing fire behavior and spread of unplanned fire moving through the Gotchen Planning Area due to the level of vegetation removal and the underburn maintenance prescribed. Remaining large diameter snags would fall and affect ground fuels volume level in future years, with scheduled underburns removing

the small diameter fuels; the remaining unburned large fuels would be of little fire threat.

Within the Shaded Fuelbreak, a greater amount of biomass would be generated than what is proposed in Alternatives C, due to the size and volume of the trees cut. A target residual fuel level is 15 tons per acre with the majority of this in the larger diameter fuel class; fine fuel loading levels would be at or less than three tons per acre comprising the one, ten and one hundred hour time lag fuels.

Cumulative Effects (10 and 50 years)

Underburning maintenance (Shaded Fuelbreak Stands N-Q and S-W) would have been completed on 475 acres. All acres treated by intermediate prescribed burning would reduce the volume of existing surface fuels and created slash. Young stand thinning and underburning on approximately 214 acres would have occurred, promoting a more resilient stand and fuel condition similar to that of the historical fire regime and plant association.

By year 50, many of the treated areas in the mid and late seral stands would have moved towards an old forest single story timber stand with low levels of surface fuel. Underburning maintenance and fuel reduction treatments would have been conducted on approximately 5,135 acres within the Gotchen Planning Area in early, mid and late seral stands. Young stand thinning and underburning (included in the acreage above) would -have been conducted on approximately 920 acres.

The implemented activities would have reduced the threat of fire spread to the entire planning area but would not have treated all areas of high hazard. Surface fuel loading and vegetation modeling in areas outside of the treated stands indicate a continued increase in fire hazard. The majority of the affected trees from the western spruce budworm and other diseases would have fallen to the forest floor. The fire threat would remain “high” in areas of existing Fuel Model 10. Natural decay process and or fire would reduce the high fuel load levels.

Alternative C

Direct, Indirect, Cumulative Effects (1-5 years)

The primary fire strategy of this alternative is to treat and modify areas of existing bug kill and high surface fuel loads. A Fuelbreak, tied into the Aitkin Lava Flow would be created in the central portion of the planning utilizing natural barriers, areas of low fire hazard, and areas of high mortality. A Shaded Fuelbreak along portions of FR82 would also be created but at a reduced cut level as compared to Alternative B (max dbh cut 10”). This proposed Shaded Fuelbreak would tie into recently treated Yakama Indian Reservation lands and to proposed units in matrix lands in the southeastern portion of the Gotchen Planning Area Other treatments proposed to complement the fuelbreaks would directly treat stands with heavy surface fuel loads as well as returning prescribed fire in young reforested stands.

Alternative C thins and cuts trees up to 10" dbh in areas of moderate to high levels of bug kill. After the initial fuels are piled, burned, or removed, prescribed fire would be used to maintain conditions over time that more closely resemblepre-1900 historical forest stands within the Gotchen Planning Area. Approximately 2,182 acres of slash would be machine (grapple) piled and hand piled and burned. Underburning would be conducted on 624 acres as a follow-up fine fuel reduction treatment.

The potential for surface fire moving into the crowns of the residual trees is reduced in all of the treated areas; however, the potential for crown fire moving through the Gotchen Planning Area is unchanged in light mortality stands with a dbh greater than 10".

Within the Fuelbreaks, a target residual fuel level is 15 tons per acre with the majority of this in the larger diameter fuel class; fine fuel loading levels would be at or less than three tons per acre, comprising the one, ten and one hundred hour time lag fuels. Remaining large diameter snags would fall and affect ground fuels volume level in future years; however, with scheduled underburns removing the small diameter fuels, the remaining unburned large fuels would be of little threat.

Cumulative Effects (10 and 50 years)

In 10 years, underburning maintenance would have been completed on 1,011 acres. All acres treated by burning would have a reduced volume of surface fuels and created slash. Young stand thinning and underburning on approximately 214 acres (included in the above acres) would have occurred promoting, a more resilient stand and fuel condition similar to that of the historical fire regime and plant association groups. Due to the openings of the stands, (both treated and in high mortality areas) an increase in forbs and shrubs would be expected to occur; while this growth would have some effect on surface fuel moisture, minimal fire behavior changes are expected.

In 50 years, predicted fire behavior would be low surface fire and intensity levels within all previously treated areas. By this time, approximate 6,001 acres of early, mid and late seral stands areas would have been treated with underburning maintenance and fuel reduction treatment. Young stand thinning and underburning would have been conducted on approximately 920 acres (included in the above treated acres). Many of the treated mid and late seral stands would have moved towards an old forest single story timber structure with low levels of surface fuel. Surface fuel loading and vegetation modeling in areas outside of the treated units indicate a continued increase in fire hazard. The majority of the affected trees from the western spruce budworm and other diseases would have fallen to the forest floor.

The fire hazard would remain "high" within the Gotchen Planning Area until natural decay or fire reduces the high fuel load levels over the untreated affected area. The reduction in surface fuel in the central and southern portions of the Gotchen Planning Area would create a fuel and vegetation mosaic that reduces the average flame length potential and reduces the fire threat to the Gotchen Planning Area.

Alternative D

Direct, Indirect, Cumulative Effects (1-5 years)

Alternative D's primary fire strategy is to create a Fuelbreak along existing roads around large areas of heavy fuel loads and dense stands to "compartmentalize" the landscape. The Fuelbreak may provide some protection against large fire disturbance. Under this alternative, a greater portion of the stand is left untreated and calls for future underburns as a primary way to reduce the fuels buildup. The Fuelbreak "footprint" is exactly the same as Alternative B's Shaded Fuelbreaks. Alternative D limits the trees cut to 10" dbh; Alternative B opens up the canopy by removing additional trees up to 20"dbh.

In this alternative, approximately 1,416 acres of slash would be machine (grapple) piled and burned, 191 acres of slash would be hand piled and burned. Underburning would be conducted on 358 acres.

The Fuelbreak created in this alternative would be managed to reduce ground fuel and ladder fuels while maintaining a 50% canopy cover. The surface fuel treatment in the Fuelbreaks is the same in both Alternatives. The effectiveness of the Fuelbreak as an initial treatment is less under this alternative than in B due to the decreased level of thinning of trees and surface fuel reduction. Crown fire potential (initiation) may be limited under the treated stands, however, crown fire may spread through the area if it initiates in an adjacent stand. Initial slash created would increase the surface fuel loadings until they were piled and burned in the fall. The probability of reducing the hazard and risk in a timely manner would be high due to the time of the year the fuel created and weather conditions under which the piles would be burned.

The effectiveness of the Fuelbreak in Alternative D, under a high to extreme fire threat, would be less than in Alternative B due to a greater crown ratio remaining. Potential surface fuel would also be expected to increase at a higher rate than Alternative B due to a higher number trees remaining in the stand. Under a wildfire situation, the Fuelbreak may be used as a primary fireline to modify, hold and contain the spread of fire to within its boundary. Alternative D treats some interior areas of high fuel load and bug kill areas, but at a reduced rate than in Alternative C.

Cumulative Effects (10 and-50 years)

Within 10 years, underburning would have been implemented on 317 acres within the Fuelbreaks. By year 50, underburning maintenance and fuel reduction treatments would have been conducted on approximately 5,251 acres in early, mid and late seral stands. Young stand thinning would have been conducted on approximately 920 acres.

Many of the treated Fuelbreaks would move towards an old forest single story timber stand with low levels of surface fuel.

Surface fuel loading and vegetation modeling in areas outside of the treated stands indicate a continued increase in fire hazard. The majority of the trees affected from

the western spruce budworm defoliation and other diseases would fall to the forest floor. The fire hazard would remain "high" until natural decay or fire reduces the high fuel load levels.

The effectiveness of the Fuelbreak in alternative D, under a high to extreme fire threat would be less than in B due to the crown ratio being unchanged in areas with low mortality and in stands with DBH greater than 10 inches. Under a wildfire situation, the treated Fuelbreak may be used as a primary fireline to hold and contain the spread of fire to within its boundary. Alternative D would reduce the threat of stand-replacing fire moving freely over the landscape by reducing and modifying the surface fuel mosaic and thinning of ladder fuels.

Issue: Air Quality

Under the action alternatives, air quality would be affected during the prescribed and pile burning operations. Smoke from the prescribed fire operations may potentially affect the class one airshed within the Mt Adams wilderness, reducing the visibility of Mt. Adams as viewed from the Trout Lake community as well as from other viewing areas within the forest. Projected fuel consumption and pollutant emissions rates vary by alternative and are widely affected based on fuel moistures, weather conditions, time of year and type of burn.

Methodology

Projected smoke emission rates are based on average fuel loads treated under specific weather and fuel moisture conditions. For this analysis, average consumption estimates in machine pile units is 26 tons per acre, 10 tons per acre in handpiled units and 10 tons per acre in underburns previously treated. Calculations for emissions produce are based on consumption averages (fire averages) for mixed conifer species during the smoldering and flaming periods. Total emissions produced equals the fuel consumed times the emissions factor times the area burned. The two categories of particulate matter of concern are those less than 2.5 microns (PM2.5) and those less than 10 microns (PM10). Emission factors used for particulate matter (PM) estimates for this analysis are found in the Smoke Management Guide for Prescribed and Wildland Fire (NWCG-2001).

The amount of smoke and particulates produced on a per acre basis is directly related to the type of burn, time of year treated, duff and soil moisture, and moisture content of the large diameter surface fuels. Estimated pounds of PM2.5 and PM 10 from the Gotchen fuel treatments from pile and burn slash are 10.8 PM2.5 and 12.4 PM10, respectively. PM10 values (factors) are calculated, not measured, and are derived from known size-class distributions of particles using PM and PM2.5. (Ward et al. 1989, Hardy et al.1996, Hardy and Einfield 1992).

Smoke emission factors vary during fuel combustion periods; in general, fuels consumed under flaming combustion produce less smoke than fuels consumed under smoldering combustion. Factors used to calculate projected PM for the action alternatives are fire averages of 20.4 pounds for pile burning, and 29.0 for underburns.

Total smoke emissions are projected in each action alternative for the 1-5 year projection periods. A "Burn Plan" would be prepared prior to actual implementation of prescribed fire activities; at that time, smoke emission factors (pounds of emission per ton of fuel consumed) would be calculated on actual fuel conditions on-site and outputs from the consumption models utilized in the Fire and Fuels Effects Model (Reinhardt et al. 1997) and Consume 2.1 (Ottmar et al.). In reality, the prescribed burning activities would be spread-out over several seasons within the 1-5 year time period.

Measurement Methods

- Particulate Matter (PM) less than 2.5 microns (PM2.5)
- Particulate Matter (PM) less than 10 microns (PM10)

Alternative B

Direct, Indirect, Cumulative (1-5 years)

Projected smoke emissions (PM2.5, PM 10) from the treatments conducted in years 1-5 would be 491.47 tons of PM with approximately 70% of the total in the PM2.5 size class.

Alternative C

Direct, Indirect, Cumulative (1-5 years)

Projected smoke emissions (PM2.5, PM 10) from the treatments conducted in years 1-5, would be 704.25 tons of PM with approximately 70% produced in the PM2.5 size class.

Alternative D

Direct, Indirect, Cumulative (1-5 years)

Projected smoke emissions (PM2.5, PM 10) from the treatments conducted in years 1-5 would be 477.49 tons of PM with approximately 70% produced in the PM 2.5 size class.

WILDLIFE

Significant Issue: Northern Spotted Owl

Spotted owls are considered a key indicator species for a wide-variety of species associated with late successional, old growth (LSOG) forest. Spotted owl habitat and the potential effects to spotted owls have been identified as significant issues. The

analysis of effects to spotted owls is evaluated by the short and long-term changes in nesting, roosting, foraging (NRF) and dispersal habitat.

Measurement Methods

Acres of NRF habitat treated

Acres of NFR habitat converted to dispersal habitat

Acres of NRF habitat converted to non-suitable habitat

Percent of NFR habitat treated in the Gotchen

Post-action percentage of NFR habitat in CHU WA-42

Incidental take of spotted owls

Post-action percentage of NFR habitat in Gotchen

Data used for Analysis

The analysis of effects to spotted owl habitat was completed using the GPNF 2001 vegetation GIS database (GPVEG), based primarily on tree size, canopy cover and species composition. This database provided continuous coverage beyond the Gotchen Planning Area boundary (e.g. spotted owl circles include areas outside of the Gotchen boundary). Effects to late-successional habitat were analyzed using the modified WSFL vegetation GIS database (see Vegetation analysis), based on structural stages.

To determine how owl habitat correlated with forest structural classes, the two GIS databases were compared and a weighted average was developed for calculating changes in owl habitat over time. For example, when calculating the 10 year and 50 year changes in NRF habitat, 100% of the old-forest multi-story, understory reinitiation, and old forest single story structural classes were assumed to provide NRF habitat. Only 50% of stem exclusion open canopy stands, 80% of stem exclusion closed canopy, and 85% of young forest multi-story stands were assumed to provide NRF habitat in 10 years and 50 years.

To determine changes in late-successional old-growth (LSOG) over time, it was assumed that 100% of the old-forest multi-story, understory reinitiation, and old forest single story structural classes provided late-successional habitat.

Alternative A – No Action

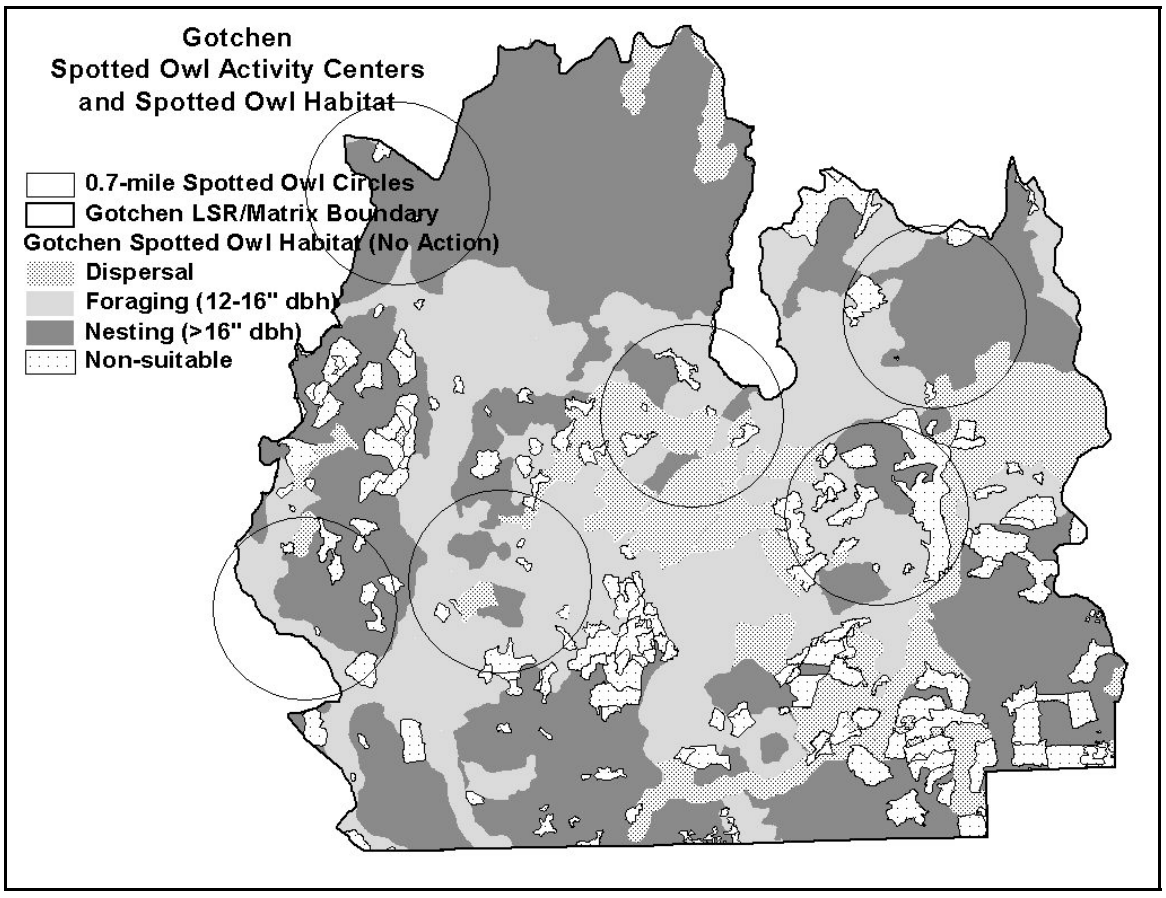
Direct, Indirect, and Cumulative Effects (1-5 Years)

Spotted owl habitat in the Gotchen Planning Area would continue to decline as trees succumb to the combined stresses of defoliation and root diseases. Over 200 acres of NRF habitat that are currently identified as severely degraded would decline to a non-suitable condition, resulting in a loss of about 1.3 percent of the NRF in the Gotchen Planning Area. The NRF stands that collapse would create a patchy mosaic of small openings, resulting in a slight-increase in the amount of edge habitat, increasing forest

fragmentation at the landscape scale. The NRF habitat within spotted owl management circles would be maintained above recommended thresholds, except one the site that is currently below thresholds.

Dispersal habitat and connectivity with adjacent lands would be maintained. Spotted owls would not be directly affected in the short-term, because there would be no actions resulting in direct habitat alteration or disturbance. However, declining forest canopy cover in the understory reinitiation stands would result in increasingly marginal conditions for spotted owls, particularly at sites that are currently near or below minimum habitat thresholds. Total fire suppression would continue to be practiced in the hopes of avoiding a stand-replacing wildfire. Depending on conditions, fire suppression may or may not be successful in protecting spotted owls and their habitat from destruction. About 72% of the landscape would provide spotted owl habitat.

Map 4-1. Current distribution of spotted owl habitat in Gotchen.



bark beetles, and root diseases. Vegetation modeling indicates a decline of approximately 2,700 acres of late-successional habitat due to much of the 2002 understory reinitiation stands transitioning to stem exclusion open canopy stands. However, the majority of mid-seral stands would continue to provide foraging habitat for spotted owls. In the absence of a major disturbance, suitable owl habitat would still cover about 72 % of the landscape, but the majority of habitat would be in mid-seral structural. Spotted owls occupying the Ground and Smith Butte territories that were near or below the minimum habitat thresholds in 2003 may or may not have sufficient habitat levels to persist at these sites by 2013.

50 Years

Vegetation modeling indicates that in the absence of a major disturbance, there would be an increase in late-successional structural classes over the next 50 years as current mid-seral stands transition into old-forest multi-story, potentially resulting in 79% suitable owl habitat on the landscape. However, this outcome seems unlikely. Agee and Edmonds (1992) suggest that there are no forest protection options that would maintain owl habitat at its current levels in the East Cascades over the long-term. Total fire suppression would maintain an unstable forest condition that is susceptible to high-severity fires, insects, and disease disturbances. Key habitat features for spotted owls provided by legacy trees would likely decline and become rare or absent on much of the landscape due to competitive stresses from dense thickets of understory trees, insects, and root diseases.

Summary of Effects Common to All Action Alternatives for the Northern Spotted Owl and it's Habitat

All action alternatives are likely to adversely affect spotted owls and spotted owl critical habitat in the short term due to the potential for disturbance to individuals and the direct loss of suitable habitat. Individual spotted owls may be flushed or displaced from their nesting/roosting or foraging areas by the disturbance associated with timber harvest and fuels treatments. As a result, spotted owls may abandon a territory and seek out habitat elsewhere that may be marginal or is occupied by other owls that compete for the same resources (USDI 1990a). The nesting season (March 1 – August 31) is considered to be the most critical time for disturbance and potential harm to spotted owls because they are reluctant to leave an area during incubation and rearing of juveniles (Delaney et al 1999), and because the juveniles are dependent upon the adults for survival.

The USFWS recently completed an analysis of the potential for injury to spotted owls associated with disturbance (USDI 2003). This analysis concluded that there is a likelihood of injury to spotted owls if the activity occurs in close enough proximity (65 yards for tree felling) to cause an owl to flush away from a nest or to miss one or more feedings (USDI 2003). Seasonal restrictions have been incorporated into the Gotchen project to minimize the potential for injury due to disturbance to spotted owls.

In areas that have not been surveyed for owls, seasonal operating restrictions would minimize the potential that a tree containing a spotted owl nest with eggs or juveniles would be harvested. Under all action alternatives, the potential risk of this happening is considered to be low due to existing survey information and the limited scope of treatments in unsurveyed NRF habitat. Not all areas identified would be treated in a single year, so the disturbance associated with timber harvest and fuels treatments would occur over a five year period distributed across a 20-square-mile area. Depending on the alternative, 5 to 7 percent of the NRF habitat in the area would be subject to disturbance over a 5-year period.

Gotchen action alternatives would implement prescribed burning during the next 5 years. No prescribed burning is proposed in NRF habitat, but smoke generated from the burn areas could drift into adjacent habitat and cause disturbance or harm to spotted owls. Recent research indicates that spotted owls have a high level of site tenacity and are usually not displaced from a territory by moderate to low intensity fire events (Bond et al. 2002). These findings suggest that although there may be short-term impacts to spotted owls from fire, spotted owls have shown a high level of tolerance to the effects of low to moderate severity fires. Under all alternatives, no prescribed burning would occur within harassment distance (65 yards) of the best 100 acres of habitat surrounding known spotted owl sites.

Other silvicultural activities include gopher baiting to improve reforestation. Although pocket gophers *(*Thomomys sp.*)* comprise only a minor part (5%) of the spotted owls diet (Forsman et al. 2001), there is a remote chance that a spotted owl could be harmed as a result of secondary poisoning by consuming poisoned prey. Spotted owls are not known to scavenge carrion, so an owl would have to catch a live poisoned gopher to be affected. This is a remote possibility because pocket gophers spend the most of their life underground (Maser 1998). Gopher bait is only applied underground in the gopher's tunnels, and would only be applied in Matrix units. No poison would be applied within the LSR.

The thinning and fuels reduction treatments in the Action Alternatives are designed to maintain structural features such as legacy trees, snags, and down logs critical to providing habitat for spotted owls and the small mammals that spotted owls prey on. Hansen and others (1993) suggest that treated stands would be functionally non-suitable during project implementation, and for up to 2 years following habitat modification, due to short-term negative effects on spotted owl prey populations or spotted owl behavior (e.g. avoidance of treated stands). Prey species would be impacted through the mechanical effects of harvesting on animals, dens, and borrows, and through short-term reductions in food sources (e.g. fungi, seeds, berries). Hicks and others (1999) documented spotted owls using partially harvested stands for roosting 6 months after treatment, suggesting that recovery of prey populations may occur rapidly following treatment in some areas.

All action alternatives reduce habitat for northern flying squirrels in the Matrix regeneration harvest units (141 acres) potentially resulting in decreased foraging opportunities for spotted owls. In the eastern Washington Cascades, the northern flying squirrel is the species that spotted owls are most dependant upon (Forsman et

al. 2001). Flying squirrels are sensitive to forest fragmentation and decline in abundance where old-forest stands are removed (Thomas et al., p. 205). Recent studies in the eastern Cascades suggest that densities of flying squirrels in open-canopy pine forests are only slightly less than those found in mature mixed-conifer stands (Lehmkuhl 2002). Therefore, fuelbreak treatments and other proposed activities that maintain dispersal habitat for spotted owls are expected to maintain habitat for flying squirrels. Key habitat features for flying squirrels include large-diameter trees, snags and down logs, and patches of understory shrubs (Carey 1995). These structural features are maintained in all the action alternatives, and NRF habitat levels are maintained at high levels throughout the Gotchen Planning Area.

Spotted owls are wide-ranging predators with large home-range areas; any action that results in removal or destruction of suitable habitat has the potential to disturb, displace, or adversely affect individual spotted owls. The seasonal restrictions (mitigation) would minimize the potential for incidental take to occur, but they do not completely eliminate the risk, thus project implementation of any action alternative would adversely affect spotted owls due to the potential for disturbance to individual owls, the direct loss of suitable habitat, and the short-term loss of prey species abundance in treated stands. Formal consultation with the USFWS is required.

Other actions that have the potential to affect spotted owls include road decommissioning work, planting conifer seedlings, and pre-commercial thinning in the post-harvest regeneration stands. The noise and activity from these actions could potentially disturb spotted owls if they occur adjacent to occupied habitat. The interrelated actions associated with the Gotchen project implementation are considered programmatic forest management activities. The GPNF has determined that these activities "may affect, but are not likely to adversely affect" the spotted owl. These activities are covered under an informal programmatic consultation for forest management on the GPNF (USFWS 2001).

Alternative B

Direct, Indirect, and Cumulative Effects (1-5 Years).

Alternative B treats a total of 749 acres of NRF habitat, or about 5.2 percent of the total NRF within the Gotchen Planning Area. Of these, 386 acres of NRF are altered to non-suitable habitat (including 320 acres altered to dispersal), resulting in a reduction of about 1.9% of the NRF within the Gotchen Planning Area from 73.1% to 71.2%. Late-successional habitat is reduced by about 700 acres, primarily by the conversion of understory reinitiation stands to stand initiation or stem exclusion open canopy stands.

Shaded Fuelbreak treatments result in a slight increase in the amount of edge habitat, increasing forest fragmentation at the landscape scale. The NRF habitat within spotted owl management circles is maintained above recommended thresholds, except at one site, where Shaded Fuelbreak treatments result in a slight reduction of NRF below incidental take thresholds. Dispersal habitat and connectivity with adjacent lands is maintained above recommended thresholds.

Alternative B is likely to adversely affect spotted owl and spotted owl critical habitat in the short-term, due to the potential for disturbance to individual spotted owls during project implementation, the short-term loss of prey species in treated areas, and the direct loss of 386 acres of NRF habitat. However Alternative B has the potential to create a long-term beneficial effect by reducing the fire hazard and improving health in the treated areas, and by culturing legacy trees.

The 1994 Northwest Forest Plan (NWFP) baseline estimate of spotted owl habitat on the GPNF was 497,491 acres, or about 36 percent of the total area on the GPNF (USFWS 2001b). This represents about 6.5 percent of all spotted owl habitat within the entire NWFP area. Under the NWFP, about 63 percent of the spotted owl habitat on the GPNF is located in reserved land allocations. Only 1 acre of suitable habitat has been removed in LSRs on the GPNF since 1994. Alternative B would increase that figure to 285 acres. Between 1994 and January 2003, the USFWS has issued 58 Biological Opinions (BOs) to the GPNF authorizing the removal of 6,910 acres of suitable spotted owl habitat (USFWS 2003). Implementation of Alternative B would increase that figure to 7,296 acres. This represents a cumulative decline of about 1.47 percent in suitable habitat across the GPNF. As a result, the total number of acres of suitable habitat on the GPNF would decrease from 497,491 to 490,195 acres since 1994 (USFWS 2003). Of the 286 spotted owl activity centers documented on the GPNF, 56 (20%) have been harmed due to the removal of habitat causing incidental take since 1994. Implementation of Alternative B would increase that figure to 57 spotted owl sites harmed due to habitat removal.

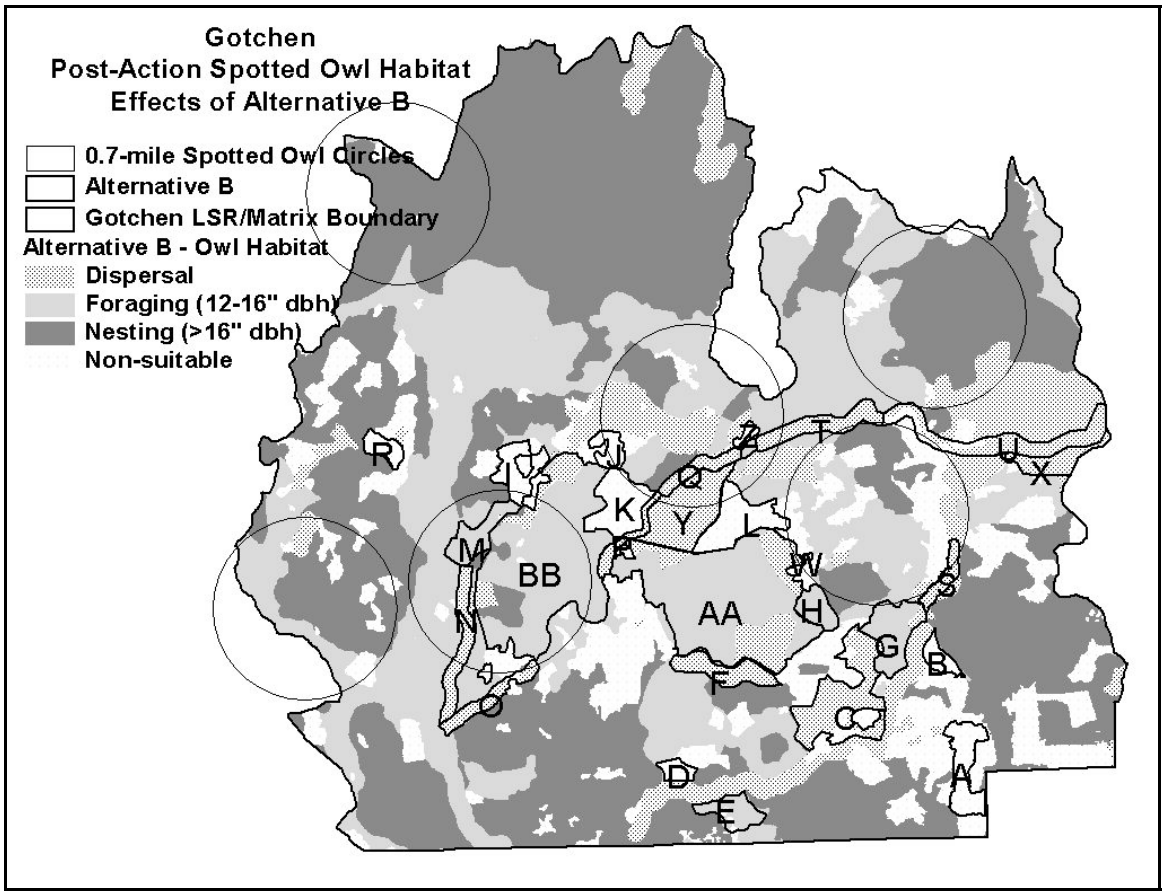
Table 4.3 lists the effects of Alternative B to spotted owl habitat, and Map 4-2 displays the effects of Alternative B to spotted owl habitat.

Table 4-3. Alternative B – Unit treatment effects to spotted owl habitat.

Unit	Unit Rx	Resulting live tree canopy closure (%)	Nesting degraded to Foraging	Foraging degraded	Nesting downgraded to Dispersal	Foraging downgraded to Dispersal	Foraging downgraded to unsuitable	Dispersal downgraded to unsuitable	Dispersal degraded	Unsuitable acres	Total acres affected
A	LFR	15	-	-	-	-	-	87	-	2	89
B	MFR	30	-	-	-	-	-	29	-	-	29
C	MFR	40	-	-	-	-	-	182	-	24	206
D	MFR	30	-	-	-	-	-	23	-	-	23
E	UAM	50	12	36	-	-	-	-	-	-	48*
F	HFR	40	-	-	39	34	-	-	-	-	73
G	ST	50	-	91	-	-	-	-	-	-	91*
O	SFB	40	-	-	18	11	-	-	-	-	29
S	SFB	40	-	-	-	-	-	-	1	-	1
Matrix Totals:			12	127	57	45	0	321	1	26	589
H	FRR,UB	NC	-	44	-	-	-	-	-	-	44
I	FRRUB	35	-	-	-	-	66	-	-	-	66
J	FRRUB	NC	-	-	-	-	-	34	-	-	34
K	FRRUB	NC	-	-	-	-	-	108	-	-	108
L	FRRUB	NC	-	-	-	-	-	112	-	-	112
M	PPUT	60	14	53	-	-	-	-	1	-	68
N	SFB	40	-	-	-	65	-	-	10	-	75
O	SF	40	-	-	-	19	-	-	-	3	22
P	SFB	40	-	-	-	26	-	-	8	-	34
Q	SFB	50	3	1	-	-	-	-	40	-	44
R	YSTUB	N/A	-	-	-	-	-	-	-	38	38
S	SFB	40	-	-	-	-	-	-	33	-	33
T	SFB	40	-	-	4	78	-	-	-	-	82
U	SFB	40	-	-	6	10	-	-	101	29	146
V	SFBR	60	-	7	-	-	-	-	-	-	7
W	SFB	40	-	-	-	-	-	-	3	-	3
X	LPUT	40	-	-	-	10	-	-	40	1	51*
Y	LTC	N/A	-	1	-	-	-	-	161	-	162
Z	AR	N/A	-	1	-	-	-	-	1	9	11
AA	LGST	N/A	-	50	-	-	-	-	-	-	50*
BB	LGST	N/A	-	50	-	-	-	-	-	-	50*
LSR Totals:			17	207	10	208	66	254	398	80	1240
LSR and Matrix Totals:			29	334	67	253	66	575	399	106	1829

*Net acres treated. All units are located within CHU WA-42 except 74 acres in: Q (1 acre), T (56 acres), V (6 acres), and Z (11 acres).

Map 4-2. Effects of Alternative B to spotted owl habitat.



Cumulative Effects (10 and 50 Years)

10 Years

Spotted owl habitat in much of the untreated landscape would continue to decline from the delayed effects of western spruce budworm mortality, bark beetles, and root diseases. Vegetation modeling indicates a cumulative decline of approximately 3,000 acres of late-successional habitat as the 2002 understory reinitiation stands transition to stem exclusion open canopy stands. However the total amount of NRF habitat remaining on the landscape is about 71%, but the majority of this habitat would be comprised of mid-seral structural classes. Shaded Fuelbreaks and portions of the Matrix would continue to be managed as stem exclusion open canopy stands. These areas would continue to provide dispersal habitat for spotted owls, but they represent a break in larger patches of interior NRF habitat

50 Years

Vegetation modeling indicates that in the absence of a major disturbance, there would be an increase in old-forest multi-story stands, but much of the understory reinitiation that is present in 2002 would decline and transition to earlier successional phases. Early seral stands and Shaded Fuelbreaks of 2002 would have been managed with

prescribed fire to maintain stem exclusion open canopy structure. Under this scenario, spotted owl NRF habitat would cover about 75% of the Gotchen landscape, with about half of the NFR habitat comprised of mid-seral structural classes.

Alternative C

Direct, Indirect, and Cumulative Effects (1-5 Years)

Alternative C treats a total of 1,051 acres of NRF habitat, or about 7.2 percent of the total NRF within the Gotchen Planning Area. Of these, 159 acres of NRF are altered to non-suitable habitat (including 83 acres altered to dispersal), resulting in a reduction of about 0.8% of the NRF within the Gotchen Planning Area from 73.1% to 72.3%. Late-successional habitat is reduced by about 682 acres, primarily by the conversion of understory reinitiation stands to stand initiation or stem exclusion open canopy stands. Understory density reduction and fuels treatments would result in a short-term degradation of NRF habitat on about 892 acres. However, these treatments would maintain a multi-story forest structure and overstory canopy cover necessary for suitable owl habitat.

Alternative C would result in a net decrease in the amount of edge habitat, and would reduce forest fragmentation at the landscape scale. NRF habitat within spotted owl management circles is maintained above recommended thresholds, except at one site, where fuels reduction and reforestation treatments result in a slight reduction of NRF below incidental take thresholds. Dispersal habitat and connectivity with adjacent lands would be maintained above recommended thresholds.

Alternative C is likely to adversely affect spotted owl and spotted owl critical habitat in the short-term, due to the potential for disturbance to individual spotted owls during project implementation, the short-term loss of prey species in treated areas, and the direct loss of 159 acres of NRF habitat. However, Alternative C has the potential to create a long-term beneficial effect by reducing the fire hazard and improving forest health in the treated areas through understory density reductions and legacy tree culturing.

Alternative C would increase the amount of suitable habitat that has been removed in the LSRs on the GPNF from 1 acre to 77 acres and increase the amount of suitable owl habitat removed on the GPNF from 6,910 acres to 7,069 acres. This represents a cumulative decline of about 1.42 percent in suitable habitat across the GPNF. As a result, the total number of acres of suitable habitat on the GPNF would decrease from 497,491 to 490,422 acres since 1994 (USFWS 2003). Of the 286 spotted owl activity centers documented on the GPNF, 56 (20%) have been harmed due to the removal of habitat causing incidental take since 1994. Implementation of Alternative C would increase that figure to 57 spotted owl sites harmed due to habitat removal.

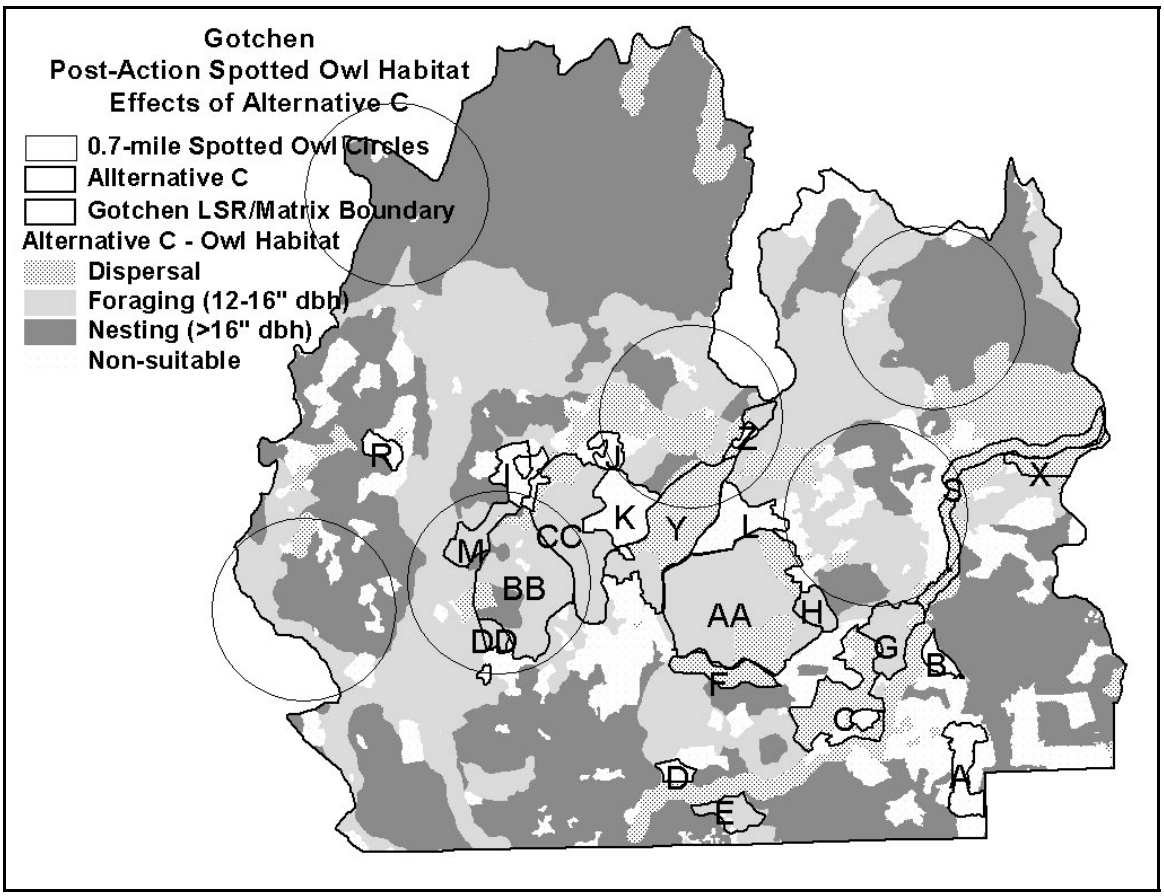
Table 4-4 lists the effects of Alternative C to spotted owl habitat, and Map 4-3 displays the effects of Alternative C to spotted owl habitat.

Table 4-4. Alternative C – Unit treatment effects to spotted owl habitat.

Unit	Unit Rx	Resulting live tree canopy closure (%)	Nesting degraded to Foraging	Foraging degraded	Nesting downgraded to Dispersal	Foraging downgraded to Dispersal	Foraging downgraded to unsuitable	Dispersal downgraded to unsuitable	Dispersal degraded	Unsuitable acres	Total acres affected
A	LFR	15	-	-	-	-	-	87	-	2	89
B	MFR	30	-	-	-	-	-	29	-	-	29
C	MFR	40	-	-	-	-	-	182	-	24	206
D	MFR	30	-	-	-	-	-	23	-	-	23
E	UAM	50	12	36	-	-	-	-	-	-	48*
F	HFR	40	-	-	39	34	-	-	-	-	73
G	ST	50	-	91	-	-	-	-	-	-	91*
S	SFB	40	-	-	-	-	-	-	1	-	1
CC	UDR	NC	-	1	-	-	-	-	-	-	1
Matrix Totals:			12	128	39	34	0	321	1	26	561
H	FRR,UB	NC	-	39	-	-	-	-	-	-	39*
I	FRRUB	35	-	-	-	-	66	-	-	-	66
J	FRRUB	NC	-	-	-	-	-	34	-	-	34
K	FRRUB	NC	-	-	-	-	10	119	-	-	129
L	FRRUB	NC	-	-	-	-	-	112	-	-	112
M	PPUT	60	14	47	-	-	-	-	-	-	61*
R	YSTUB	N/A	-	-	-	-	-	-	-	38	38
S	SFB	40	-	-	-	-	-	-	144	-	144
X	LPUT	40	-	-	-	10	-	-	40	1	51*
Y	LTUDR	N/A	-	74	-	-	-	-	175	-	249*
Z	AR	N/A	-	1	-	-	-	-	1	9	11
AA	UDR	NC	-	314	-	-	-	-	171	-	485*
BB	LGST	N/A	-	30	-	-	-	-	-	-	30*
CC	UDR	NC	-	193	-	-	-	-	56	-	249*
DD	UDR	NC	-	21	-	-	-	-	-	-	21*
EE	FB	50	3	15	-	-	-	-	4	-	22*
FF	FB	50	-	1	-	-	-	-	5	-	6
LSR Totals:			17	735	0	10	76	265	596	48	1747
LSR and Matrix Totals:			29	863	39	44	76	586	597	74	2308

*Acres treated. All units are located within CHU WA-42 except 35 acres in: EE (22 acres), FF (2 acres), and Z (11 acres).

Map 4-3. Effects of Alternative C to spotted owl habitat.



Cumulative Effects (10 and 50 Years)

10 Years

Spotted owl habitat in much of the untreated landscape would continue to decline from the delayed effects of western spruce budworm mortality, bark beetles, and root diseases. Vegetation modeling indicates a cumulative decline of approximately 3,000 acres of late-successional structure as the 2002 understory reinitiation stands decline and transition to stem exclusion open canopy stands. However, the total amount of NRF habitat remaining on the landscape is about 71 percent, but the majority of the habitat is comprised of mid-seral structural classes. Stands treated with understory density reduction treatments would potentially respond favorably to reduced stem density, resulting in increased canopy cover on these sites. Portions of the Matrix would continue to be managed as stem exclusion open canopy stands with the use of prescribed fire. These areas would continue to provide dispersal habitat and connectivity for spotted owls, but the trend would be moving towards more acres of young forest multi-story and stem exclusion open canopy stands.

50 Years

Vegetation modeling indicates that in the absence of a major disturbance, there would be an increase in old-forest multi-story stands, but much of the understory reinitiation that is present in 2002 would decline and transition to mid-seral structural classes. Early seral stands of 2002 would have been managed with prescribed fire and thinning to maintain stem exclusion open canopy stands. Under this scenario, spotted owl NRF habitat would cover about 76 percent of the Gotchen landscape, with about half of the NRF habitat comprised of mid-seral structural classes.

Alternative D

Direct, Indirect, and Cumulative Effects (1-5 Years)

Alternative D treats a total of 731 acres of NRF habitat, or about 5 percent of the total NRF within the Gotchen Planning Area. Of these, 149 acres of NRF are altered to dispersal habitat, resulting in a reduction of about 0.7% of the NRF within the Gotchen Planning Area, from 73.1 % to 72.4 %. Late-successional habitat would be reduced by 682 acres, primarily by the conversion of understory reinitiation stands to stand initiation or stem exclusion open canopy stands. Fuels reduction treatments within the Shaded Fuelbreaks would not increase or reduce the amount of edge habitat or forest fragmentation within the LSR. NRF habitat within spotted owl management circles is maintained above recommended thresholds except at one site, which is currently below thresholds. Alternative D would not result in the removal of habitat from this circle, so no incidental take is anticipated. Dispersal habitat and connectivity with adjacent lands is maintained well above recommended thresholds.

Alternative D is likely to adversely affect spotted owl and spotted owl critical habitat in the short-term, due to the potential for disturbance to individual spotted owls during project implementation, the short-term loss of prey species in treated areas, and the direct loss of 149 acres of NRF habitat. However Alternative D has the potential to create a long-term beneficial effect by reducing fire hazard, and improving forest health in the treated areas. The level of risk reduction achieved is not as significant as with the other alternatives, so there is a greater level of risk that NRF habitat could be lost in a wildfire event.

Alternative D would increase the amount of suitable habitat that has been removed in the LSRs on the GPNF from 1 acre to 77 acres and increase the amount of suitable owl habitat removed on the GPNF from 6.910 acres to 7,059 acres. This represents a cumulative decline of about 1.42 percent in suitable habitat across the GPNF. As a result, the total number of acres of suitable habitat on the GPNF would decrease from 497,491 to 490,432 acres since 1994 (USFWS 2003). Of the 286 spotted owl activity centers documented on the GPNF, 56 (20%) have been harmed due to the removal of habitat causing incidental take since 1994. Implementation of Alternative D would not increase that figure.

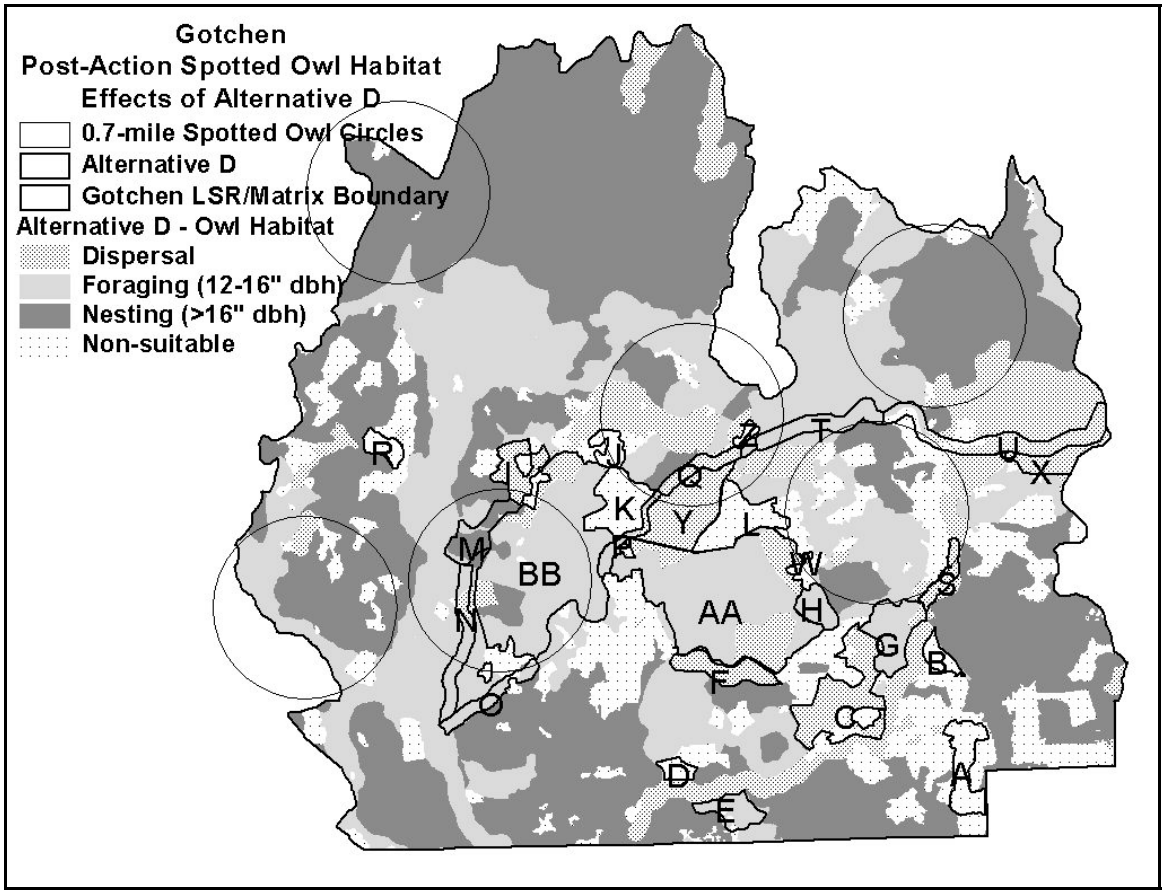
Table 4-5 lists the effects of Alternative C to spotted owl habitat, and Map 4-4 displays the effects of Alternative D to spotted owl habitat.

Table 4-5. Alternative D – Unit treatment effects to spotted owl habitat.

Unit	Unit Rx	Resulting live tree canopy closure (%)	Nesting degraded to Foraging	Foraging degraded	Nesting downgraded to Dispersal	Foraging downgraded to Dispersal	Foraging downgraded to unsuitable	Dispersal downgraded to unsuitable	Dispersal degraded	Unsuitable acres	Total acres affected
A	LFR	15	-	-	-	-	-	87	-	2	89
B	MFR	30	-	-	-	-	-	29	-	-	29
C	MFR	40	-	-	-	-	-	182	-	24	206
D	MFR	30	-	-	-	-	-	23	-	-	23
E	UAM	50	12	36	-	-	-	-	-	-	48
F	HFR	40	-	-	39	34	-	-	-	-	73
G	ST	50	-	91	-	-	-	-	-	-	91*
0	FB	50	18	11	-	-	-	-	-	-	29
S	FB	50	-	-	-	-	-	-	1	-	1
Matrix Totals:			30	138	39	34	0	321	1	26	589
H	FRR,UB	NC	-	39	-	-	-	-	-	-	39*
I	FRRUB	35	-	-	-	66	-	-	-	-	66
J	FRRUB	NC	-	-	-	-	-	34	-	-	34
K	FRRUB	NC	-	-	-	-	-	108	-	-	108
L	FRRUB	NC	-	-	-	-	-	112	-	-	112
M	PPUT	70	14	47	-	-	-	-	-	-	61*
N	FB	50	-	65	-	-	-	-	10	-	75
O	FB	50	-	19	-	-	-	-	-	3	22
P	FB	50	-	26	-	-	-	-	8	-	34
Q	FB	50	3	1	-	-	-	-	40	-	44
R	YSTUB	N/A	-	-	-	-	-	-	-	38	38
S	FB	50	-	-	-	-	-	-	33	-	33
T	FB	50	4	78	-	-	-	-	-	-	82
U	FB	50	6	10	-	-	-	-	101	29	146
W	FB	50	-	-	-	-	-	-	3	-	3
X	LPUT	40	-	-	-	10	-	-	40	1	51
Y	LTC	N/A	-	1	-	-	-	-	161	-	162
Z	AR	N/A	-	1	-	-	-	-	1	9	11
AA	LGST	N/A	-	50	-	-	-	-	-	-	50*
BB	LGST	N/A	-	50	-	-	-	-	-	-	50*
LSR Totals:			27	387	0	76	0	254	397	80	1221
LSR and Matrix Totals:			57	525	39	110	0	575	398	106	1810

*Net acres treated. All units are located within CHU WA-42 except 68 acres in: Q (1 acre), T (56 acres), and Z (11 acres).

Map 4-4. Effects of Alternative D to spotted owl habitat.



Cumulative Effects (10 Years and 50 Years)

10 Years

Spotted owl habitat in much of the untreated landscape would continue to decline from the delayed effects of western spruce budworm mortality, bark beetles, and root diseases. Vegetation modeling indicates a cumulative decline of approximately 3,000 acres of late-successional structure as the 2002 understory reinitiation stands transition to stem exclusion open canopy stands. However the total amount of NRF habitat remaining on the landscape is about 71 percent, but the majority of this habitat would be comprised of mid-seral structural classes. Shaded Fuelbreaks and portions of the Matrix would continue to be managed as stem exclusion open canopy stands. These areas would continue to provide foraging or dispersal habitat for spotted owls, but they represent a break in larger patches of interior NRF habitat.

50 Years

Vegetation modeling indicates that in the absence of a major disturbance, there would be an increase in late-successional forest as current mid-seral stands transition into old-forest multi-story, but much of the under-story reinitiation that is present in 2002 would decline and transition to earlier successional phases. Early seral stands and

Shaded Fuelbreaks of 2002 would have been managed with prescribed fire to maintain stem exclusion open canopy structure. Under this scenario, spotted owl NFR habitat would cover about 75% of the Gotchen landscape.

Comparison of Effects to Spotted Owl Habitat by Measurement Methods

The effects to spotted owl NRF habitat vary in intensity, depending on the silvicultural treatment. These effects fall into 3 categories: (1) Nesting habitat degraded to foraging habitat, or foraging habitat degraded, (2) Nesting or foraging habitat downgraded to dispersal, and (3) Nesting or foraging habitat converted to unsuitable. Table 4-5 summarizes the effects owl habitat by alternative.

Nesting habitat degraded to foraging, or foraging habitat degraded

Thinning and fuels treatments in spotted owl nesting or foraging habitat that maintain a multi-story forest structure with greater than 40% overstory canopy closure and adequate levels of snags and down wood are expected to provide foraging habitat for spotted owls. These treatments include uneven- age management, sanitation thinning, fuels reduction and reforestation, legacy tree culturing, and gap-sapling thinning. It is acknowledged that foraging habitat that has less than 50% canopy closure is marginal for spotted owls. In Gotchen, all treatments designed to maintain foraging habitat would maintain a minimum of 50% canopy cover except in Unit H (44 acres), which is currently below the 50% threshold due to western spruce budworm defoliation.

Treatments that alter a multi-story forest structure to a single-story forest structure with a minimum canopy closure of 40% are expected to provide dispersal habitat for spotted owls. Treatments include Shaded Fuelbreaks, and heavy retention regeneration harvest. These treatments remove most understory vegetation and reduce the overstory canopy. Snags and down wood are also reduced. NRF stands downgraded to dispersal habitat are considered non-suitable for spotted owls. Single-story stands would continue to provide minimal cover and connectivity for spotted owls moving between patches of suitable habitat, but habitat for some spotted owl prey species is reduced or eliminated with the loss of understory vegetation.

Treatments that remove overstory trees to less than 40% canopy closure are considered unsuitable as spotted owl habitat. It is important to note that the areas identified in the Action Alternatives that alter NRF to unsuitable are stands that are severely degraded by western spruce budworm mortality (45% canopy cover or less), and it is anticipated that these stands would continue to decline to an unsuitable condition (less than 40% canopy cover) within 5-10 years regardless of whether they are treated or not (from understory reinitiation and stem exclusion closed canopy stands to stem exclusion open canopy stand structures).

Table 4-6. Comparison of Action Alternatives. Summary of effects to spotted owl habitat.

Alternative		Total NRF Acres Affected	Nesting degraded to foraging, or foraging habitat degraded	Nesting or foraging downgraded to dispersal	NRF converted to unsuitable
B	LSR	508	224	218	66
	Matrix	241	139	102	0
	Total	**749**	**363**	**320**	**66**
C	LSR	838	752	10	76
	Matrix	213	140	73	0
	Total	**1,051**	**892**	**83**	**76**
D	LSR	490	414	76	0
	Matrix	241	168	73	0
	Total	**731**	**582**	**149**	**0**

Note: For most units identified for treatment, the gross acres identified were counted as affected acres because untreated retention acres are usually small and difficult to track unless they are large enough to be mapped as a discrete stand. For the purposes of this analysis, **gross acres** were counted for treatments that changed suitable habitat to dispersal or non-suitable habitat. Net acres were counted in stands that maintained the existing habitat function post treatment.

Effects to NRF acres within the Gotchen LSR and Gotchen LSR/Matrix

This Measurement Method displays the acres and percentage of NRF habitat treated and the percent of NRF that would remain after implementation. Table 4-7 displays these effects. Depending on the alternative, project implementation would result in a loss of 0.7 to 1.9% of the NRF habitat within Gotchen. Under all action alternatives, over 90% of the NRF habitat in the area would remain undisturbed by any treatment associated with this decision.

Table 4-7. Comparison of Action Alternatives. Summary of effects to NRF habitat within the Gotchen LSR/Matrix.

	Gotchen LSR and Matrix (19,831 acres)		Gotchen LSR (15,204 acres)		
Alt.	**Post-action NRF Acres**	**Percent Area**	**Post-action NRF Acres**	**Percent Area**	**Percent of NRF Treated in LSR**
No Action	14,506	73.1 %	11,512	75.7	0%
B	14,120	71.2%	11,228	73.8	4.4%
C	14,347	72.3%	11,426	75.1	7.3%
D	14,357	72.4 %	11,436	75.2	4.2%

Note: All acreages are approximate values derived from 2201 GPVEG GIS database. Due to inherent inconsistencies with different GIS data, the acreage values presented here may be slightly different from acreage values reported elsewhere within the FEIS.

Evaluation of Effects to Spotted Owl Nesting/Roosting Sites and Incidental Take Thresholds

Timber harvest can affect spotted owls by reducing the total amount of suitable habitat within a spotted owl's homerange. The result may be that the owls continue to persist at the territory, but marginal habitat conditions in the territory compromise the owl's ability to survive and successfully reproduce. This is the basis for the USFWS incidental take thresholds for the loss of suitable habitat within a spotted owl homerange (USDI 1990b).

Each Action Alternative treats NRF habitat within five of the six historic spotted owl circles in the Gotchen LSR. Only two of these sites were confirmed to be occupied by spotted owls in 2003 (Buck and Smith Butte). However, abandoned sites may be re-occupied in the future (Lahaye et al. 2002), so for the purposes of this analysis, the abandoned sites are considered to be occupied.

Treatments units that would result in the removal of NRF habitat were intentionally located to avoid the 0.7 mile spotted owl circles as much as possible. Most fuels treatments are expected to maintain foraging habitat. In most owl circles the total amount of NRF acres treated usually greatly exceeds the acres that are downgraded to dispersal or non-suitable habitat. For example Alternative C treats 772 acres of NRF habitat within the Big Tree owl circle, but only 108 acres are downgraded to dispersal or unsuitable (Table 4-7).

Assuming that treated areas would be avoided by spotted owls during project implementation, the total amount of untreated NRF habitat remaining in the circles is still above minimum thresholds. Therefore, spotted owls associated with these sites would have access to enough undisturbed habitat during project implementation to persist at these sites, except at the Ground site. The Ground site is currently below the minimum threshold of 500 acres of NRF within a 0.7-mile radius (478 acres). The low NRF level in this circle is partially due to the proximity of the circle to the Aiken lavabed. Because the Aiken lava bed is a natural fuelbreak, each of the action alternatives proposes treatments that link fuels reduction units to the Aiken lava bed. Therefore, both Alternative B and C propose treatments that would result in slight reductions to the existing NRF habitat in this 0.7-mile circle, resulting in incidental take of the spotted owls at this site.

No treatments are proposed within the best 100 acres of suitable habitat surrounding any of the spotted owl sites. Spotted owls associated with the owl circles are not expected to be displaced from their home ranges as a result of project implementation. However, the ability of spotted owls to successfully reproduce and survive into the future may be impaired at the Ground site where thinning and fuels reduction treatments would result in a further reduction of habitat below incidental take thresholds. Table 4-8 displays the effects to owl circles.

Table 4-8. Summary of effects to spotted owl circles.

Big Tree Owl Circle								
	1.82-mile radius circle				**0.7 mile radius circle**			
Alternative	**Total NRF Acres Treated**	**NRF acres removed**	**Post-action NRF acres**	**Below incidental take threshold?**	**Total NRF Acres Treated**	**NRF acres removed**	**Post-action NRF acres**	**Below incidental take threshold?**
No Action	0	0	5,087	NO	0	0	885	NO
B	376	236	4,851	NO	81	45	840	NO
C	772	108	4,979	NO	192	7	878	NO
D	376	32	5,055	NO	81	7	878	NO
Buck Creek Owl Circle								
Alternative	**1.82-mile radius circle**				**0.7 mile radius circle**			
No Action	0	0	5,394	NO	0	0	871	NO
B	205	118	5,276	NO	0	0	871	NO
C	94	8	5,386	NO	0	0	871	NO
D	199	8	5,386	NO	0	0	871	NO
Smith Butte Owl Circle								
Alternative	**1.82-mile radius circle**				**0.7 mile radius circle**			
No Action	0	0	3,579	NO	0	0	587	NO
B	368	172	3,407	NO	7	7	580	NO
C	622	10	3,569	NO	2	0	587	NO
D	357	71	3,508	NO	7	2	585	NO
Ground Owl Circle								
Alternative	**1.82-mile radius circle**				**0.7 mile radius circle**			
No Action	0	0	4,713	NO	0	0	478	YES
B	334	190	4,523	NO	27	16	462	YES
C	875	78	4,635	NO	21	1	477	YES
D	327	68	4,645	NO	21	0	478	YES
Gotchen Owl Circle								
Alternative	**1.82-mile radius circle**				**0.7 mile radius circle**			
No Action	0	0	2,889	NO	0	0	849	NO
B	115	109	2,780	NO	1	1	848	NO
C	30	10	2,779	NO	0	0	849	NO
D	109	11	2,878	NO	1	0	849	NO

Note: NRF acres removed includes NRF degraded to dispersal habitat. The incidental take threshold is 500 acres of NRF at 0.7-mile circle, and 2,663 acres of NRF at 1.82-mile circle.

Effects to Off-Forest Spotted Owl Sites

Each Action Alternative treats acres on the outer edge of three historic off-forest owl circles. These sites include Snowplow Mountain (27 acres), King Mountain (85 acres), and Lower Gotchen Creek (40 acres). No NRF habitat would be altered to non-suitable in these owl circles.

Effects to Dispersal Habitat within the Gotchen LSR, Gotchen LSR/Matrix, and connectivity with adjacent lands

Dispersal habitats include mid-seral stands of pole-sized trees (8"-11.9" dbh), mature stands severely degraded by western spruce budworm, and lodgepole stands. The effects to dispersal habitat vary in intensity, depending on the silvicultural treatment. These effects fall into 2 categories: (1) Dispersal areas treated that maintain dispersal habitat; and (2) Dispersal altered to unsuitable. Table 4-9 displays the acres of habitat affected in each category:

Table 4-9. Summary of effects to spotted owl dispersal habitat.

Alternative	Total Dispersal Acres Treated	Dispersal altered to unsuitable
B	974 acres	575 acres
C	1,183 acres	586 acres
D	973 acres	575 acres

Spotted owls use both NRF habitat and dispersal habitat for movements across the landscape. Actions that alter NRF habitat or dispersal habitat to an unsuitable condition result in the loss of dispersal habitat. Connectivity is defined as the amount and distribution of dispersal habitats located between conservation lands (Thomas et al 1990). Adjacent lands along the southeast Gotchen boundary are lands managed for spotted owl NRF habitat and dispersal under the Washington Department of Natural Resources Habitat Conservation Plan (WDNR 1997). Early conservation strategies for the spotted owl recommended maintaining at least 50% of the landscape outside of conservation areas (i.e. LSRs) with forest capable of supporting spotted owl dispersal (Thomas et al. 1990). Under all action alternatives, dispersal habitat and connectivity is maintained on over 83% of the Gotchen landscape. Table 4-10 displays these effects.

Table 4-10. Summary of effects to dispersal habitat within the Gotchen LSR/Matrix.

ALTERNATIVE	NRF ACRES	DISPERSAL ACRES	TOTAL NRF + DISPERSAL	PERCENT AREA
A	14,506	2,645	17,204	86.5%
B	14,120	2,390	16,510	83.2%
C	14,347	2,142	16,489	83.1%
D	14,357	2,219	16,576	83.6%

Note: All acreages are approximate values derived from the 2001 GPVEG GIS database. Due to inherent inconsistencies with different GIS data, the acreage values presented here may be slightly different from acreage values reported elsewhere within the FEIS.

Forest Fragmentation and Spotted Owl Habitat in the Gotchen LSR

Although a number of studies have attempted to define the significance of habitat fragmentation and edge effects to spotted owls, there have been no definite conclusions regarding this matter (Irwin and Hicks, 1995). These studies have

determined that the total amount of NRF habitat is the best indicator of a whether a particular landscape would support spotted owls (Meyer et al 1998; Irwin and Hicks 1995; Lehmkuhl and Rapheal, 1993). However, old forest "interior habitat" is assumed to be important for spotted owls in that it provides optimal cover for nesting, roosting, foraging, dispersal, and protection from predators. Great horned owls, a key predator of spotted owls, are known to be closely associated with fragmented forest habitats (Johnson 1992). As mature forests are harvested, great horned owls may colonize the fragmented forest, with the result that spotted owls lose suitable habitat and may become more susceptible to predation from great horned owls (Johnson 1992).

Barred owls, the spotted owl's main competitor, is a habitat "generalist" that is able to persist in a wide-variety of forest habitats. Recent research comparing habitat characteristics of barred owl and spotted owl territories have indicated that barred owls would occupy sites with fewer acres of mature forest than do spotted owls (Herter and Hicks 2000). One can infer from these studies that barred owls may be more tolerant of timber harvest, and thus may have a competitive edge over spotted owls in fragmented habitats.

To evaluate the potential impacts of fragmentation, the acres of "interior" NRF and "edge" NRF were calculated to determine if the action alternatives altered the relative amount of edge habitat. For this analysis, edge habitat was assumed to extend 330 feet (100m) into the edge of NRF stands that bordered non-suitable habitats. Although some road corridors can create an edge effect, roads were excluded from this analysis. Table 4-11 displays these effects within the Gotchen LSR.

Table 4-11. Acres and percentage of edge and interior NRF habitat within the Gotchen LSR.

Alternative	"Edge" NRF		"Interior" NRF		NRF Total
	acres	percent	acres	percent	
A	3,255	28.3%	8,257	71.7%	11,512
B	3,328	29.6%	7,900	70.4%	11,228
C	3,217	28.1%	8,209	71.9%	11,426
D	3,237	28.3%	8,199	71.7%	11,436

Shaded Fuelbreak treatments within Alternative B would increase fragmentation and edge habitat within the LSR. Alternative C, which does not propose any Fuelbreak treatments, results in a net reduction in the percentage of edge habitat in the LSR. Alternative D results in essentially no change. Under each alternative, the change in edge and interior habitats is relatively minor, and therefore the risk of increasing competition and predation of spotted owls due to edge effects is considered to be minimal.

Effects To Spotted Owl Critical Habitat Unit CHU WA-42

The effects to critical habitat are evaluated on the effects to the primary constituent elements of critical habitat, i.e., the physical and biological features that support nesting roosting, foraging, and dispersal of spotted owls. All stands identified for treatment under the action alternatives are located within CHU WA-42 except

portions of Q, V, T, Z, EE, and FF. Table 4-12 displays the acres NRF habitat in CHU treated, and the acres altered to non-suitable habitat.

Table 4-12. Summary and comparison of NRF acres treated within CHU WA-42.

Alternative		Total CHU-NRF Acres Treated	CHU-NRF degraded to foraging	CHU-NRF downgraded to dispersal	CHU-NRF converted to unsuitable
B	LSR	444	216	162	66
	Matrix	241	139	102	0
	Total	**685**	**355**	**264**	**66**
C	LSR	818	732	10	76
	Matrix	213	139	73	0
	Total	**1031**	**871**	**83**	**76**
D	LSR:	432	356	76	0
	Matrix:	241	168	73	0
	Total:	**673**	**524**	**149**	**0**

All action alternatives result in the direct removal of NRF habitat from within the CHU, therefore all action alternatives are likely to adverse affects to spotted owl critical habitat in the short-term. Table 4-13 displays the overall impact to the CHU in terms of acres and percent NRF and dispersal habitat within CHU WA-42.

Table 4-13. Summary and comparison of effects to CHU WA-42.

Alt.	CHU - NRF		CHU-Dispersal		CHU-Unsuitable	
	Acres	%	Acres	%	Acres	%
A	24,203	67.4	2,796	7.8	8,885	24.8
B	23,873	66.6	2,485	6.9	9,526	26.5
C	24,044	67.0	2,293	6.4	9,547	26.6
D	24,054	67.0	2,370	6.6	9,460	26.3

Alternative A

The effects of Alternative A are similar to those previously described for the spotted owl. No risk reduction treatments would be implemented and the eastern half of CHU WA-42 that overlaps the Gotchen Planning Area would continue to decline due to western spruce budworm defoliation. Fire hazard would remain high in the untreated landscape.

Alternatives B, C, D

The cumulative effects to CHU WA-42 are similar to those previously described for the spotted owl. CHU WA-42 was designated to support at least 12 pairs of spotted owls by providing essential NRF and dispersal habitat, and to provide connectivity between spotted owl populations in the eastern and western Cascades (USDI 1991).

Although action alternatives result in short-term habitat loss and degradation, the level of habitat loss is not expected to compromise the ability of the CHU to support spotted owls and spotted owl connectivity with adjacent lands.

The 1994 Northwest Forest Plan (NWFP) baseline estimate of NRF habitat in CHU WA-42 was 26,084 acres, or about 8.4 percent of the total NRF in CHUs on the GPNF (USFWS 2001b). This represents less than 1 percent of all spotted owl habitat within the entire CHU network. Since 1994 there has been 331 acres of NRF habitat removed or downgraded from CHU WA-42, a loss of about 1.3%. Alternative B would increase that figure to 661 acres. Alternative C would result in a cumulative total 490 acres of NRF removed or downgraded to dispersal. Alternative D would result in a cumulative total 480 acres of NRF removed or downgraded in CHU WA-42. Between 1994 and January, 2003, the USFWS has issued 58 Biological Opinions (BOs) to the GPNF authorizing the removal or degradation of 3,980 acres of suitable habitat in CHUs (USFWS 2003). Implementation of Alternative B would increase that figure to 4,300 acres. This would represent a cumulative loss of about 1.38 percent of all suitable habitat in CHUs across the GPNF since 1994.

Spotted Owl Habitat as an Indicator of LSR Function and the Desired Future Condition

Spotted owls and other late-successional species in the East Cascades have evolved over time in the presence of fire and other disturbances. Generally, a desired condition for LSRs is a landscape that sustains native species and natural ecosystem processes over the long-term. In Gotchen this could be achieved by restoring fire and disease resistant species to the ecosystem, and through the judicious use of fire suppression, fuels reduction treatments, and prescribed fire to create a forested landscape that is resilient to fire and other disturbances, and provides habitat for spotted owls.

Under the NWFP, the LSRs are to be “managed to protect and enhance old-growth forest conditions” (ROD, p. 8). The desired future condition for LSRs is to develop and maintain large patches of old-growth that provide habitat for the northern spotted owl and other old-growth dependent species (LSRA p. 3-1). At the scale of individual LSRs, this desired condition may be outside the historical natural range of variation (NRV), particularly in eastside forests, and may not be sustainable over the long-term (Agee and Edmonds 1992). Recent assessments indicate that large, contiguous patches of old forest multi-story structure likely did not occur in the Gotchen Planning Area and a management goal that seeks to develop and maintain this type of structure is likely to fail (Agee 2001). On the Wenatchee National Forest where forest conditions are similar to Gotchen, wildfires were the single largest cause of spotted owl habitat loss from 1994 – 2001. A large wildfire event in 1994 resulted in high-severity fire effects to over 9,500 acres of NRF habitat and resulted in the direct loss of 17-spotted owl activity centers, including 11 activity centers in LSRs (USFSW 2001b).

Spotted owls are excellent indicator species for other late-successional and old-growth dependent species because they occupy large territories and require on

average at least 50% old forest habitat in their territories (Hanson et al 1993). It is reasonable to assume that a landscape that is capable of supporting multiple pairs of spotted owls is also capable of supporting other late-successional species. Therefore, owl habitat can be used as an indicator of LSR "function".

The total amount of suitable owl habitat is the strongest indicator of whether or not a landscape is capable of supporting spotted owls (Irwin and Hicks 1995). Bart and Forsman (1992) found that levels of occupancy and reproductive success increased with an increasing amount of old forest in the landscape; spotted owl density and reproductive rates were significantly higher in areas with greater than 60% old forest than in areas with less than 20% old forest. However, there was no significant difference between 50% and 60% old forest (Bart 1995).

A reasonable objective for maintaining LSR function in the East Cascades would be to maintain a minimum of 50 to 60 percent suitable habitat surrounding known spotted owl territories, and to maintain a minimum of 50-60% suitable habitat within the larger landscape. These are the criteria that WDNR uses to manage spotted owl habitat on state lands designated for spotted owl demographic support (WDNR 1997). All action alternatives propose treatments that would achieve these objectives to varying degrees, and would maintain habitat levels well above the recommended 50-60% threshold for a "functional" LSR.

The cumulative effects of current actions and potential future actions are difficult to predict. Future management of the Gotchen LSR/Matrix would be critical to developing and maintaining desired conditions. The Matrix area would continue to be managed for timber production, and would most likely trend towards uneven age management with an emphasis on restoring ponderosa pine forests. These stands would potentially be less suitable for spotted owls, but would continue to provide connectivity with adjacent lands. Young forest stands and plantations within the LSR would also be managed with precommercial thinning and prescribed fire to create fire and disease resistant stands within the LSR. Buttes, riparian areas, and cool-moist potential vegetation zones in the LSR would provide the most likely locations to sustain old-forest multi-story structure and NRF habitat over the long-term.

Although all action alternatives are likely to adversely affect spotted owls in the short-term, each alternative has the potential to create a beneficial effect by reducing the fire hazard and improving forest health in treated stands. When these effects are weighed against the potential losses that could occur as a result of a large, high-severity fire event, the short-term effects to spotted owls are minor by comparison.

Effects on other Wildlife Species for all Alternatives

Bats

The effects of the no action alternative are similar to those previously described for spotted owls. All action alternatives would affect bats by removing potential roost trees and snags. Individual bats could potentially be harmed or killed during operations that cut and remove active roost trees. Because forest bats in the Gotchen

Planning Area use different roost trees over the course of the season (Taylor 1999, Mendez 2000), it is not possible to identify and protect all potential roost trees. Therefore, all action alternatives may impact individuals or habitat, but would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species. Mitigation measures that retain large trees, hollow trees, and snags would provide potential roosting locations for bats in all treated areas. Assuming bats use similar habitats to spotted owls, over 90% of the mature forest important for bats is undisturbed under all action alternatives. The cumulative effects to bats are similar to those previously described for spotted owls.

Western Gray Squirrel.

Although there is some Oregon white oak present in Gotchen, it appears that there is not enough of this species present to support a population of western gray squirrels. The No Action alternative would keep the forest in more closed canopy condition, providing greater horizontal and vertical connectivity for squirrels across the landscape. All action alternatives are determined to have no impact to western gray squirrels. Under all action alternatives, all oak trees located in treatment units would be retained on-site.

Gray wolf, grizzly bear, and California wolverine

Roads management has the greatest potential to affect these species. The action alternatives would not increase road access in Key Watersheds, roadless areas, or designated Wilderness areas. Under Alternatives B, C, and D open road densities would be decreased through road closures (gates) on 18.4 miles of road, and road decommissions on 6.4 miles of roads. This would reduce open roads in the area from approximately 100 miles to 75.2 miles. Open road densities would be reduced from approximately 3.24 miles per square mile, to 2.44 miles per square mile. Post action road density would remain relatively high, but any reduction in road density is beneficial to deer and elk, which are the primary prey species for these carnivores.

Under Alternatives A or C-1, there would be no change in open road densities; therefore any benefit in reducing roads would not be realized. Fuels reduction and restoration treatments would not reduce the capacity of the landscape to support deer and elk.

Therefore, all action alternatives are not likely to adversely affect the gray wolf or grizzly bear, and are not likely to contribute to a trend towards federal listing for the California wolverine. Hiding cover and winter thermal cover for deer and elk is maintained in mature forest habitat on over 70% of the area. Forage production for deer and elk would be enhanced in early seral stands created in the Matrix, and in open canopy stands created by Shaded Fuelbreaks.

Pacific Fisher and American Marten

Fishers and marten are closely associated with late-successional and old-growth forest. Conversion of closed-canopy forest to more open stands would reduce habitat

quality for fisher and marten. Fuels reduction and restoration treatments that remove snags and down logs can reduce availability of structures important for denning, and can reduce prey populations (Bull et al. 2001). Therefore, all action alternatives may impact individuals or habitat, but would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species. Mitigation measures that retain large trees, hollow trees, snags, and down logs would provide potential denning structure for fisher and marten in all treated areas. Assuming fisher and marten use similar habitats to spotted owls, over 90% of the mature forest important for fishers is undisturbed under all action alternatives. The effects of no action and the cumulative effects to fisher and marten are similar to those previously described for spotted owl.

Canada Lynx

Based on the current knowledge of lynx habitat requirements, the Lynx Biology Team has concluded that there is no lynx habitat on the Gifford Pinchot National Forest (B. Naney, pers. com.). Therefore, Alternative A would result in no effect to lynx or lynx habitat. No cumulative effects to lynx or lynx habitat are anticipated under the No Action Alternative, because there is no lynx habitat in the area.

Lynx are known to occasionally occur outside lynx habitat in areas adjacent to as well as far from primary lynx habitat (USFWS 2002). Transient lynx that occur outside of lynx habitat represent (a) lynx that are dispersing to lynx habitat elsewhere; (b) lynx on relatively short exploratory movements near or adjacent to lynx habitat; or (c) individuals that have emigrated away from their habitat due to prey species declines and ultimately would not successfully establish home ranges and reproduce (USFWS 2002). Because the nearest potential lynx habitat is located approximately 40 miles northeast of Gotchen, any individuals that occur in the area are most likely lynx that have emigrated away from their primary habitat.

Based on the wide-ranging nature of lynx, there is a slight potential that transient lynx could occur in Gotchen. Therefore, all action alternatives may affect, but are not likely to adversely affect lynx based on the potential for insignificant effects to transient individuals. Action alternatives are not likely to adversely affect lynx because (a) there would be no effect whatsoever to suitable lynx habitat, (b) action alternatives would not result in an increased potential for human encounters or human-caused mortality, (c) fuels reduction treatments may result in short-term reductions in snowshoe hares within individual treatment units, but snowshoe hare densities would not be reduced at the landscape scale, and (d) fuels reduction treatments would not result in barriers to lynx movement across the landscape. No cumulative effects to lynx or lynx habitat are anticipated under the Action Alternatives, because there is no lynx habitat in the area.

Deer and Elk Winter Range

Most of the deer and elk winter range occur in the Matrix lands, and as such, winter forage conditions would improve under all the action alternatives given the prescriptions for regeneration harvest and under burn. These harvest prescriptions

would stimulate growth of forage species. Gating or closing roads on these lands would also improve security cover and reduce disturbance to ungulates during the critical winter period. Determination: All action alternatives would have a beneficial impact on deer and elk winter range.

Bald Eagle

Alternative A would result in no effect to bald eagles or bald eagle habitat. Based on the wide-ranging nature of bald eagles, there is a slight potential that migratory bald eagles could occur in Gotchen. Therefore, all action alternatives may affect, but are not likely to adversely affect bald eagles based on the potential for insignificant effects to transient individuals. Action alternatives are not likely to adversely affect bald eagles because (a) there are no known bald eagle nesting, feeding, or roosting sites within the Gotchen Planning Area and (b) under all action alternatives, old-growth stands and individual old-growth trees are maintained as potential roosting sites. No cumulative effects to bald eagles are anticipated.

Northern Goshawk

Northern goshawks are closely associated with late-successional and old-growth forest. Conversion of closed-canopy forest to more open stands would reduce habitat quality for goshawks. Risk reduction and restoration treatments that that remove snags and down logs can reduce availability of structures important for roosting, and can reduce prey populations. Therefore, all action alternatives may impact individuals or habitat, but would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Known goshawk nest sites and nest territories located in the Gotchen are not affected by the any of the proposed activities. If any new goshawks sites are located during implementation, then these sites would be protected with a 31-acre no harvest buffer and seasonal operating restrictions to minimize disturbance (include in mitigation measures). Mitigation measures that retain large trees, hollow trees, snags, and down logs would provide potential roosting structures for goshawks and their prey species. Assuming goshawks use similar habitats to spotted owls, over 90% of the mature forest important for goshawks is undisturbed under all action alternatives. The effects of no action and the cumulative effects to northern goshawk are similar to those previously described for spotted owl.

Great Gray Owl

Great gray owls are a Survey and Manage protection buffer species. NWFP standards and guidelines require a 300-foot buffer around meadows and other natural openings to protect great gray owl nesting and roosting habitat. All action alternatives propose to apply treatments within the 300-foot buffer around the Gotchen Creek Guard Station to restore the aspen and meadow habitat at this site. However, this treatment would only remove small conifers and would enhance the open meadow and aspen habitats that are present at this site. Large trees that provide potential roosting structures would be maintained. Therefore, all action alternatives may impact

individuals or habitat, but would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species. There no known great gray owl nest sites in Gotchen, and the species has never been documented in the area. If a great gray owl site is located during project implementation, it would be protected with a 125-acre no harvest buffer. The effects of no action and the cumulative effects to great gray owl are similar to those previously described for spotted owl.

Primary cavity excavators (woodpeckers)

Perhaps the greatest challenge in providing for the great variety of cavity users is meeting snag/tree needs in terms of unique characteristics (soft, hard, height, hollow, cavities, crevices, flaking bark) and the patterns in which these snags are left (aggregate islands, single sentinels, scattered, clumped).

Matrix lands that are managed for ponderosa pine provide an opportunity to increase numbers of breeding white-headed woodpeckers. White-headed woodpeckers are at the western-most extent of their range in the Gotchen planning area so they may naturally occur in lower numbers.

The mosaic patterns of habitat conditions in the Gotchen Planning Area, even after treatments are implemented and maintained, would provide for the northern flicker, red-breasted sapsucker, hairy woodpecker, black-backed woodpecker, and Williamson's sapsucker, given the snag and live tree retention prescriptions. Specific treatments in the action alternatives like the Shaded Fuelbreaks would favor edge and open habitat species over others preferring greater tree density and canopy cover. The Shaded Fuelbreaks along Forest road 8020 coincides with the richest portion of the Gotchen Planning Area for woodpeckers. At this point, adjacent untreated acres are maintained on the landscape to provide for a whole range of species. This is similar in all action alternatives. However, Shaded Fuelbreaks in the LSR action alternatives drop slightly below the 100% population level (7.5 snags per acre) by retaining only 7 snags per acres. This would impact individuals in those areas of the landscape, but adjacent untreated areas would be expected to have snag densities that meet or exceed the requirements for these species.

The primary retention of hard snags under the treatment alternatives would reduce the foraging base and nest sites for woodpeckers and secondary cavity users. This could reduce the population potential within the treated areas; however, the proposed snag retention guidelines would be important in providing for the various niches occupied by cavity users. Distribution and patterns of snag retention would be important in providing for the various niches occupied by cavity users.

Pileated woodpeckers are a special case. Their home ranges are so large and their territorial tenacity so great that determining their core breeding areas is relatively straightforward over four survey visits during the breeding period. Because they maintain their territories year-round, it is important to pay particular attention to key habitat components in core territories.

According to Bate (2000), pileateds may be detected in higher numbers and have smaller breeding territories when food resources are abundant, as they have been since the spruce budworm outbreak. Stand CC (Alt C) contains a core territory for pileated woodpecker, and the nest tree is confidently located in the southeast corner of the unit. For pileateds, the action alternatives must provide larger diameters and greater amounts of trees, snags, and down wood in their core areas. Pileateds are foragers of down wood and key into carpenter ants.

All action alternatives may impact individual primary cavity excavators, but would not likely contribute to a trend toward Federal listing. The mitigation measures that retain large trees, hollow trees, snags, down logs would provide habitat for woodpeckers in all proposed treatment areas. The objective in Gotchen is to provide for the 100% population potential for all cavity excavators. This would be accomplished for all alternatives by retaining all live trees >21” dbh in the LSR. Snags would be retained from the largest available at densities of 7 snags/per acre in Shaded Fuelbreaks, and 10 snags/acre in all other LSR treatments. Shaded Fuelbreaks would have slightly deficient snag levels, but the adjacent untreated areas would provide abundant snags for cavity nester. Large down logs would be retained at approximately 2% cover, which is consistent with average levels for Eastside mixed conifer forest. Down wood levels retained in treated areas are low for pileated, woodpeckers, but this species would expect to be maintained by large patches of mature forest in the area. Assuming pileated woodpeckers use similar habitats to spotted owls, over 90% of the mature forest important for pileated woodpeckers would be undisturbed under all action alternatives.

Neotropical birds

The No Action alternative may increase the number and abundance of cavity-nesting birds because of the large number of dead and dying grand fir trees present. The irruptive bird species associated with specific insect disturbance outbreaks, resulting from years or drought and stress to conifers would remain more abundant under the No Action alternative for at least ten years. Mistletoe, a parasite to Douglas-fir and ponderosa pine, has created substantial nesting platforms in conifers for many bird species. As many of the conifers die from the various stressors, so too, would the mistletoe. This would likely affect nesting platform opportunities for birds 20 to 50 years from now.

All action alternatives would affect neo-tropical birds. Aerial-feeding Neotropical birds (e.g. dusky and Hammond's flycatchers) may most benefit from the treatments in all action Alternatives in the LSR. Stands would open up and shrub density management would increase open air space for aerial feeders. Likely, only the regeneration harvest treatments would increase olive-sided flycatcher numbers. This would happen only by creating truly open habitat with scattered leave trees versus an evenly distributed tree prescription.

Shrub-associated bird species (e.g. Nashville warbler) are impacted by the management of the under story vegetation in the Shaded Fuelbreaks. Conifer crown ratios and tree species diversity would increase in the years following treatment as a

result of the action Alternatives. Hermit and Townsend's warblers benefit from an increase in surface area of needles in the upper canopy. Maintenance of soft snags benefits species like the white-headed woodpecker, red-breasted nuthatch, and chestnut-backed chickadee.

The long-term increase of healthy, intermediate conifers would provide improved habitat conditions for the warbling vireo, western tanager, and chipping sparrow. Ground nesters like the dark-eye junco would be impacted by the loss of the shrub component for nesting, foraging, and cover. The alternatives, as applied across the landscape, plant a variety of conifer species, and reintroduce fire to specific areas. These prescriptions may improve stand dynamics in the future if maintenance continues.

Fall burning would reduce the mortality and disturbance to nesting land birds because they are finished with the breeding cycle. Spring burning (up to Memorial Day) would impact certain species but not all.

The removal of mistletoe-infected Douglas-fir trees within the various action alternatives would reduce nesting opportunities for the common raven, the great blue heron, and other species including the northern spotted owl, which use secondary platform nests. Pine grosbeaks feed on mistletoe. Generally in Gotchen, mistletoe occurs in larger diameter Douglas-fir. The prescription under the action alternatives would harvest large diameter, Douglas-fir trees greater than 21 inches dbh in Matrix harvest units. No live trees greater than 21 inches would be cut in the LSR.

All action alternatives may impact individual neotropical birds, but would not likely contribute to a trend toward Federal listing". Mitigation measures that retain large trees, hollow trees, snags, and untreated understory retention areas would provide habitat for neo-tropical birds. Assuming late-successional and old-growth associated species use similar habitats to spotted owls, over 90% of the mature forest important for neo-tropical is undisturbed under all action alternatives. There would be no impact to designated Important Bird Areas. The effects of no action and the cumulative effects to neo-tropical birds are similar to those previously described for spotted owl.

Great Blue Heron

One rookery is approximately 1400 feet at its closest point from the shaded fuel-break prescription. The Ground heron rookery would have a limited operating season and a no-harvest protection buffer, which would maintain the stand's integrity surrounding the rookery. Stand K and BB are on the edge of the rookery area. None of the action alternatives would impact the great blue heron rookery.

Harlequin Duck

All alternatives are expected to have no impact to harlequin ducks. There are no activities proposed in the riparian zones along the Upper White Salmon River that provide potential nesting habitat for this species. Riparian reserves and water-quality are maintained in the Wicky/Morrison Creek subwatershed, so no impact would be anticipated to the habitat or aquatic insects that harlequin ducks prey upon.

Amphibians and Mollusks

No Survey & Manage amphibian or mollusk protection buffer species have been located in the Gotchen Planning Area. Per the No Action alternative, the presence of more down wood may provide micro-site conditions that retain moisture longer into the dry season. This may increase dispersal habitat for slug and amphibian species, which is currently low and locally occurring. All action alternatives would have no impact on S&M species. All action alternatives may impact individual amphibians or slugs, but would not likely contribute to a trend toward Federal listing. Mitigation measures that limit activities in riparian areas, and retention of decayed down logs would provide some measure of protection for these species. If any species were located during implementation, they would be protected by implementing specified management recommendations for the species. Other species of concern include the tailed frog, Cope's giant salamander, and the Cascade torrent salamander. All action alternatives are expected to have no impact to these species because there are no activities proposed in the Wicky/Morrison Creek riparian zones. Cascades frog, red-legged frog, and western toads are all species associated with moist forest, decayed down wood, springs, and vernal pools. .

Edge effect and special habitat components are the most important features to consider for amphibians within Gotchen. Micro site is critically important in retaining moisture, regulating airflow and temperature. The action alternatives would increase edge effect conditions and reduce area effectively retaining moisture when compared to the current condition. The action alternatives open the canopy cover and remove down wood and snags to a level that allows desiccation to occur at a higher rate. The road decommissioning would allow natural seeding to occur, providing for safer travel and improve connectivity across the landscape for dispersing individuals.

Mardon Skipper

Of all the species in Gotchen the mardon skipper is probably the most threatened by the long-term effects of no action. The 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, and mardon skippers have been able to colonize some plantation areas, but these sites are limited. Without active management, the open grass habitats that mardon skippers require would be lost to natural succession. Vegetation modeling indicates that in the absence of disturbance, early seral habitats would be virtually absent from Gotchen within 50 years. The potential for a high-severity fire in the Gotchen Planning Area also threatens the mardon skipper.

Currently there are 40 known mardon skipper sites in the Washington Cascades, including 20 sites in Gotchen. These sites represent about 30 percent of the known mardon skipper population in the Washington Cascades. Stand-replacing fires could potentially eliminate this population, placing the species at risk of local extirpation.

Under the action alternatives, there are two treatments proposed that have the potential to directly impact mardon skippers. The aspen restoration (Unit Z) identified

at the Gotchen Creek Guard Station and plantation maintenance with prescribed fire (Unit R). Individual mardon skippers (larva, pupa, or adults) could be trampled and killed by people working in these areas. Slash would be piled and burned, potentially killing individual skippers if they are adjacent to burn piles. Prescribed fire treatments within plantations could eliminate the mardon skippers occupying the site if all occupied habitat gets burned at once. Mardon skippers may also be impacted where fuels reduction treatments occur adjacent to occupied roadside areas or occupied plantations. Individuals could be crushed if trees are felled and yarded through occupied habitat, or if heavy equipment drives through occupied habitat.

Although there are some unavoidable short-term adverse affects associated with the proposed treatments, these actions would be beneficial to mardon skippers by maintaining the open grass habitats they require. Additionally, open habitats created in Shaded Fuelbreaks areas may provide some transitory habitat for mardon skippers and potentially improve connectivity between local populations within the Gotchen Planning Area. Risk reduction strategies that allow for effective fire management would also benefit mardon skippers by reducing the risk of local extirpation from a high-severity fire.

The meadow at the Gotchen Creek Guard Station is significant in that it is one of only 4 natural meadows in Gotchen known to be occupied by mardon skippers. The population at this site is small (peak count is 11 individuals) and the existing uses (grazing and water storage) along with natural conifer encroachment and invasive weeds are severely degrading the habitat at this site. The proposed aspen restoration would be beneficial to maintaining the meadow at this site, but full recovery of the aspen and meadow habitat is not likely to occur while the site is actively grazed by cattle. Therefore, a cattle exclosure would be constructed around portions of the Gotchen meadow to facilitate the restoration of this site. Excluding cattle from this meadow would remove the direct impacts that grazing cattle have to mardon skippers and their habitat.

Unit R is a ponderosa pine plantation with about 3 acres of open grass habitat occupied by mardon skippers. This site currently has about 10 percent of the known mardon skipper population in Gotchen as indicated by a peak count of 25 individuals. Prescribed burning at this site has the potential to create more open grass habitat in this plantation, resulting in increased habitat for mardon skippers.

Mitigation measures to protect mardon skippers are listed in Chapter 2, Wildlife mitigation. Despite these mitigation measures, however, all action alternatives would impact individuals and habitat, but are not likely to jeopardize the continued existence of the species.

Johnson's Hairstreak and Chinquapin Hairstreak Butterflies

There is no golden chinquapin present in Gotchen; therefore, all alternatives are determined to have no impact to the chinquapin hairstreak butterfly. The Gotchen Planning Area is located above 2,000 feet elevation, so there is a low likelihood that the Johnson's hairstreak occurs in Gotchen. Some large trees infected with mistletoe would be removed in Matrix harvest units, so there is a slight chance that individual

trees occupied by Johnson's hairstreak could be harvested. Therefore, all action alternatives may impact individuals or habitat, but are not likely to contribute to a trend towards federal listing. Mitigation measures that retain large, old-growth trees would provide potential habitat for the Johnson's hairstreak.

VEGETATION

Objectives: Stand Density and Species Composition

Stand densities and species composition are two factors that have a major influence on overall stand conditions within the Gotchen planning area. Forests that were once dominated with Douglas- fir and ponderosa pine and supported tree densities of 25-40 trees per acre now contain tree densities greater than 500 trees per acre and are dominated by grand fir (Agee 2001), due to effective fire prevention and suppression during the last century. Consequently, an abundant and expanding source of shade-tolerant species (particularly grand fir) has become established and developed into a dense understory. This understory is currently causing inter-tree competition and stress on the remaining large, remnant ponderosa pine trees, and serving as a conduit for insects and disease.

Stand density *is a primary factor affecting growth and vigor of the Gotchen stands. High stand densities can produce water, light, and nutrient stress on trees. Trees with low vigor are more likely to be subject to mortality, especially during incidences such as climatic cycles, wildfires, and/or insects and disease. Reducing stand density, by thinning consistently shows increases in diameter, growth/vigor (Reukema et al. 1977), and reduces moisture stress on the residual stand.*

Species composition *is a primary factor influencing the risk and stability of the Gotchen forests. The majority of these forests, once dominated with Douglas- fir and ponderosa pine, experienced a frequent, low-intensity fire regime (Weaver 1961, Agee 1993). The current change in species composition, to more shade-tolerant species, mainly grand fir, has increased the susceptibility of the Gotchen forests to disturbances, such as damage from the western spruce budworm and root rots.*

Repeated defoliation, from budworm attacks, can reduce tree canopies and produce low vigor trees and/or individual tree mortality. Several significant pathogen epicenters of laminated root rot (Phellinus werii) and Armillaria root disease (Armillaria ostoyae) are scattered throughout the Gotchen forests. Susceptibility to infection and associated damage by these diseases varies with tree species. Grand fir, within Gotchen forests, is the most susceptible species. Manipulating tree species during forest management activities and improving the vigor of the trees can reduce root disease losses.

Measurement Methods

Acres of treatment activity that accomplishes density management

Acres of treatment activity that increases the early seral component (Douglas-fir, ponderosa pine, western white pine, western larch, and lodgepole pine)

Methodology

The Forest Vegetation Simulator (FVS) was used to simulate forest growth and portray structural and compositional characteristics for the vegetation analysis. The Vegetation Report, located in the Project File, describes the use of this model in more detail, as well as the origin of the stand data used in the vegetation analysis.

It is assumed for this analysis, that there would be no additional regulated timber harvest (other than proposed within the treatment alternatives) during the time period from 2003-2013. From 2013 thru 2053, out year timber harvest would reflect the harvest schedule as noted in the Summary of Cumulative Effects Table in Appendix G. It is also assumed that the regulated timber harvest program, within the Matrix, would remove a portion of the overstory within Units B, C, D, and F in 2013-2023 time period.

Table 4.14 compares the treated acres for each alternative that affect stand density and species composition. The diameter at breast height (dbh) information displayed in the shaded portion of the table provides insight into the potential future condition of the treated stands; the higher the green tree diameter cut limit, generally the more open the stand would be in the future.

Table 4.14 Comparison of Treatments by Alternative

Forest Element	Alternative A	Alternative B	Alternative C	Alternative D
Density Management Treatment (Acres)	0	739	1,298	739
Increases Early Seral Species (Acres)	0	934	911	896
Green Tree Diameter Cut Limit in LSR (Inches - Diameter Breast Height)	N/A	20”	10”*	10”**
Percent of the Gotchen Planning Area Treated.	0	9	11	8

* Except 20” in Units M and X
** Except 20” in Unit X

Alternative A – No Action

Direct, Indirect and Cumulative Effects (1-5 years)

Alternative A fails to meet the silvicultural objectives of density reduction and reintroducing early seral species to Gotchen

Under the No Action alternative, several of the older plantations, established in the late 1960’s, early 1970’s, would soon begin to experience inter-tree competition due to high tree density. A loss of tree vigor would be accompanied with this competition.

In the stands within the Grand Fir Zone, the intolerant species (ponderosa pine, Douglas-fir, western larch, and lodgepole pine) would continue to grow the most rapidly and provide species diversity and resilience to the stands. However, grand fir is the dominant species within these stands and would continue to be a host species to budworm and the various root rot diseases. Budworm populations within these stands are predicted to decline within the next five years and existing host tree canopies would begin to recover from several years of repeated defoliation.

Underground disease agents (Armillaria, laminated root rot, and annosus root rot) would continue to keep many of these stands in an open condition. Timber stands within the mountain hemlock ecoclass would continue to maintain a species diversity that would provide resilience to future budworm attacks. Tree mortality from root rot diseases would continue and be directly related to the grand fir component.

Trees within high density pockets and the "stem exclusion closed canopy" stands would continue to experience stress as they compete for moisture, light, and nutrients. The shade tolerant species (grand fir) would continue to survive within and beneath the main canopy. Several of the large, remnant ponderosa pine trees would continue to experience moisture stress from the existing grand fir understory component. Mortality of single trees would continue and would be inversely related to the existing insect/root rot damage and grand fir species component. The trees with sparse crowns (mostly grand fir) and reduced live crown canopies would likely be candidates for future mortality, particularly during the drier years.

The Gotchen meadow area would continue to experience an encroachment of conifers and the existing aspen trees would continue to experience inter-tree competition. Forage production for domestic livestock and big game is expected to decrease as the tree canopies recover and continue to encroach on open areas.

Alternative A: Cumulative Effects (10 and 50 years)

In 10 years, the Gotchen landscape reflected in Alternative A would continue on the same trajectory as described for the first 1-5 years. The grand fir component would continue to grow and germinate in the understory. This condition would continue to cause moisture, light, and nutrient stress within the trees. Mortality of single trees would continue and would be inversely related to the existing insect/root rot damage and grand fir species component. The trees with sparse crowns (mostly grand firs) and reduced live crown canopies would likely be candidates for future mortality, particularly during the drier years. The western spruce budworm population, based on historic trends, is not expected to increase during this time period (Willhite 2002). However, the stands would remain vulnerable to disturbances due to the high component of grand fir, multi-canopies, and dense pockets of understory trees.

In 50 years, the grand fir component would continue to grow and germinate in the understory. This condition would exacerbate the inter-tree competition. The soil resource would not be able to sustain the existing trees. Mortality of single and groups of trees would continue at an accelerated rate and would be inversely related to the existing insect/root rot damage and grand fir species component. The western spruce budworm population, based on historic trends, would most likely increase

during this time period (Willhite 2002). The majority of stands within the Grand Fir Zone would be vulnerable due to the high component of grand fir, multi-canopies, and dense understories.

Forage production for domestic livestock and big game would increase as the forest stand densities begin to decrease and open additional sunlight to the forest floor.

Alternative B

Direct, Indirect and Cumulative Effects (1-5 years)

Density Management

Alternative B is better than Alternatives A and D but not as good as Alternatives C for meeting the silvicultural objectives of density reduction and reintroducing early seral species to Gotchen. The 20" green diameter cut tree limit, in most of the LSR stands, allows adequate density reduction and the 934 acres of planting early seral species is the highest of all alternatives.

Alternative B would conduct density management on approximately 739 acres within the first five years. Most of this activity would be within the LSR land allocation (Units N through U, W, X, Y, AA, and BB). The effect on forest health would be increased stand vigor, as the remaining trees would have less stress associated with competition for moisture, light, and nutrients. In addition, the majority of the understory within these acres is grand fir, thus a substantial percentage of this species component would be reduced within these units. All of these acres would benefit from increased forage production for domestic livestock and big game.

Treatment within Unit V (6 acres of riparian) is limited to an 8" dbh maximum green tree cut. This activity would promote increased growth and vigor within the isolated dense pockets of small trees within the stands. However, elsewhere in the stand, this cutting restriction would not be sufficient enough to produce any growth/vigor benefits. Riparian density management, within Stands Z, AA, and BB (13 acres) would slightly accelerate the growth on the remaining trees. Riparian treatment, within Unit L (25 acres), treats dead material only, thus no accelerated growth of the residual trees would occur.

Treatment in Unit Y (81 acres) would help relieve the current moisture stress on fifty percent of the large, remnant ponderosa pine trees.

Treatment in Unit Z would release the existing aspen component within the Gotchen meadow area and promote the health and vigor of the aspen trees.

Species Composition

Alternative B would increase the early seral component within the timber stands on approximately 934 acres. These activities would occur within both the matrix and LSR land allocations (Units A-M). All of these stands, except Units G and M, would have a mix of ponderosa pine, Douglas-fir, and western larch conifer species artificially planted after the overstory was reduced to allow for adequate light for the

seedling establishment. The effect would be an increase in the intolerant seedling component, providing a future tolerance against root rots and western spruce budworm infestations. Stands G and M would experience an increased component of intolerant species since mostly grand fir would be removed with the silvicultural prescription.

Approximately 9 percent (1,710 acres) of the National Forest System lands, within the Gotchen planning area, would be in the initiation structure stage in five years. No additional federal timber harvest plans (regulated harvest), within the Gotchen planning area, are expected to occur within this time period (Summary of Cumulative Activities Table in Appendix G.).

Alternative B: Cumulative Effects (10 and 50 years)

In ten years, the 739 acres that received a density management treatment would continue to benefit from the increased tree growth and vigor. The inter-tree competition would not be expected to be a factor in ten years since the tree canopies would still be enlarging into unoccupied space forage production for domestic livestock and big game would remain stable. As the tree crowns start to close, shade conditions would promote establishment of grand fir seedlings in the understory. Units N-Q and S-W would receive an underburn treatment to “maintain” the Shaded Fuelbreaks. Most of the natural regenerated seedlings within these stands would perish with this treatment, keeping these stands one-storied.

Similarly, the 934 acres that received an overstory treatment, followed by the artificial planting of early seral species would continue to reflect species diversity accomplished through the original treatment. Ponderosa pine, Douglas-fir, and western larch conifer species would continue to provide species diversity and resilience for these plantations against future budworm outbreaks and root rot infections, despite the increase in the grand fir component from natural regeneration during the last 10 years. The early seral species, previously planted in Units H-L, would experience a reduction in their growth potential due to partial shading from the overstory trees (McDonald 1976). Unit G and M, which were not artificially planted, would experience an ingrowth of natural regenerated species, mostly grand fir. No additional silvicultural treatments are scheduled for these stands within 10 years (Summary of Cumulative Effects Table in Appendix G).

In 50 years, the inter-tree competition/stress would once again be expected to be a factor since most of the tree canopies would be closed and little-to-no-growing space would be available. Units N-Q and S-W would receive a second underburn treatment (21-30 years) to “maintain” the Shaded Fuelbreaks and most of the natural regenerated seedlings within these stands would be killed. However, the canopies of the residual stand, if not treated with another density reduction treatment, would utilize all of the available growing space in fifty years. Forage production would decrease with the LSR. Units A-D, F, and H-L (722 acres), would receive a young stand thinning treatment (11-20 years) to maintain/increase the growth/vigor of the plantations. These same plantations would receive an underburn treatment in (21-30 years). Both of these treatments would help reduce the inter-tree competition.

However, by year 50, inter-tree competition would return and these stands would be in need of another density reduction (commercial thin) treatment. Only the Matrix stands (Units A-D, and F, 376 acres) would likely be scheduled for a density reduction treatment as part of the future regulated harvest schedule (Summary of Cumulative Activities Table in Appendix G). Units E, G, and R would also receive another silvicultural treatment (11-20 years), but again, these stands would need "maintenance" every 15-20 years to retain growth and vigor benefits.

In 50 years, the 934 acres previously treated and planted with ponderosa pine, Douglas-fir, and western larch would continue to provide species diversity and resilience against future budworm outbreaks and root rot infections. However, early seral species, with Units H-L would continue to not grow to their full potential due to the shading from the overstory trees. Armillaria may infect and overtake some of the stressed conifers especially the ponderosa pine and cause mortality (USDA-FS-1986). These same stands would also receive an underburn treatment (21-30 years) to reduce fuels and introduce fire into these stands. Unit M, which was not artificially planted, would incur no additional silvicultural treatment within 50 years, allowing shade tolerant grand fir to reinvade this stand and again place inter-tree competition/stress on the large residual ponderosa pines.

Alternative C

Direct, Indirect and Cumulative Effects (1-5 years)

Density Management

Alternative C is determined as the best alternative for meeting the silvicultural objectives of density reduction and reintroducing early seral species to Gotchen. Alternative C directly treats more acres than the other alternatives. In addition, the alternative increases the early seral component on 911 acres, slightly less than alternative B.

Alternative C would conduct density management on approximately 1,298 acres within the first five years. Most of this activity would be within the LSR land allocation (Units R, S, X, Y, AA, BB, CC, DD, EE, and FF). Alternative C limits the cutting of the green trees to 10" dbh and less within these stands. As a result, these units would have a denser residual forest, which would produce less growth and vigor benefits than with an unrestricted diameter cut limit.

Alternative C would treat more acreage in the stem exclusion open canopy stand structure than Alternative B, though this increase is not reflected in Table 4-4. The difference is mostly within Unit AA. Unit AA, in Alternative C, is already a stem exclusion open canopy stand with 571 acres proposed for understory density reduction. The stand structure after treatment would remain the same structure type (stem exclusion open canopy), thus no net increase in the short-term. However the existing "pockets" of understory would receive the benefits of a density management treatment and the grand fir component, currently existing within this unit, would be

substantially reduced. Forage production for domestic livestock and big game would increase as a result of understory thinning within the LSR.

Riparian density management, within Units L, Z, AA, BB, and FF (57 acres) would slightly accelerate the growth on the remaining trees (10” green tree diameter cutting restriction).

Treatment in Unit Y (249 acres) would help relieve the current moisture stress on all of the large, remnant ponderosa pine trees.

Treatment in Unit Z would release the existing aspen component within the Gotchen meadow area and promote the health and vigor of the aspen trees.

Species Composition

Alternative C would increase the early seral component within timber stands on approximately 911 acres. Reforestation activities would occur within both the Matrix and LSR land allocations (Units A-M). All of these units, except G and M, would have a mix of ponderosa pine, Douglas-fir, and western larch conifer species artificially planted after the overstory was reduced to allow for adequate light for the seedling establishment. The increased effect of the intolerant seedling component would provide a future tolerance against root rots and western spruce budworm infestations. Units G and M would also experience an increased component of intolerant species since mostly grand fir would be removed with the silvicultural prescription. Thinning the understory trees in Unit H would produce a residual stand with more growth and vigor. Thinning the understory trees in Unit I, with a 10” green tree diameter cut would produce a denser forest with less growth and vigor than with an unrestricted diameter cut limit. Units J, K, and L would treat (thin) the existing understory, which would benefit the establishment and growth of the planted intolerant species.

Alternative C: Cumulative Effects (10 and 50 years)

In ten years, Alternative C would continue to provide growth and vigor benefits to the 1,298 acres that received a density management treatment ten years prior. However, because of the 10” green tree diameter cut limit the tree canopies within the LSR stands would close earlier and shade conditions would promote establishment of grand fir seedlings in the understory. Forage production would start to decline. Units S, EE, and FF would receive an underburn treatment to “maintain” the Fuelbreaks. Most of the natural regenerated seedlings within this stand would perish with this treatment, keeping these stands one-storied.

In ten years, Alternative C would continue to provide species diversity and resilience to the 911 acres that received a previous overstory treatment followed by the artificial planting of early seral species. However, the early seral species within Units H-L would experience a reduction in their full growth potential due to the continued partial shading from the residual overstory. Units G and M, which were not artificially planted, would experience an ingrowth of natural regenerated species,

mostly grand fir. No additional silvicultural treatments would be scheduled for these stands within 10 years

In 50 years, inter-tree competition/stress would once again be a factor to the 1,298 acres treated previously; most of the tree canopies would be closed and little to no growing space would be available. Forage production would decrease within the LSR. Units S, EE, and FF would receive a second underburn treatment (21-30 years) to "maintain" the Fuelbreaks and most of the natural regenerated seedlings within these stands would be killed. However, the canopies of the residual stand, if not treated with another density reduction treatment, would utilize all of the available growing space in fifty years.

Units A-D, F, and H-L (722 acres), would receive a young stand thinning treatment (11-20 years) to maintain/increase the growth/vigor of the plantations. These same plantations would receive an underburn treatment in (21-30 years). Both of these treatments would help reduce the inter-tree competition. However, by year 50, inter-tree competition would return and these stands would be in need of another density reduction (commercial thin) treatment. Only the Matrix stands (Units A-D and F, 376 acres) would likely be scheduled for a density reduction treatment as part of the future regulated harvest schedule.

Units E, G, and R would also receive another silvicultural treatment (11-20 years), but again, these stands would need "maintenance", every 15-20 years to retain growth and vigor benefits.

In 50 years, Alternative C would continue to provide species diversity and resilience to the 911 acres that received a previous overstory treatment, followed by the artificial planting of early seral species. Ponderosa pine, Douglas-fir, and western larch would provide species diversity and resilience against future budworm outbreaks and root rot infections on the 911 acres treated previously. Existing understory trees within LSR Units H-L would continue to produce shaded conditions and stunt the growth of the understory trees. Armillaria may cause mortality to the severely stressed trees, especially the ponderosa pine component. Most of these same stands would also receive an underburn treatment (21-30 years) to reduce fuels and introduce fire into these stands. Unit M, which would not have been artificially planted, would incur no additional silvicultural treatment within 50 years, allowing shade tolerant grand fir to reinvade this stand and again place inter-tree competition/stress on the large residual ponderosa pines.

Alternative D

Direct, Indirect and Cumulative Effects (1-5 years)

Density Management

Alternative D does less than Alternatives B and C toward meeting the silvicultural objectives of density reduction and reintroducing early seral species to Gotchen. This alternative treats the same acreage as Alternative B but the 10" green tree diameter

cut tree limit results in less growth/vigor benefit. The alternative increases the early seral component on 896 acres, the least of all the treatment alternatives.

Alternative D would conduct density management on approximately 739 acres within the first five years. These silvicultural treatments would occur within the same stands as in Alternative B. However, Alternative D limits the cutting of the green trees to 10” dbh and less within Units N-Q, S-W, and Y. This would result in denser residual stands. Thus the growth and vigor benefits from thinning would be significantly less than with an unrestricted diameter cut limit. Forage production would increase as a result of density management.

The density reduction treatment of riparian Units Z, AA, and BB (13 acres) would slightly accelerate the growth on the remaining trees. Riparian treatment within Unit L (25 acres) treats dead material only, thus no accelerated growth of the residual trees would occur.

Treatment in Unit Y (81 acres) would help relieve the current moisture stress on fifty percent of the large, remnant ponderosa pine trees.

Treatment in Unit Z would release the existing aspen component within the Gotchen meadow area and promote the health and vigor of the aspen trees.

Species Composition

Alternative D would increase the early seral component within timber stands on approximately 896 acres. These activities would occur within both the Matrix and LSR land allocations (Units A-M). The efficacy of the silvicultural treatments in Units I and M would be reduced due to the cutting restriction of green trees to 10”dbh and less. This would result in the intolerant seedlings planted in Unit I, to grow under a denser overstory, which would reduce their full growth potential. Unit M would also contain a denser understory after treatment that would result in a grand fir component (trees greater than 10” dbh).

The same amount of stand initiation structure, as identified in Alternatives B and C, would be present in five years.

Alternative D: Cumulative Effects (10 and 50 years)

In ten years, the 739 acres treated in the initial entry to reduce the stand density would continue to experience increased growth and vigor benefits. Units I, M, N-Q, S-W, and Y (664 acres), which had a 10” dbh green tree cutting restriction, would begin to develop canopy closure and experience inter-tree competition within 10 years. Forage production would start to decline.

Units H-L, within the LSR, would contain a denser overstory because of green tree 10” diameter cutting restriction. This would impair the seedlings of their full growth potential; Unit M would also contain a denser understory, which would result in an increased grand fir component (trees greater than 10” dbh); Units N-Q and S-W would begin to develop canopy closure and experience inter-tree competition as a result of the 10” dbh green tree cutting restriction ten years prior. These same stands

would receive an underburn treatment to "maintain" the Shaded Fuelbreaks in 6-10 years. This would cause most of the natural regenerated seedlings within these stands to be killed. The underburn could also damage and/or kill some of the overstory trees, mostly grand fir, since this species component would still be high within these stands as a result of the 10" dbh green tree cutting restriction. The bark of the grand fir trees is thinner than the other species and quite susceptible to damage from fire.

In 50 years, Alternative D would no longer continue to provide growth and vigor benefits to the 739 acres that received a density management treatment fifty years prior. As the result of the 10" dbh green tree cutting restriction, Units I, M, N-Q, S-W, and Y (664 acres), would be at full canopy closure and experiencing inter-tree competition. In fifty years, Alternative D would still continue to provide resilience to the 896 acres that received an overstory treatment, followed by the artificial planting of early seral species fifty years ago. Units H-L, would contain a denser overstory because of green tree 10" diameter cutting limit, impairing the seedlings of their full growth and causing mortality in the stressed ponderosa pine component; Unit M would also contain a denser understory, resulting in an increased grand fir component; Units N-Q and S-W would begin to develop canopy closure and experience inter-tree competition as a result of the 10" dbh green tree cutting restriction. These same stands would receive a second underburn treatment to "maintain" the Shaded Fuelbreaks in 21-30 years. This would cause most of the natural regenerated seedlings within these stands to be killed. The underburn could also damage and/or kill some of the overstory trees, mostly grand fir, since this species component would still be high within these stands as a result of the 10" dbh green tree cutting restriction.

Objective: Natural Range Of Variation

In question for the Gotchen Planning Area is what effect would stand manipulation have upon the future vegetation's structure stage classes when compared to the NRV The changes resulting from vegetation manipulation at the stand level affect the amount of particular stand structure within a landscape and the patch density and patch size of that stand structure. Of particular interest is the amount of late successional and old-growth forest that would remain in the short and long-term, within the designated Late-Successional Reserve, and across the entire Gotchen Planning Area.

The NRV refers to the range of conditions and process that are likely to have occurred prior to euro-American settlement. How rapidly a forest changes from one structure stage to another varies greatly and is especially influenced by human intervention. The magnitude of risk associated with the ecosystem change would likely be related to the magnitude and direction from NRV (Landres et al. 1999).

Current landscape evaluation of the Gotchen planning area reveals that since the 1930's, forest structures have become more homogeneous (Hummel 2001). The degree in which forest management may affect stand structure depends on the type and extent of the activity proposed in the alternatives.

Measurement Methods

Number of stand structure stages that are outside the NRV

Acres of late-successional forest remaining

Methodology

The Wenatchee Forest Sciences Laboratory (WFSL) conducted a "departure analysis" for the Gotchen Planning Area. On the basis of aerial photo analysis, the Gotchen stand conditions were compared to similar subwatersheds within Ecological Subregion 4 to identify which elements of the Gotchen landscape may have changed (or departed) from historic conditions. (A map of Ecological Subregion 4 is located in Map Packet – Map 14. The departure analysis in its entirely is included in the Project File.)

The departure analysis is based on the seven structural stages, described in Chapter 3, and illustrated in Map Packet – Figure 1, WFSL Structural Classes. The seven structural classes were mapped and characterized at the mid scale (1:12,000) by WFSL, using photo-interpretation methods and vegetation classifications developed in the Interior Columbia Basin Ecosystem Management Project (ICBEMP) (Hessburg et al., 1996).

For this analysis, the WFSL data was updated with Hummel's stand exam data, which more accurately portrays the current conditions. The Forest Vegetation Simulator (FVS) was then used to simulate forest growth and portray structural and compositional characteristics for 1-5 years, 10 years, and 50 years into the future. Structural classes were then compared to the historic range to determine which elements of the landscape may have departed from historic samples. The methodology is explained in more detail in the Vegetation Analysis in the Project File.

The following assumptions were used: 1) there would be no stand-replacing fire or major insect outbreak within the Gotchen Planning Area for the next 50 years; and 2) programmed timber harvest in the outyears (2013-2053) would proceed under all of the alternatives, including No Action (Summary of Cumulated Activities Table in Appendix G).

While the results from the FVS modeling are reported on an acreage basis and reflected as such in the following tables, the intent of this analysis is to show the *trends* that would result from the alternatives.

Summary of Stand Structures as an Indicator of the Natural Range of Variation for all Alternatives

Tables 4-15, 4-16, and 4-17 compare the structural classes for the three time periods used throughout the analysis in this Statement (1-5, 10 and 50 years)[5]. Vegetation

[5] (It is noted that the *current* Gotchen conditions utilized in the departure analysis reflect only the conditions within the delineated Gotchen Planning Area, and not the entire 6th field subwatersheds in

maps were developed for each of the alternatives to portray the Gotchen landscape at 1-5 years and at 50 years into the future and are located in the Map Packet. For Alternatives B, C, and D, the retention islands that would be left within many of the treated stands are not shown on these maps due to map scale and the fact that these islands are determined during the time the units are designed on the ground.

The analysis of the stand structures, as an indicator of the NRV, revealed little difference between the alternatives, including alternative A (no action). In 50 years, each alternative produces an ecosystem in which four of the seven stand structures are outside the NRV. In Dr. Agee's report "Historic Ranges of Variability for the Gotchen Late Successional Reserve: A Working Paper (2001), the author notes several concerns about an ecosystem where the intent is to develop/maintain primarily one successional stage (late successional structure), such as the intent of the NWFP late successional reserve system that includes the Gotchen LSR. He concludes that such an attempt to do so may create a massive failure if it subjects the forest to unnatural and catastrophic disturbance. In 50 years, all of the alternatives are heading down this path. The analysis in the Statement illustrates the scientific need to re-enter the LSR portion of the Gotchen planning area in the future, on a regulated basis, and continue the effort to reduce the stand densities, reintroduce early seral species, and maintain these stands through underburning.

Alternative A

1-5 years – One structure stage (stem exclusion open canopy**)** is outside the NRV.

10 years - Two structure stages (stem exclusion open canopy and stem exclusion closed canopy) are outside the NRV.

50 years – Four structure stages (stem exclusion open canopy, stem exclusion closed canopy, young forest multistory, and old forest multistory) are outside the NRV.

Alternative B

1-5 years - One structure stage (stem exclusion open canopy) is outside the NRV.

10 years - Two structure stages (stem exclusion open canopy and stem exclusion closed canopy) are outside the NRV.

50 years - Four structure stages (stem exclusion open canopy, stem exclusion closed canopy, young forest multistory, and old forest multistory) are outside the NRV.

Alternative C

1-5 years - One structure stage (stem exclusion open canopy) is outside the NRV.

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which the Gotchen Planning Area lays. This could skew the *extent* that the current conditions "depart" from the reference conditions. The key considerations for the analysis in this Statement are the overall *trends* in conditions that result from the different alternatives, not the absolute values that are outputs from the FVS analysis.)

10 years - Two structure stages (stem exclusion open canopy and stem exclusion closed canopy) are outside the NRV.

50 years - Four structure stages (stem exclusion open canopy, stem exclusion closed canopy, young forest multistory, and old forest multistory) are outside the NRV.

Alternative D

1-5 years - One structure stage (stem exclusion open canopy) is outside the NRV.

10 years - Two structure stages (stem exclusion open canopy and stem exclusion closed canopy) are outside the NRV.

50 years - Four structure stages (stem exclusion open canopy, stem exclusion closed canopy, young forest multistory, and old forest multistory) are outside the NRV.

Table 4.15– Summary 1-5 Year Stand Structural Classes (acres) by Alternative.

Stand Structure	Alternative				Natural Range of Variation
	A	B	C	D	
Stand Initiation	1,630 (8%)	1,710 (9%)	1,710 (9%)	1,710 (9%)	0.5% - 16.2%
Stem Exclusion Open Canopy	5,061 (26%)	5,768 (29%)	5,721 (29%)	5,768 (29%)	4.6% - 15.2%
Stem Exclusion Closed Canopy	4,189 (21%)	4,080 (21%)	4,109 (21%)	4,080 (21%)	1.1% - 26.3%
Understory Reinitiation*	5,347 (27%)	4,647 (23%)	4,665 (23%)	4,647 (23%)	6.9% - 41.4%
Young Forest Multistory	1,667 (9%)	1,689 (9%)	1,689 (9%)	1,689 (9%)	5.9% - 32.8%
Old Forest Multistory*	1,671 (8%)	1,671 (8%)	1,671 (8%)	1,671 (8%)	0% - 19.6%
Old Forest Single Story*	115 (1%)	115 (1%)	115 (1%)	115 (1%)	0% - 10.9%
Non Forest	14	14	14	14	-
Total	**19,694**	**19,694**	**19,694**	**19,694**	**-**

* Denotes late successional/old growth habitat.

Table 4-16– Summary 10 year Stand Structural Classes (acres) by Alternative.

Stand Structure	Alternatives				Natural Range of Variation
	A	B	C	D	
Stand Initiation	1,190 (6%)	1,270 (6%)	1,270 (6%)	1,270 (6%)	0.5% - 16.2%
Stem Exclusion Open Canopy	5,445 (28%)	5,556 (28%)	5,529 (28%)	5,580 (28%)	4.6% - 15.2%
Stem Exclusion Closed Canopy	6,410 (32%)	5,925 (30%)	5,950 (30%)	5,928 (30%)	1.1% - 26.3%
Understory Reinitiation*	2,518 (13%)	2,208 (11%)	2,242 (11%)	2,207 (11%)	6.9% - 41.4%
Young Forest Multistory	2,224 (11%)	2,828 (14%)	2,796 (14%)	2,802 (14%)	5.9% - 32.8%
Old Forest Multistory*	1,778 (9%)	1,778 (9%)	1,778 (9%)	1,778 (9%)	0% - 19.6%
Old Forest Single Story*	115 (1%)	115 (1%)	115 (1%)	115 (1%)	0% - 10.9%
Non Forest	14	14	14	14	-
Total	**19,694**	**19,694**	**19,694**	**19,694**	**-**

* Denotes late successional/old growth habitat

Table 4.17– Summary 50 year Stand Structural Classes (acres) by Alternative.

Stand Structure	Alternative				Natural Range of Variation
	A	B	C	D	
Stand Initiation	538 (3%)	538 (3%)	538 (3%)	538 (3%)	0.5% - 16.2%
Stem Exclusion Open Canopy	6,557 (33%)	6,108 (31%)	5,648 (29%)	6,126 (31%)	4.6% - 15.2%
Stem Exclusion Closed Canopy	6,003 (30%)	5,601 (28%)	6,291 (32%)	5,610 (28%)	1.1% - 26.3%
Understory Reinitiation*	1,547 (8%)	1,502 (8%)	1,502 (8%)	1,502 (8%)	6.9% - 41.4%
Young Forest Multistory	146 (<1%)	120 (<1%)	93 (<1%)	120 (<1%)	5.9% - 32.8%
Old Forest Multistory*	4,889 (25%)	5,336 (27%)	5,435 (28%)	5,316 (27%)	0% - 19.6%
Old Forest Single Story*	0	475 (2%)	173 (1%)	468 (2%)	0% - 10.9%
Non Forest	14	14	14	14	-
Total	**19,694**	**19,694**	**19,694**	**19,694**	**-**

* Denotes late successional/old growth habitat

Alternative A – No Action

Direct, Indirect, and Cumulative Effects (1-5 years)

Within the next five years, the existing stand structures would remain fairly stable (Table 4.18, see Map Packet – Map 15). One of the seven structure stage classes,

stem exclusion open canopy, is currently outside of the NRV due to recent disease, insects, and high tree density mortality in stands with a large component of grand fir, as well as from root rot diseases. It is anticipated that additional increases for this structure class would continue during the next five years, but not as rapid as within the last decade when the western spruce budworm was at its peak.

Approximately 7,100 acres of late successional/old growth habitat would remain in 1-5 years as a result of the No Action alternative; 4700 acres in the LSR, and 2400 acres in the Matrix.

Table 4.18– Stand Structural Classes (acres) Alternative A.

Stand Structure	Alternative A			Natural Range of Variation
	1-5	10	50	
Stand Initiation	1,630 (8%)	1,190 (6%)	538 (3%)	0.5% - 16.2%
Stem Exclusion Open Canopy	5,061 (26%)	5,445 (28%)	6,557 (33%)	4.6% - 15.2%
Stem Exclusion Closed Canopy	4,189 (21%)	6,410 (32%)	6,003 (30%)	1.1% - 26.3%
Understory Reinitiation*	5,347 (27%)	2,518 (13%)	1,547 (8%)	6.9% - 41.4%
Young Forest Multistory	1,667 (9%)	2,224 (11%)	146 (<1%)	5.9% - 32.8%
Old Forest Multistory*	1,671 (8%)	1,778 (9%)	4,889 (25%)	0% - 19.6%
Old Forest Single Story*	115 (1%)	115 (1%)	0	0% - 10.9%
Non Forest	14	14	14	-
Total	**19,694**	**19,694**	**19,694**	**-**

* Denotes late successional/old growth habitat

Alternative A – No Action

Cumulative Effects (10 and 50 years)

10 Years

In ten years the total area of the **stand initiation** structure stage would remain within the NRV though patch density would remain high and the mean patch size would remain low when compared to historic conditions.

The amount **stem exclusion open canopy** stands would increase and remain high and outside the NRV. An increase in the total area of the stem exclusion open canopy structure would not be expected to cause a significant increase in the vegetation's vulnerability to insects, pathogens, and fire agents. However, these stands continue to have a large component of grand fir. Some of the 2002 stand initiation stands that were understocked by gophers and root rot diseases would also have moved into this structure class.

Alternative A would increase the **stem exclusion closed canopy** stand structure outside the NRV in ten years. Stands in this structural class would experience inter-

tree competition for moisture, light, and nutrients, causing decreased vigor, and making these stands more vulnerable to insects, pathogens, and fire. The majority of the increased acreage of the stem exclusion closed canopy structure would be due to the growth of the seedling/sapling component and the increased density of the pole, small, and medium tree component within the 2002 understory reinitiation stands. The FVS model showed that a portion of the 2002 stem exclusion closed canopy stand structure acres sustained sufficient amounts of tree mortality in ten years, from root rots and high tree density, to lapse backwards into the stem exclusion open canopy structure.

In ten years, the **understory reinitiation** stand structure would decrease but still be within the NRV. The decrease would be mainly due to the 2002 seedling/sapling component that grew into the larger pole size component, thus transitioning these acres into the stem exclusion closed canopy structure. Inter-tree competition and root disease would also reduce the seedling/sapling component during the last ten years to contribute to the transition. The FVS model showed that approximately 50% of the 2002 understory reinitiation stands would remain within the understory reinitiation stage after ten years.

In ten years, the **young forest multistory** stand structure would increase but would still be within the NRV. The majority of the increase would be due to the growth of the small tree component within the 2002 stand initiation stands. This component grew sufficiently in ten years to transition these acres to the young forest multistory structure. The FVS model showed that most of the 2002 young forest multistory stands would remain within the same structure stage after ten years.

The Gotchen Planning Area would experience an increase in the **old forest multistory** stand structure. Most of these new acres would be from 2002 stem exclusion open canopy stands that experienced an increase in the large tree component (30% or greater large tree cover). There would be no change to the **old forest single story** stand structure. These stand two stand structures, along with the understory reinitiation stands, are considered late successional/old-growth stands.

Approximately 4,400 acres of late successional/old growth habitat would remain in ten years as a result of the No Action Alternative; 3050 acres in the LSR and 1350 acres in the Matrix.

50 Years

In 50 years the total area of **stand initiation** stands would be on the low end of NRV. The majority of stand initiation stands in year 50 would be the result of regulated timber harvest in the matrix. A small amount would remain in stand initiation stands from tree mortality and intense inter-tree competition in the stands due to Armillaria and increasing tree densities. (Table 4.18, and Map Packet – Map 15).

The 2002 **stem exclusion open canopy** stand structure would increase in 50 years. Continued tree mortality, mainly in the grand fir component, from root rots and high levels of tree densities, would limit some of these stands from progressing to the next structure. The regulated timber harvest program (commercial thinning) from 2013-2053 would also add this structure stage. Some of the 2002 stem exclusion open

canopy stands, according to the FVS model, would enter into the old forest multistory stage within the next 50 years.

In 50 years**,** the amount of the 2002 **stem exclusion closed canopy** stands would slightly decrease from the 10-year acreage figure. The FVS model showed that a large portion of the 2002 stem exclusion closed canopy stand structure acres (approximately 60%) sustained sufficient amounts of tree mortality in fifty years, from root rots and high tree density, to lapse backwards into the stem exclusion open canopy structure.

Most of the remaining 2002 **stem exclusion closed canopy stands**, according to the FVS model, would enter into the old forest multistory stage within the next 50 years. The total area of this structure stage would be outside the NRV in fifty years. The regulated timber harvest program (commercial thinning) from 2013-2053 also helped contribute to the reduction of this structure stage.

In 50 years**,** the amount of the 2002 **understory reinitiation stands** would decrease within the Gotchen Planning Area by approximately 40%. The majority these 2002 acres would have grown and developed their understory component to qualify as stem exclusion closed canopy stands. A minor amount would develop into old forest multistory, as a direct result of the intolerant conifer species growing into the overstory component and establishing a minimum of 30 percent canopy closure.

The amount of the 2002 **young forest multistory** stands would decrease causing the total area of this structure stage to be low and outside the NRV in fifty years. As with the 2002 stand initiation acres at age 50, most of the understory would have sufficiently grown and developed within 50 years to transition to other structure classes.

In 50 years, the amount of the 2002 **old forest multistory** stands would increase to approximately 25% of the Gotchen Planning Area. The FVS model shows that a portion (approximately 12 percent) of the 2002 old forest multistory stands transitioned back into stem exclusion open canopy structure due to a reduction in the minimum canopy requirement of 30%. This was due to the root rot susceptible grand fir component within these stands. The total area of this structure stage would remain high and outside the NRV in fifty years, even with the regeneration harvest from the 2013-2053 regulated timber harvest program.

In 50 years, Alternative A would cause the **old forest single story** stand structure to disappear and not be part of the forest structures within the Gotchen planning area. Eventually, an understory of tolerant conifers species would become established, develop, and transition these stands into old forest multistory stands. These factors would create conditions conducive to spruce budworm epidemics and root diseases that would increase the dead fuels component well above historical levels. This would further contribute to an environment that is well outside of the historical range of variability. Table 3.13, in Chapter 3, indicates that the old forest single story stand structure was historically present in all the PAGs within Gotchen. Silvicultural treatments (density reduction/underburning in portions of the Dry Douglas-fir, Dry

Grand Fir, and the dry portion (1/3) of the Wet Grand Fir PAGs) are needed to re-establish and maintain the old forest single story stand structure within Gotchen.

Approximately 6,400 acres of late successional/old growth habitat would remain in 50 years as a result of Alternative A; 5600 acres in the LSR and 800 in the Matrix. Table 3.13, in Chapter 3, indicates that large patches of late successional forests likely did not occur in the Dry Douglas-fir, Dry Grand Fir, and the dry portion (1/3) of the Wet Grand Fir PAGs of the Gotchen Planning Area and a management goal that seeks to develop and maintain this type of structure is likely to fail (Agee 2001).

Alternative B

Direct, Indirect and Cumulative Effects (1-5 years)

Alternative B would add additional acres to the **stand initiation** structure as a result of the regeneration harvest of stand A in the Matrix , see Table 4-19 and Map Packet – Map 16). This action is intended, in part, to combine several older openings to better mimic historic, larger patch sizes, and reduce patch densities.

Stem exclusion open canopy structure acres increase within the next 1-5 years due to the removal of the understory trees within the Shaded Fuelbreaks and the fuels reduction and regeneration units. These treatments would increase the total area of the stem exclusion open canopy within the Gotchen Planning Area and further expand the departure from historic conditions. However, the trade-off is reducing the grand fir component, which would improve the stand health. The amount of stem exclusion open canopy structure stage remains outside the NRV, but not as much as Alternative A. Silviculturally, this departure could mean that these stands may be in an understocked condition and not currently growing trees to their full potential.

Alternative B would reduce the **stem exclusion closed canopy** structure within the next 1-5 years. This decrease would be mostly due to the activities within Stand C and thinning the trees within the LSR (Stand I and BB).

An additional reduction of **understory reinitiation** structure would occur within the next 1-5 years. This decrease would be mostly due to the proposed treatments within the Matrix, the Shaded Fuelbreaks (Units Q, S-U), and lodgepole thinning (Unit X) within the LSR.

Alternative B would increase **young forest multistory** structure type within the next 1-5 years. This increase would be mostly due to the proposed treatments within the Matrix, in particular, the treatment within the uneven-aged unit (Unit E) and within the sanitation unit (Unit G).

The **old forest multistor**y stands and **old forest single story** stands would not change in the short-term. These acres would continue to develop within the old forest multistory and old forest single story during the next five years.

Approximately 6,400 acres of late successional/old growth habitat remains in 1-5 years as a result of Alternative B; 4400 acres in the LSR, and 2000 in the Matrix.

Table 4-19– Stand Structural Classes (acres) Alternative B.

Stand Structure	Alternative B			Natural Range of Variation
	1-5 Years	10 years	50 Years	
Stand Initiation	1,710 (9%)	1,270 (6%)	538 (3%)	0.5% - 16.2%
Stem Exclusion Open Canopy	5,768 (29%)	5,556 (28%)	6,108 (31%)	4.6% - 15.2%
Stem Exclusion Closed Canopy	4,080 (21%)	5,925 (30%)	5,601 (28%)	1.1% - 26.3%
Understory Reinitiation*	4,647 (23%)	2,208 (11%)	1,502 (8%)	6.9% - 41.4%
Young Forest Multistory	1,689 (9%)	2,828 (14%)	120 (<1%)	5.9% - 32.8%
Old Forest Multistory*	1,671 (8%)	1,778 (9%)	5,336 (27%)	0% - 19.6%
Old Forest Single Story*	115 (1%)	115 (1%)	475 (2%)	0% - 10.9%
Non Forest	14	14	14	-
Total	**19,694**	**19,694**	**19,694**	**-**

* Denotes late successional/old growth habitat.

Alternative B

Cumulative Effects (10 and 50 years)

10 Years

In ten years, the amount of **stand initiation** stand structure would increase slightly when compared to the No Action alternative. Some of the stand initiation stands established since the early 1990's would begin to appear as two-storied stands containing residual overstory trees from the original stand, plus regeneration. The stand initiation structure stands would have larger patch sizes and a reduced patch density to better mimic historic conditions. The total area of this stand structure would be within the NRV.

The amount of the **stem exclusion open canopy** stand structure would also increase slightly, when compared to the No Action alternative. This net increase in acreage would be mainly due to the density reduction within the Shaded Fuelbreaks (Units S-U), lodgepole thinning (Unit X), and sapling thinning (Unit BB). Underburning the Shaded Fuelbreak stands within the 10-year period would prevent shade tolerant species from creating an understory. Some of the 2002 stand initiation acres that were understocked by gophers and root rot diseases would also move into this structure class in ten years. The total area of this structure stage would remain high and outside the NRV; however, it would not be expected to cause a significant increase in the vegetation vulnerability to insects, pathogens, and fire agents.

In ten years, the amount of **stem exclusion closed canopy** stand structure would decrease. The majority of this decrease would be due to canopy reductions in portions of the 2002 Matrix treatments (A-G), fuels reduction and reforestation treatments (I-K), Shaded Fuelbreak (Unit T), and the sapling thinning treatment (Unit BB). The

FVS model showed that a portion of the 2002 stem exclusion closed canopy stand structure acres that received no treatment sustained sufficient amounts of tree mortality in ten years, from root rots and high tree density, to lapse backwards into the stem exclusion open canopy structure. The total area of this structure stage would be outside the NRV in ten years, indicating that the Gotchen Planning Area still contains a lot of stands that are dense and continue to experience inter-tree competition for moisture, light, and nutrients. These conditions would make the stands more vulnerable to insects, pathogens and fire.

The **understory reinitiation** stand structure would decrease slightly more than the No Action alternative, primarily due to the canopy reductions in portions of the 2002 matrix treatments (A-G), Shaded Fuelbreak (Unit S and U), and the lodgepole thinning treatment (Unit X). Inter-tree competition and root disease would also reduce the seedling/sapling component during the last ten years to help in the transition. The FVS model also shows that approximately 50% of the 2002 understory reinitiation stands remained within the understory reinitiation stage after ten years. The total area of this stand structure would be within the NRV.

In ten years, the **young forest multistory** stand structure would increase due to the reforestation effort within the 2002 matrix treatments (Units B-G) and the fuels reduction and reforestation treatments (Units H-L). The seedlings within these stands would have grown sufficiently to develop a dense understory, thus moving the stand structure into the young forest multistory structure stage. The FVS model also showed that most of the 2002 young forest multistory stands that were not treated in 2002 remained within the same structure stage after ten years. The total area of this stand structure would be within the NRV.

Alternative B would not change the **old forest multistory** or the **old forest single forest** stand structure within ten years. The total area of these stand structures would be within the NRV.

Approximately 4,100 acres of late successional/old growth habitat remains in ten years as a result of Alternative B; 2900 acres in the LSR and 1200 acres in the Matrix.

50 Years

By implementing Alternative B, the Gotchen Planning Area would incur a change in the magnitude and spatial pattern of the structure class stages in 50 years. The total area of four of the seven structure stage classes would outside the NRV (Table 4-19). Unless additional vegetation management treatments are implemented, particularly within the LSR, this change in vegetation structure percentages would place the Gotchen landscape at an increased risk to insect, pathogen, and fire disturbance agents.

In 50 years, Alternative B would cause the majority of the 2002 **stand initiation** stands to move into the stem exclusion closed canopy and understory reinitiation stages, see Map Packet – Map 17. The FVS showed approximately 500 acres remained in the stand initiation stage due to the regulated timber harvest activities (regeneration cutting) within the Matrix ground each decade (2013-2053). The acres planted, as a component of this alternative, would have received a young stand

thinning at age 15 and another density reduction treatment by the future regulated timber harvest program (commercial thinning). The total area of this stand structure would be within the NRV.

In 50 years, the amount of the **stem exclusion open canopy** stand structure would decrease compared to the No Action alternative. This decrease would be due to the continued density reduction treatments from the regulated timber harvest program in the Matrix each decade (2013-2053); the result of the Shaded Fuelbreaks (Units P, Q, V, W); and the sapling thinning (Units AA and BB), all of which would develop into stem exclusion closed canopy stand structures. The remaining untreated 2002 stem exclusion open canopy stands, according to the FVS model, entered into the old forest multistory stage within the next 50 years, largely due to the existing intolerant species growing into the overstory. The total area of this structure stage would remain high and outside the NRV in fifty years.

Alternative B would decrease the amount of the **stem exclusion closed canopy** stands compared to the No Action alternative. The majority of this decrease would again be due to the continued density reduction treatments from the regulated timber harvest program in the Matrix each decade (2013-2053). It is expected that the Shaded Fuelbreaks in the LSR (Units N-Q, V, W) and the 2002 sapling thinning treatment (Units AA and BB) would be in need of density reduction treatments to again offset inter-tree competition. The FVS model showed that a large portion of the untreated 2002 stem exclusion closed canopy stand structure acres (approximately 60%) sustained sufficient amounts of tree mortality in fifty years from root rots and high tree density competition to lapse backwards into the stem exclusion open canopy structure. Most of the remaining 2002 stem exclusion closed canopy stands according to the FVS model entered into the old forest multistory stage within 50 years, largely due to the existing intolerant species growing into the overstory. The total area of the stem exclusion closed canopy structure stage would be outside the NRV in fifty years and indicates that the Gotchen Planning Area would still contain many stands that are dense and continue to experience inter-tree competition for moisture, light, and nutrients. These conditions would make the stands more vulnerable to insects, pathogens and fire.

In 50 years, the amount of the **understory reinitiation** stands would decrease slightly when compared to the No Action alternative. The majority of this decrease would be due to Matrix treatments in Units C and E, the density management conducted in Unit X, and the regulated timber harvest program each decade (2013-2053) in the Matrix. Approximately 10 percent of the 2002 understory reinitiation acres would transition into old forest multistory, a direct result of the intolerant conifer species growing into the overstory component and establishing a minimum of 30 percent canopy closure. The total area of this stand structure would be within the NRV.

Approximately 100 acres of the Gotchen planning area would be within the **young forest multistory** stage, a slight decrease when compared to the No Action alternative. As with the 2002 stand initiation acres at age 50, most of the understory would have sufficiently grown and developed into other structure classes. This would

cause the total area of this structure stage to be low and outside the NRV in fifty years.

In 50 years, approximately 5,000 acres of the Gotchen planning area would be within the **old forest multistory** stage, a 1% increase when compared to the No Action alternative. The increase is due to several reasons: In 50 years, Units B, C, D, and F, within the Matrix, would have a sufficient overstory cover (30%) and a maturing understory of intolerant species to qualify for this structure stage. In addition, Units H, J, K, L, within the LSR, and I would also have a sufficient overstory cover (30%) and a maturing understory of intolerant species, to qualify. Despite the regulated timber harvest (2013-2053) of approximately 700 acres of old forest multistory in the Matrix, the overall percent area for this stand structure would increase. Lastly, the FVS model showed that a portion (approximately 12 percent) of the 2002 old forest multistory stands transitioned back into stem exclusion open canopy structure due to a reduction in the minimum canopy requirement of 30%, caused by the root rot susceptible grand fir component within these stands. The total area of this structure stage would be high and outside the NRV in fifty years.

In 50 years, Alternative B would cause the **old forest single story** stand structure to increase slightly when compared to the No Action alternative. The underburn treatment within the Shaded Fuelbreaks, conducted during 2023-2033, would remove the understory of these stands and create single story old forest stands. The total area of this stand structure would be within the NRV. However, Table 3-13, in Chapter 3, indicates that the old forest single story stand structure was historically present in greater amounts within all the PAGs of Gotchen. Additional silvicultural treatments (density reduction/underburning in portions of the Dry Douglas-fir, Dry Grand Fir, and the dry portion (1/3) of the Wet Grand Fir PAGs) would be needed to re-establish and maintain this stand structure closer to historic levels.

Approximately 7,300 acres of late successional/old growth habitat would remain in 50 years as a result of Alternative B; 6200 acres in the LSR and 1100 acres in the Matrix. As with Alternative A, Table 3-13, in Chapter 3, indicates that large patches of late successional forests likely did not occur in the Dry Douglas-fir, Dry Grand Fir, and the dry portion (1/3) of the Wet Grand Fir PAGs of the Gotchen Planning Area and a management goal that seeks to develop and maintain this type of structure is likely to fail (Agee 2001).

Alternative C

Direct, Indirect and Cumulative Effects (1-5 years)

Approximately 9 percent of the lands within the Gotchen Planning Area would be in the **stand initiation structure** stage in five years, a slight increase compared to the No Action alternative, as a result of the regeneration harvest of Unit A (light forest retention) in the Matrix (Table 4-20). This would result in larger patch sizes and reduced patch densities for this structure stage.

Within the next five years the **stem exclusion open canopy** structure type would increase due to the removal of the understory trees that implement fuel hazard and density reduction prescriptions. Although these actions would contribute to the departure from historic conditions, removing the grand fir component would achieve project objectives. Silviculturally, this departure could mean that these stands may be in an understocked ("open") condition and not currently growing trees to their full potential.

The **stem exclusion closed canopy** structure type would be reduced slightly within the next 1-5 years due primarily to the activities within the Matrix (Unit C) and thinning the trees within the LSR (Units I and DD).

Alternative C would reduce the **understory reinitiation** structure stage within the next 1-5 years due to the proposed treatments within the Matrix (Units A-G), the Fuelbreaks (Units S and EE), lodgepole thinning (Unit X), and understory density treatments within the LSR.

Alternative C would add a slight amount of **young forest multistory** structure type within the next 1-5 years.

The **old forest multistory** stands and **old forest single story** stands would not change in the short-term.

Approximately 6,450 acres of late successional/old growth habitat would remain in 1-5 years as a result of Alternative C; 4450 acres in the LSR and 2000 in the Matrix.

Table 4-20. Stand Structural Classes (acres) Alternative C.

Stand Structure	Alternative C			Natural Range of Variation
	1-5 Years	10 Years	50 Years	
Stand Initiation	1,710 (9%)	1,270 (6%)	538 (3%)	0.5% - 16.2%
Stem Exclusion Open Canopy	5,721 (29%)	5,529 (28%)	5,648 (29%)	4.6% - 15.2%
Stem Exclusion Closed Canopy	4,109 (21%)	5,950 (30%)	6,291 (32%)	1.1% - 26.3%
Understory Reinitiation*	4,665 (23%)	2,242 (11%)	1,502 (8%)	6.9% - 41.4%
Young Forest Multistory	1,689 (9%)	2,796 (14%)	93 (<1%)	5.9% - 32.8%
Old Forest Multistory*	1,671 (8%)	1,778 (9%)	5,435 (28%)	0% - 19.6%
Old Forest Single Story*	115 (1%)	115 (1%)	173 (1%)	0% - 10.9%
Non Forest	14	14	14	-
Total	**19,694**	**19,694**	**19,694**	**-**

* Denotes late successional/old growth habitat.

Alternative C

Cumulative Effects (10 and 50 years)

10 years

In ten years after implementing Alternative C, the amount of the **stand initiation** stand structure would increase slightly, when compared to the no action alternative, resulting in larger patch sizes and reduced patch densities for this structure stage. The total area of this stand structure would be within the NRV.

Alternative C would also increase the amount of the **stem exclusion open canopy** stand structure slightly, when compared to the no action alternative. This net increase in acreage would be due primarily to the density reduction within the Fuelbreaks (Units S, EE), lodgepole thinning (Unit X), and understory density reduction (Units CC and DD). The total area of this structure stage would remain high and outside the NRV in ten years.

The amount of the **stem exclusion closed canopy** stand structure would be reduced by when compared to the no action alternative, due to canopy reductions in portions of the 2002 Matrix treatments (A-G), fuels reduction and reforestation treatments (I-K), Fuelbreak (Unit EE), and the understory density reduction treatment (Units CC and DD). The total area of this structure stage would be outside the NRV in ten years and indicates that the Gotchen Planning Area would still contains stands that are dense and continue to experience inter-tree competition for moisture, light, and nutrients. These conditions would make the stands more vulnerable to insects, pathogens and fire.

In ten years, the amount of **understory reinitiation** stand structure would also decrease by when compared to the No Action alternative, primarily due to the canopy reductions in portions of the 2002 Matrix treatments (Units A-G), Fuelbreak (Unit S), and the lodgepole thinning treatment (Unit X). The total area of this stand structure would be within the NRV.

Implementing Alternative C would increase the **young forest multistory** stand structure when compared to the No Action alternative, due to the reforestation efforts within the 2002 Matrix treatments (Units B-G) and the fuels reduction and reforestation treatments (Units H-L). The total area of this stand structure would be within the NRV.

In ten years, there would be no change in the **old forest multistory** or **old forest single story** stand structure acreage. The total area of these stand structures would be within the NRV.

Approximately 4,100 acres of late successional/old growth habitat would remain in ten years as a result of Alternative C; 2900 in the LSR and 1200 acres in the Matrix.

50 Years

The future structure class stages would incur a change in magnitude and spatial pattern in fifty **years.** The total area of four of the seven structure stage classes would

be outside the NRV, Table 4-20 and Map Packet – Map 19. This amount of departure is similar to those amounts within Alternative B. This change in vegetation structure and composition would place the Gotchen landscape at an increased risk to insect, pathogen, and fire disturbance agents.

Implementing Alternative C would cause the majority of the 2002 **stand initiation** stands to move into the stem exclusion closed canopy and understory reinitiation stages in 50 years. The FVS showed approximately 500 acres remained in the stand initiation stage due to the regulated timber harvest activities (regeneration cutting) within the Matrix ground each decade (2013-2053). The total area of this stand structure would be within the NRV.

In 50 years, amount of the **stem exclusion open canopy** stand structure would be reduced by approximately 900 acres, compared to the No Action alternative. This net decrease would be due primarily to the planting of early seral species (fifty years prior) and the maturing of this understory in the fuels reduction and reforestation units (Units H, I, and K). In addition, the understory density reduction treatment and underburning within Units AA and CC would reduce the grand fir component within these stands. The total area of this structure stage, as with Alternatives A and B, would remain high and outside the NRV in fifty years.

The amount of the **stem exclusion closed canopy** stands would increase compared to the No Action alternative due the understory density reduction treatment and underburning in Units AA, CC, and DD. These stands, in 50 years, would have a healthy component of early seral species. The total area of this structure stage would remain high and outside the NRV and indicates that the Gotchen Planning Area would still contain stands that are dense and continue to experience inter-tree competition for moisture, light, and nutrients. These conditions would make the stands more vulnerable to insects, pathogens and fire.

In 50 years, the amount of the **understory reinitiation** stands would slightly decrease due to previous treatments in Matrix Units C and E and the density management conducted in Unit X. The total area of this stand structure would be within the NRV.

Alternative C would slightly decrease the amount of the **young forest multistory** stand area compared to the No Action alternative. As with the 2002 stand initiation acres at age 50, most of the understory would have sufficiently grown and developed within 50 years to transition to other structure classes, causing the total area of this structure stage to be low and outside the NRV in fifty years.

In 50 years, approximately 5,435 acres of the Gotchen planning area would be within the **old forest multistory** stage, an increase of approximately 500 acres, when compared to the no action alternative. The increase would be due to several reasons: In 50 years, Units B, C, D, and F, within the Matrix, would have a sufficient overstory cover (30%) and a maturing understory of intolerant species to qualify for this structure stage. In addition, Units H, I, J, K, and L, within the LSR, would also have a sufficient overstory cover (30%) and a maturing understory of intolerant species to qualify. And even though the regulated timber harvest program would have cut and regenerated approximately 700 acres of old forest multistory in the Matrix

within the last fifty years, the total area of old forest multistory structure stage would be high and outside the NRV in fifty years.

In 50 years, the Alternative C would cause the **old forest single story** stand structure to increase when compared to the no action alternative. The underburn treatment within the Fuelbreaks, conducted during 2023-2033, would remove the understory of these stands and create single story old forest stands. The total area of this stand structure would be within the NRV. However, Table 3-13, in Chapter 3, indicates that the old forest single story stand structure was historically present in greater amounts and within all the PAGs of Gotchen. Additional silvicultural treatments (density reduction/underburning in portions of the Dry Douglas-fir, Dry Grand Fir, and the dry portion (1/3) of the Wet Grand Fir PAGs) are needed to re-establish and maintain this stand structure closer to historic levels.

Approximately 7,100 acres of late successional/old growth habitat would remain in 50 years as a result of Alternative C; 6000 acres in the LSR and 1100 acres in the Matrix. As with Alternatives A and B, Table 3.13, in Chapter 3, indicates that large patches of late successional forests likely did not occur in the Dry Douglas-fir, Dry Grand Fir, and the dry portion (1/3) of the Wet Grand Fir PAGs of the Gotchen Planning Area and a management goal that seeks to develop and maintain this type of structure is likely to fail (Agee 2001).

Alternative D

Direct, Indirect and Cumulative Effects (1-5 years)

The stand structure changes and effects within 1-5 years, under Alternative D, would be identical to Alternative B, see Map Packet – Map 20. Even though ten percent of the acreage within H, J, K, L, M, would be retained and Unit V would be dropped, the cutting intensity would not be sufficient to change the 1-5 year stand structures from the acreages shown in alternative B. Alternative D, as in Alternatives A and B, shows that the percent area of the **stem exclusion open canopy** structure stage would be outside the NRV, see Table 4.21). The current percent area is approximately 29 percent, which is identical to alternative B.

Approximately 6,400 acres of late successional/old growth habitat remains in 1-5 years as a result of Alternative D; 4400 acres in the LSR and 2000 acres in the Matrix.

Table 4-21. Stand Structural Classes (acres) Alternative D.

Stand Structure	Alternative D			Natural Range of Variation
	1-5 Years	10 Years	50 Years	
Stand Initiation	1,710 (9%)	1,270 (6%)	538 (3%)	0.5% - 16.2%
Stem Exclusion Open Canopy	5,768 (29%)	5,580 (28%)	6,126 (31)	4.6% - 15.2%
Stem Exclusion Closed Canopy	4,080 (21%)	5,928 (30%)	5,610 (28%)	1.1% - 26.3%
Understory Reinitiation*	4,647 (23%)	2,207 (11%)	1,502 (8%)	6.9% - 41.4%
Young Forest Multistory	1,689 (9%)	2,802 (14%)	120 (<1%)	5.9% - 32.8%
Old Forest Multistory*	1,671 (8%)	1,778 (9%)	5,316 (27%)	0% - 19.6%
Old Forest Single Story*	115 (1%)	115 (1%)	468 (2%)	0% - 10.9%
Non Forest	14	14	14	-
Total	**19,694**	**19,694**	**19,694**	**-**

* Denotes late successional/old growth habitat.

Alternative D

Cumulative Effects (10 and 50 years)

10 years

Ten years after implementing Alternative D, the amount of the **stand initiation** stand structure would increase slightly compared to the No Action alternative. As with Alternatives B and C, the stand initiation structure stands would have larger patch sizes and a reduced patch density to better mimic historic conditions. The total area of this stand structure would be within the NRV.

The amount of the **stem exclusion open canopy** stand structure would increase compared to the No Action alternative, mainly due to the density reduction within the shade Fuelbreaks (Units S-U), lodgepole thinning (Unit X), and sapling thinning (Unit BB). The total area of this structure stage would remain high and outside the NRV

In ten years, the amount of **stem exclusion closed canopy** stand structure would be reduced compared to the No Action alternative primarily due to canopy reductions in portions of the 2002 Matrix treatments (A-G), fuels reduction and reforestation treatments (I-K), Shaded Fuelbreak (Unit T), and the sapling thinning treatment (Unit BB). The total area of this structure stage would be outside the NRV in ten years and indicates that the Gotchen Planning Area would still contains stands that are dense and continue to experience inter-tree competition for moisture, light, and nutrients. These conditions would make the stands more vulnerable to insects, pathogens and fire.

Implementing Alternative D would decrease the amount of **understory reinitiation** stand structure compared to the no action alternative. This decrease would be associated with the canopy reductions in portions of the 2002 Matrix treatments (A-G), Shaded Fuelbreak (Unit S, U), and the lodgepole thinning treatment (Unit X). The total area of this stand structure would be within the NRV.

In ten years, the amount of **young forest multistory** stand structure would increase by approximately 600 acres compared to the No Action alternative. The majority of this increase would be due to reforesting the 2002 Matrix treatments (Units B-G) and the fuels reduction and reforestation treatments (Units H-L) with intolerant species. The total area of this structure stage would be low and outside the NRV in ten years.

In ten years, the acreages of **old forest multistory** and **old forest single story** structure would not change. The total area of these stand structures would be within the NRV.

Approximately 4,100 acres of late successional/old growth habitat would remain in ten years as a result of Alternative D; 2900 acres in the LSR and 1200 acres in the Matrix.

50 Years

A total area of four of the seven structure stage classes would be outside the NRV, Table 4-21 and Map Packet – Map 21. This change in vegetation structure and composition would place the Gotchen landscape at an increased risk to insect, pathogen, and fire disturbance agents.

In 50 years, there would be no net change in the amount of the **stand initiation** stand structure. The NRV effects for this stand structure would be on the low end of the NRV.

Alternative D would reduce the amount of the **stem exclusion open canopy** stand structure compared to the No Action alternative, due to the maturing of the fuels reduction and reforestation units (Units H, I, and K), which in 50 years, would develop into old forest multistory stands. The difference in acres between Alternative B and D would be due to the ten percent retention in portions of the stands within Alternative D and the dropping of Unit V. The total area of this structure stage would remain high and outside the NRV in fifty years.

In 50 years, Alternative D would slightly increase the amount of the **stem exclusion closed canopy** stands compared to the No Action alternative due to the dense conditions of the Fuelbreaks (Units N-Q, and W) and the 2002 sapling thinning treatment (Unit AA and BB. As with the other alternatives, the total area of this structure stage would be outside the NRV in fifty years and indicates that the Gotchen Planning Area would still contains stands that are dense and continue to experience inter-tree competition for moisture, light, and nutrients. These conditions would make the stands more vulnerable to insects, pathogens and fire.

The amount of the 2002 **understory reinitiation** stands would slightly decrease compared to the No Action alternative due to Matrix treatments in Units C and E and

the density management conducted in Unit X. The total area of this stand structure would be within the NRV.

In 50 years, Alternative D would slightly decrease the amount of the **young forest multistory** compared to the no action alternative. Most of the understory within these stands would have sufficiently grown and developed within 50 years to transition to other structure classes, causing the total area of this structure stage to be low and outside the NRV in fifty years.

In 50 years, approximately 5,316 acres of the Gotchen planning area would be within the **old forest multistory** stage, an increase of approximately 400 acres compared to the No Action alternative. The increase is due to several reasons. In 50 years, Units B, C, D, and F, within the Matrix, would have a sufficient overstory cover (30%) and a maturing understory of intolerant species, to qualify for this structure stage. In addition, Units H, I, J, K, and L, within the LSR, would also have a sufficient overstory cover (30%) and a maturing understory of intolerant species, to qualify. However, two Shaded Fuelbreak stands (Units N and O), which grew into old forest multistory with the No Action alternative, would transition into stem exclusion closed canopy stands due to the maintenance activities (underburning) in Alternative D. These acres would be prevented from transitioning into old forest multistory because of the lack of an understory. Despite the regulated timber harvest program (2013-2053) cutting approximately 700 acres of old forest multistory in the Matrix, the percent area for this stand structure increased. Lastly, the FVS model showed that a portion (approximately 12 percent) of the 2002 old forest multistory stands transitioned back into stem exclusion open canopy structure due to a reduction in the minimum canopy requirement of 30%, caused by the root rot susceptible grand fir component within these stands. The total area of this structure stage is high and outside the NRV in fifty years.

In 50 years, the **old forest single story** stand structure would increase compared to the No Action alternative. The underburn treatment within the Fuelbreaks, conducted during 2023-2033, would remove the understory of these stands and create single story old forest stands. The total area of this stand structure would be within the NRV. However, Table 3-13, in Chapter 3, indicates that the old forest single story stand structure was historically present in greater amounts and within all the PAGs of Gotchen. Additional silvicultural treatments (density reduction/underburning in portions of the Dry Douglas-fir, Dry Grand Fir, and the dry portion (1/3) of the Wet Grand Fir PAGs) are needed to re-establish and maintain this stand structure closer to historic levels.

Approximately 7,300 acres of late successional/old growth habitat would remain in 50 years as a result of Alternative D; 6200 acres in the LSR and 1100 acres in the Matrix. As with Alternatives A, B, and C, Table 3-13, in Chapter 3, indicates that large patches of late successional forests likely did not occur in the Dry Douglas-fir, Dry Grand Fir, and the dry portion (1/3) of the Wet Grand Fir PAGs of the Gotchen Planning Area and a management goal that seeks to develop and maintain this type of structure is likely to fail (Agee 2001).

BOTANY

Federally Endangered, Threatened and Proposed Plant Species

There are no Federally listed (Endangered or Threatened) or Proposed plant species known to occur on the Gifford Pinchot National Forest, although there is one species that is suspected to occur here: *Howellia aquatilis*. This species is aquatic, confined to palustrine emergent wetlands and there is no potential habitat for this species within the Gotchen Planning Area Therefore, Alternatives A-D would have ***no effect*** upon this species.

Sensitive Plant Species

Sisyrinchium sarmentosum

Sisyrinchium sarmentosum (hereafter referred to as *Sisyrinchium*) is a Regional Forester's sensitive plant species known to occur within the Gotchen Planning Area. It is a U.S. Fish and Wildlife species of concern (SoC), and is considered Threatened by the Washington Natural Heritage Program, which ranks the species as S2 (vulnerable to extirpation in the state, with only 6 to 20 known occurrences). Potential habitat for this species, consisting mostly of small meadows and forest openings, occurs throughout the Gotchen Planning Area. The one known site of this species within the Gotchen Planning Area is located near the northern boundary of the analysis area, west of Snipes Mountain.

Since this species is ranked as Sensitive, rather than federally Endangered, Threatened or Proposed, effects analyses and effects determinations do not trigger consultation with the US Fish and Wildlife Service.

Alternative A – No Action

Direct, Indirect and Cumulative Effects

Alternative A has the greatest potential of all of the alternatives to negatively impact individuals or habitat of *Sisyrinchium sarmentosum*. The No Action alternative ***may impact*** individuals or habitat, but ***would not likely contribute to a trend towards federal listing or cause a loss of viability*** to the population or species.

Without active management, the open meadows that comprise *Sisyrinchium sarmentosum* habitat would continue to be encroached upon by conifers and shrubs resulting in an indirect, long-term threat to this species and its habitat. The potential for *Sisyrinchium* habitat to experience high severity fires – fires more destructive than those experienced by plants historically - would remain and continue to increase in the long-term. These fires would be unpredictable in their outcome, and could extirpate sites and destroy habitat. With increased high intensity fire threat, projects

designed to benefit *Sisyrinchium,* by using prescribed fire to mimic the natural fire regime and reduce conifer encroachment, would become more difficult and risky to implement, and therefore, less likely to occur.

No road decommissioning would occur adjacent to the known site of *Sisyrinchium sarmentosum*. As a result, current access to/use of the site by humans (which is minimal at present) would continue at its present level, as would the probability of introduction of noxious weeds or other invasive plants to the area via motor vehicle traffic.

Cumulatively, the present and increasing risks associated with severe fire conditions and potential weed introduction, acting on a species known to be rare within the state, in combination with the continuing negative effect of grazing upon known sites and *Sisyrinchium* habitat, along with the pressures of land development and continuing encroachment in *Sisyrinchium* habitat throughout its range, are indirect effects such that over the long-term Alternative A ***may impact*** individuals or habitat, but ***would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species***.

Effects Common to Action Alternatives B, C, and D

Direct, Indirect and Cumulative Effects

Alternatives B, C and D are similar in their effects upon *Sisyrinchium sarmentosum*. Though slightly different in their scope and placement on the landscape depending on alternative, fire risk reduction strategies are common to all of the action alternatives. These alternatives do not propose any activities at the known *Sisyrinchium sarmentosum* site in Gotchen, and thus would have no direct impact upon this site in the short-term.

These alternatives also propose decommissioning a 1.2-mile segment of Forest Road 822-5791, which is near the known site of *Sisyrinchium*. Decommissioning this road would have beneficial effects, even though this segment of road is seldom used. First, it would preclude any further motor vehicle use or development in the area. Secondly, motor vehicles are a major vector for introducing and spreading noxious weeds and other invasive species. Eliminating motor vehicle traffic from the area could reduce the potential for the establishment of noxious weeds and invasive species near the *Sisyrinchium* site. Introductions of noxious weeds and invasive species could threaten the long-term viability of *Sisyrinchium* at this site.

Other stand treatments proposed under these alternatives may benefit this species in the long term by reducing conifer encroachment in meadows that may potentially host *Sisyrinchium*. Specifically, treatment of Unit Z (aspen restoration) would improve meadow habitat by reducing conifer encroachment and shrub growth in the meadow near the Gotchen Creek Guard Station. This meadow is potential habitat for *Sisyrinchium,* although this species has not been found there, presently.

In addition, fire risk reduction strategies that allow for effective fire management may benefit both the known *Sisyrinchium* site as well as potential *Sisyrinchium* habitat

within the Gotchen project area. By reducing the risk of extirpation or habitat loss resulting from high-severity fires, the Gotchen risk-reduction actions would allow for future fire and silvicultural treatments aimed at site and habitat restoration.

Overall, these alternatives should have a ***beneficial impact*** on *Sisyrinchium sarmentosum*.

Alternative C-1

Direct, Indirect and Cumulative Effects

Alternative C-1 is similar in most aspects to alternatives B, C and D, except Alternative C-1 proposes no road decommissions or closures. Forest Road 8225-791, which passes near the *Sisyrinchium* site, would remain open. As such, this alternative is less beneficial with regard to the potential introduction and spread of noxious weeds and invasive species than Alternatives B, C and D. In all other aspects, the effects of this alternative upon *Sisyrinchium* would be the same as those of Alternatives B, C and D.

Forest Road 8225-791 is located near the known site of *Sisyrinchium*. Leaving this road open would allow current human access to the site (at present, minimal) to continue at the present level, but more importantly, could allow for potential increased motor vehicle use in the future, which could constitute a risk to the known site. Leaving this road open does not reduce the potential for introduction of noxious weeds at the site. In summary, action alternative C-1 would have indirect, long term effects of improving *Sisyrinchium* habitat by reducing conifer encroachment into potential habitat within meadows, and by reducing the risk of extirpation of the known site from high-severity fires.

Overall, Alternative C-1 should have a ***beneficial impact*** to *Sisyrinchium sarmentosum*

Survey And Manage Plant Species

Schistostega pennata

S*chistostega pennata* is a Survey and Manage management category A species, indicating that it is rare within the Northwest Forest Plan area (USDA & USDI 2001). There are four known sites of *Schistostega pennata* within the Gotchen Planning Area. One of these sites is located within Unit BB. Three of these sites are located just outside stands where treatments are proposed (aspen meadow restoration and Shaded Fuelbreaks/Fuelbreaks – Units L, Q, V, Z). All sites are located within riparian zones in the northern part of the Gotchen Planning Area.

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 (Reference: Survey and Manage Management Recommendations for Bryophytes).

The Washington State Natural Heritage Program tentatively ranks non-vascular plants on "working lists" of endangered, threatened and sensitive plants for the state. *Schistostega pennata* is ranked on these lists as S2, indicating that it is thought to be vulnerable to extinction, with only 6 to 20 occurrences known statewide; it is also listed as S2 in the state of Oregon.

Effects determinations are not required for Survey and Manage species. Instead, the Northwest Forest Plan mandates various levels of management depending on the management category of individual species. For a comprehensive list of management categories and associated management requirements, refer to the Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA & USDI 2001). For the purpose of this analysis, project effects upon Survey and Manage "manage known sites" species and associated habitat are analyzed by alternative in a format similar to that employed in the effects analysis for TES plant species; however, no formal effect determinations are made.

Alternative A—No Action

Direct, Indirect and Cumulative Effects

Under the No Action alternative there would be no direct, short-term effects upon *Schistostega pennata* known sites or habitat. Overall, the no action alternative would likely have the most negative long-term impact on this species, compared to the action alternatives. In the long term, the potential for *Schistostega* habitat to experience high severity fires – fires more severe than those experienced by plants historically – would remain and increase in the long-term. These fires would be unpredictable in their outcome, and could extirpate sites and destroy habitat. No road decommissioning would occur, thus known sites of this species would remain relatively accessible (in comparison to alternatives where the road is decommissioned) to disturbance by humans. This impact would be presumed to be minimal, given the sheltered habitat of this species within this area (hollows in root-wads).

Effects Common to Alternatives B, C and D

Direct, Indirect and Cumulative Effects

None of the action alternatives would have any predictable short- term, direct effects upon *Schistostega pennata*, since all *known sites* would be buffered with a 300 ft. radius no-entry buffer. All of the action alternatives propose various levels of fuels reduction and reforestation, Shaded Fuelbreaks/Fuelbreaks, aspen restoration and legacy tree culturing in stands adjacent to known sites; and in the case of Unit BB, sapling thinning in a stand immediately surrounding a known site. The long-term effects of the action alternatives have the potential to negatively impact some *Schistostega habitat,* and may even impact known sites. However, with a 300 ft radius no entry buffer around known sites, and culvert removal mitigation, the long-

term negative effect would likely be minimal, and would be unlikely to extirpate known sites or destroy habitat.

None of the action alternatives propose activities within 25 ft of stream channels, including seasonal streams. The area within 25 ft of streams (immediately adjacent to standing water) provides the primary habitat for *Schistostega.* However, since *Schistostega* is heavily dependent on shade, moderate to heavy thinning that occurs adjacent the 25 ft riparian buffer could decrease the suitability of the habitat to support this species, by increasing illumination. Current understanding of this species suggests that increased illumination is likely to damage existing populations of *Schistostega pennata*, but some increase in illumination to potential habitat is not likely to prevent the species from establishing there (Judy Harpel, personal communication 3-19-03). This being the case, management activities proposed by the action alternatives have the potential to negatively impact undiscovered populations of *Schistostega* within Gotchen, but impact to potential habitat would be negligible.

The action alternatives all propose to maintain the opened forest understory, in the long term, by controlled understory burns. Although the alternatives differ slightly in scope and placement of treatment activities on the Gotchen landscape, the underburning treatments proposed are located close enough to *Schistostega* habitat (and known sites) that there would be a possibility of fire escape and damage to *Schistostega's* substrate root wads, and the *Schistostega* populations themselves. This impact is highly speculative, however, and would likely be minimal across the extent of *Schistostega* habitat within the Gotchen Planning Area.

Decommissioning Forest Road 8225-150 would help protect known sites of *Schistostega* by reducing human access to these sites, though this impact is currently presumed to be minimal, given the sheltered habitat of this species within this area (hollows in root-wads). On the other hand, the culvert removal associated with road decommissioning could negatively affect known sites of *Schistostega pennata* downstream by causing sedimentation in stream channels that could cause changes in pooling patterns. Since *Schistostega* is thought to rely on reflection pools adjacent to its root wad habitat, these changes could reduce the quality of *Schistostega* habitat, and may cause the extirpation of these known sites. Mitigation to minimize these potential negative effects is incorporated into the alternatives.

Restricting access would also help prevent the introduction of noxious weeds and invasive plants to these areas.

In the long term, Alternatives B, C and D would be likely to benefit the species by employing risk reduction strategies that reduce the probability of high severity fires that could extirpate known sites and destroy *Schistostega* habitat; and by reducing access to known sites. These alternatives would be likely to benefit the species more than the No Action alternative or Alternative C-1.

Alternative C-1

Alternative C-1 is similar in most aspects to Alternatives B, C and D, except that Alternative C-1 would leave Forest Road 8225-150 open. This road is located near

two known sites for *Schistostega pennata*. Leaving this road open would allow current human access to the site to continue at the present level (presumed to be minimal), and would not preclude the possibility of increased future human use in future. In addition, leaving this road open would not reduce the probability of introduction of noxious weeds or other invasive plants to the site, as do the other action alternatives. In all other aspects, the effects of this alternative upon *Schistostega pennata* would be the same as those of alternatives B, C and D.

In the long term, by employing risk reduction strategies that reduce the probability of high severity fires that could extirpate known sites and destroy *Schistostega* habitat, Alternative C-1 would be likely to benefit *Schistostega pennata*. This alternative would be likely to benefit *Schistostega pennata* less than the other action alternatives that include road decommissioning and reduce human access to sites, but, by reducing the probability of high severity fires, would likely be more beneficial to this species than the No Action alternative.

Botrychium montanum

Botrychium montanum is a Survey and Manage management category A species, indicating that it is rare within the Northwest Forest Plan area (USDA & USDI 2001). 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. (USDA & USDI Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Related Species within the Range of the Northern Spotted Owl, 1999) The three known sites of *Botrychium montanum* within the Gotchen Planning Area are located within Unit BB. There is an additional site located just northwest of the Gotchen Planning Area.

The suspected mycorrhizal associate of *Botrychium montanum*–western red cedar–is a fire intolerant species that would most likely be killed in a moderate to high intensity fire. Under the action Alternatives B, C and D, Unit BB would experience gap sapling thinning, which would reduce the probability of high intensity fire within the stand, but no thinning would occur within 25' from the intermittent stream. Slash produced from the thinning would be hand piled and burned. With the mitigation of a 300 ft. radius no entry buffer around all known sites, the action alternatives would have no direct, short term effects upon *Botrychium* sites.

Grazing constitutes an additional threat to this species, and management recommendations specify that sites should be protected from grazing impact in some areas proposed for treatment (Survey and Manage Management Recommendations). Most of the Gotchen Planning Area is within a grazing allotment. The areas surrounding *Botrychium montanum* sites and habitat appear to be minimally affected by grazing at this time. Because of the proximity of the sites to riparian zones, which tend to attract livestock, this situation could change.

Alternative A—No Action

Direct, Indirect and Cumulative Effects

Under Alternative A, no treatments would occur in Unit BB or in other stands adjacent to *Botrychium* known sites. The potential for *Botrychium* sites and habitat to experience more intense fires than experienced by these plants historically – would remain and increase in the long-term. These fires would be unpredictable in their outcome, and could extirpate existing populations of *Botrychium* and/or kill the riparian western red cedar communities upon which the *Botrychiums* may depend. The negative impacts of the No Action alternative would be in addition to the existing and continuing risk the population faces from grazing. For these reasons, the No Action alternative may have an indirect and cumulative negative effect upon *Botrychium montanum* in Gotchen, and would be likely to benefit *Botrychium montanum* the least of all the alternatives.

Effects Common to Alternatives B, C, C-1, and D

Direct, Indirect and Cumulative Effects

Action alternatives B, C and D would all have similar impacts to *Botrychium* known sites and habitat. All of the action alternatives propose treatments that would reduce the risk of extirpation of known sites and the destruction of habitat from high-severity fires and would thus have positive, indirect, long-term effects upon the known sites. The activities proposed within Unit BB under the action alternatives may create localized disturbance from workers implementing treatments, which would create potential for trampling of *Botrychium* plants and disturbance to *Botrychium* habitat. However, no activities are proposed within 25 ft of the stream under these alternatives (*Botrychium montanum* grows on the immediate streambank), so trampling would only constitute a risk if workers traveled to and from the project sites through *Botrychium* habitat.

With the implementation of the 300 ft. no-entry buffer mitigation around known sites, there should be no direct negative impacts to the sites or habitat from workers. The gap sapling thinning proposed in Unit BB could increase livestock accessibility to *Botrychium* sites, but this is highly speculative. In order to mitigate for this possible impact, *Botrychium* sites should be monitored throughout the grazing season following the treatment of Unit BB. If evidence of increased grazing is found, livestock should be excluded from the area (for more detailed descriptions of mitigations, refer to the Botany mitigation section in Chapter 2).

Overall, the action alternatives would have the positive, indirect, long- term effect of reducing the risk of high-intensity fires that could destroy habitat or extirpate known sites. Possible indirect negative effects that could result from implementation of these alternatives would be mitigated. For these reasons, the action alternatives are likely to benefit *Botrychium montanum* more than the No Action alternative.

Introduction and Spread of Noxious Weeds

Noxious weeds are non-native plants that colonize and grow aggressively, and possess few natural enemies. This combination of characteristics causes these plants to be difficult to control, and a threat to native ecosystems.

There are a number of noxious weed-related concerns, though relatively little is currently known about the spatial extent of infestation for specific noxious weed species within Gotchen. Weed surveys within Gotchen were performed during other required plant surveys (Threatened, Endangered, Sensitive {TES}; Survey and Manage {S&M}). Surveyors compiled a comprehensive plant list during these surveys, including noxious/invasive species sightings. Because the TES and S&M surveys target habitats less likely to host weeds-- TES and S&M species are likely to be found in undisturbed and old growth habitat-- these surveys undoubtedly missed species and sites of noxious weeds.

Motorized vehicles, livestock and horses are primary vectors for the spread of noxious weeds within the Gotchen Planning area. There are approximately 100 miles of existing roads within Gotchen. This accessibility allows forest visitors and their vehicles to transport weed seeds into Gotchen from other areas on and off of the National Forest, as well as from one place to another within the Gotchen Planning Area.

The 18.4 miles of roads proposed for closure would remain as habitat for weeds, though closure would reduce the potential for the spread or introduction of weeds via motor vehicles. The overall effect on weeds vary, but may be assumed to be beneficial based on the elimination of vehicle access and traffic.

Mt. Adams cattle allotment encompasses the Gotchen Planning Area. Five hundred head of cattle range within this allotment, and their impacts tend to be concentrated on frequently used trails and preferred congregation areas; these areas are at high risk of weed infestations.

Each of the action alternatives would increase the amount of transitory range available for grazing by livestock. This means that livestock would be traveling to, and grazing in, areas that have previously been ungrazed. Thus, an indirect effect of the action alternatives is a spatial expansion of livestock use within the area, with a corresponding increase in the potential for noxious weed dispersal and infestation into previously uninfested areas.

In addition, Gotchen has experienced little systematic weed control in the past; presently, control efforts are limited. All of these circumstances place Gotchen at high risk from weed invasion and increasing weed infestation.

Noxious Weed Risk Analysis

This analysis discusses weed risks associated with proposed activities in the Gotchen Planning Area. A finding of risk drives the development of specific mitigation measures, in addition to prevention practiced in all projects that create ground disturbance. Risk includes identifying the likelihood of weeds spreading to the

Gotchen Planning Area and determining the consequence of weed establishment in the Gotchen Planning Area (Region 6 Implementation Guidelines for Invasive Plants Contract Provisions).

For the purpose of this analysis, road decommissioning is viewed as an action that would reduce the risk of noxious weed spread and invasion in the long-term, particularly if mitigation measures to prevent and control weeds are effectively implemented. This conclusion recognizes, however, that road decommissioning initially causes more soil disturbance and potential for weed establishment than would leaving roads in their existing condition. With prevention and control mitigation, the long-term beneficial effect compensates for the initial risk. Mitigation for noxious weeds is summarized in the Botany mitigation section in Chapter 2.

Most of the potential impacts from project activities upon noxious weed spread can be mitigated. However, unlike many types of mitigations, which essentially eliminate risk to the resource, the ultimate outcome of weed mitigation is often uncertain. Evaluation of the probable efficacy of mitigation measures designed to prevent project activities from spreading noxious weeds, is complicated by the necessity of making certain assumptions. For instance, to help prevent the transfer of weed seeds from lands located outside the Gifford Pinchot National Forest onto the Forest, equipment operators are required to wash their equipment before entering the Forest. The effectiveness of this mitigation is entirely dependent upon how thoroughly the equipment is cleaned. In evaluating the efficacy of this mitigation, the evaluator must assume that the equipment would be cleaned thoroughly or that the equipment won't be cleaned thoroughly. For this reason, when making comparisons of the environmental consequences of project alternatives upon noxious weed spread, the inherent uncertainty of the efficacy of mitigations must be considered.

In addition, the degree to which noxious weed mitigations to control infestations are funded is uncertain. This uncertainty must be considered in the assessment of risk for noxious weed spread. Currently, National Forest System funding for weed control (treatment) is minimal. Although there are opportunities for seeking additional funding in order to implement mitigations, this is highly speculative.

In order to try to address these uncertainties in the risk assessment, all alternatives have been considered under two scenarios: **Scenario 1** includes mitigation measures to ***prevent*** the introduction of noxious weed to the Gotchen Planning Area during project implementation (by equipment cleaning); and measures to ***control*** or eradicate existing and ensuing weed infestations in the Gotchen Planning Area before and after project implementation (through treatment and monitoring). **Scenario 2** includes only mitigation measures pertaining to prevention. Both scenarios assume moderate success in implementation of specific mitigations. Scenario 1 always prevents the spread of noxious weeds a great deal better than scenario 2, demonstrating the importance of thorough implementation of both preventative and control mitigations.

Measurement Methods

Acres of ground disturbance

Miles of road closed (gated or decommissioned)

Miles of temporary road constructed or reconstructed.

Increase in transitory range (acres)

Alternative A—No Action

Direct, Indirect and Cumulative Effects

Under the No Action alternative, there would be no changes to present levels of noxious weed infestations due to project implementation. Of all the alternatives, the No Action alternative would be likely to cause the least increase in noxious weed spread across the Gotchen Planning Area in the short-term, compared to the relatively large area of ground disturbance that would occur in the action alternatives. In the short and long-term, all existing roads in the Gotchen Planning Area would remain open and continue to act as vectors for the spread of noxious weeds.

Effects Common to All Action Alternatives

There are a number of activities proposed in the action alternatives that have the potential to cause weed spread. All actions that are ground disturbing would create new habitat for noxious weeds. Movement of equipment between stands has the potential to transfer weed seeds from roads to stands, or between stands. Decommissioning of existing roads and construction and reconstruction of temporary roads has the potential to exacerbate noxious weed infestations by creating large areas of disturbance in areas where the weed seed bank is likely high (roads). If expansion of weed infestation is controlled in these areas, through systematic survey and control over a period of years after the project, road decommissioning and construction/reconstruction of temporary roads can reduce or eliminate existing infestations. Decommissioning can eliminate the long term potential for weed spread, by removing roads from use by motor vehicles. In areas with existing weed infestations, burning may cause an expansion of the infestation by killing off existing, native plants, and causing weed seeds stored in the soil to germinate.

Implementing any of the Gotchen alternatives has the potential to exacerbate or help reduce the spread of noxious weeds and other invasive species within Gotchen.

Alternatives proposing greater numbers of acres of stand treatment, and/or number of miles of road decommissioned, constructed or reconstructed, have a greater potential to disturb more ground, introduce more noxious weeds, and expand existing noxious weed populations. Based on this, Alternative A (treats 0 acres) would be superior to alternative D (treats 1645 acres); which would be superior to Alternative B (treats 1684 acres and creates nearly three more miles of newly constructed temporary road than all of the other action alternatives). Alternative B would be superior to Alternative C (treats 2220 acres). Alternative C, with road closure and decommissioning proposals, is superior to Alternative C-1, without the road closure proposals, but only if mitigations are fully implemented.

A summary of the area that would be disturbed for each action alternative is summarized below:

Alternative B

Under Alternative B, 1684 acres would undergo potentially ground-disturbing activities and expansion of transitory range. In addition, 24.8 of road would be closed or decommissioned, and 7.5 miles of temporary road would be constructed (3.1 miles) or reconstructed (4.4 miles). This alternative proposes 3.1 miles of new temporary road construction, substantially more that any of the other alternatives. This would create about 5 acres of roadbed and landings to the area.

Alternative C

Under Alternative C, 2220 acres would undergo potentially ground-disturbing activities and expansion of transitory range. Approximately 24.8 miles of road would be closed or decommissioned, and 4.3 miles of temporary road would be constructed (0.4 mile) or reconstructed (3.9 miles). New temporary road construction would add about 0.4 acres of roadbed to the area.

Alternative C-1

Under Alternative C, 2220 acres would undergo potentially ground-disturbing activities and expansion of transitory range. 4.3 miles of temporary road would be constructed (0.4 mile) or reconstructed (3.9 miles). New temporary road construction would add about 0.4 acres of roadbed to the area.

Alternative D

Under Alternative D, 1645 acres would undergo potentially ground-disturbing activities and expansion of transitory range. 24.8 miles of road would be closed or decommissioned, and 4.1 miles of temporary road would be constructed (0.2 miles) or reconstructed (3.9 miles). New temporary construction would add about 0.2 acres of roadbed to the area.

Scenario 1: Prevention and Control Mitigation

Effects Common to Alternatives B, C, and D

If prevention and control mitigation measures are fully implemented, there would likely be a slight increase in the distribution of noxious weeds in treated stands, in the short term. The increase in weed infestation would be minimized, but not eliminated, by mitigation. Road decommissioning and closure would, in the long term, reduce current infestations and help prevent future infestations along 24.8 miles of road. New construction and reconstruction of temporary roads would open up new ground for weeds initially, though this may also be mitigated under the prevention and control mitigation called for. In the long term, all of the action alternatives would likely cause a slight overall increase in noxious weed infestation in treated stands, relative to the current level of infestation based on the large area of ground disturbance proposed.

Effects Specific to Alternative C-1

Similar to the other action alternatives, there would likely be a slight increase in the distribution of noxious weeds in treated stands in the short term, with prevention and control measures fully implemented. In the long term, infestations along the sections of temporary road constructed and reconstructed would likely be reduced under scenario 1. Under scenario 1, Alternative C-1 is less likely to help prevent future spread of noxious weeds than Alternatives C (with road closures).

Scenario 2: Prevention Mitigation Only

Effects Common to Alternatives B, C, and D

Overall, implementing Alternative B, C and D would likely cause a moderate to large increase in noxious weed infestation in treated stands; and particularly along decommissioned, closed, newly constructed and reconstructed roads, relative to the current level of infestation.

If only prevention mitigations are implemented, there would likely be an increase in the distribution of noxious weeds in treated stands, in the short term. This outcome is similar to that described for scenario 1, because mitigations designed to prevent noxious weed introduction are required under both scenarios. In contrast to scenario 1, the slightly expanded weed infestation would not be treated under scenario 2. Over time, many of the initially small, new infestations would reproduce and spread. The problem of weed spread would be exacerbated by the increased livestock use of treated stands. Without treatment, in many areas, particularly areas that receive high levels of light, these populations would continue to expand.

In addition to impacts associated with treated stands, road decommissioning, closure, construction and reconstruction would likely cause an overall expansion of existing weed populations across 32.3 miles, 29.1 miles and 28.9 miles of road, respectively, for Alternatives B, C and D.

Effects Specific to Alternative C-1

Under **Scenario 2**, this alternative would likely cause a moderate to large increase in noxious weed infestation across the treated stands, and along constructed/reconstructed temporary roads, relative to the current level of infestation. Because Alternative C-1 would not create the ground disturbance associated with decommissioning, it would have a lower potential for the introduction and spread of noxious weeks in comparison to Alternatives B, C and D, under Scenario 2.

RECREATION

Significant Issue: Public Road Access And Dispersed Recreation

Alternative B includes several miles of road closures and decommissions. Open roads facilitate dispersed recreation such as hunting, mushroom collection, and camping. Open roads can also detract from some recreational experiences. A reduction in road density reduces the access to areas with habitual use and reduces dispersed camping opportunities. Closure of Forest Road 8225-150 eliminates access to the Snipes Trail.

Measurement Methods

Mileage of roads closed or decommissioned within the Gotchen Planning Area.

Availability of dispersed campsites

Alternative A – No Action

Direct, Indirect, and Cumulative Effects (1-5 Years)

Open road density would remain unchanged, and the current level of dispersed recreation that is facilitated by roads would remain unchanged. There would be no loss of access to the 30 major dispersed campsites in the Gotchen Planning Area. There would be no loss of access to existing or proposed trailheads. No immediate cumulative effects are expected.

Cumulative Effects (10 and 50 Years)

No immediate vegetative changes would occur at Cherry Flats dispersed camping area. In the long term (50 years) the area is likely to become denser with grand fir and Douglas-fir. Western pine beetle is likely to kill some of the large ponderosa pines that are stressed from increased tree density.

Alternatives B, C, And D

Direct, Indirect, and Cumulative Effects (1-5 Years)

Open roads that would be decommissioned or otherwise closed to public vehicle traffic would reduce opportunities for dispersed recreation, primarily camping. There are 30 major dispersed campsites in the Gotchen Planning Area. Proposed road decommissions and gated closures would eliminate access to 20 major dispersed campsites. A mitigation measure has been stipulated to leave open the first 50-100 feet of decommissioned and closed roads to provide dispersed camping opportunities. If 100% effective, this could provide 21 dispersed campsites. Realistically, only half of these road stubs (10) are likely to be attractive enough to be used. Thus, with mitigation, action alternatives would reduce dispersed camping by 33% (from 30 to

20 sites). Table 4-22 displays the miles of road affected and the resulting dispersed sites.

Fall deer and elk hunters are the primary user group affected by this reduction in dispersed campsites. Generally, all of the existing sites are used throughout the hunting season. In many cases, hunters would repeatedly camp in the same location year after year. Those hunters who are displaced from traditional campsites would be significantly affected. As a percentage of the major campsites, 66% of the traditional campers would be displaced.

Aside from camping, a reduction in open road density has mixed impacts on the quality of hunt. It is assumed hunters who spend more time in the woods than in vehicles would benefit from a reduction in road density.

Alternative C-1 would be implemented without any of the road management actions. Under this alternative, impacts to dispersed recreation would be similar to no action.

No additional cumulative effects are expected when considering this project along with other planned project. No other projects would affect currently open roads. The Eastside Trails Expansion project would convert some existing closed roads to trails

Table 22. Mileage of Roads Closed or Decommissioned and Likely Dispersed Campsites.

	Alt. A	Alt. B	Alt. C	Alt. C-1	Alt. D
Roads Closed or Decommissioned	0 miles	24.8 mile	24.8 miles	0	24.8 miles
Dispersed Campsites	30 campsites	20 campsites	20 campsites	30 campsites	20 campsites

The action alternatives thin understory grand fir from beneath the large ponderosa pine at Cherry Flats. The public would be displaced from dispersed camping at the site during logging and fuels treatment. Post treatment, the site would appear more like the historical condition, having a more open understory (White 1923, Wilcox 1909). The large ponderosa pines that characterize the site would have greater opportunity to persist. Younger ponderosa pine would have space to grow.

Cumulative Effects (10 Years and 50 Years)

No addition cumulative effects are expected in the long term. The displacement from traditional campsites that would occur after implementation of road closures/decommission, would be sustained over time. In the long-term, dispersed use activity would conform to the open road density.

Issue: Designated Wilderness, Inventoried Roadless Area, And Unroaded Areas

Proposed actions may have direct and indirect impacts on designated Wilderness and other lands with the potential for wilderness designation. Mt. Adams Wilderness lies to the north of the Gotchen Planning Area. No actions are proposed in the Mt. Adams Wilderness. Mt. Adams Wilderness is contiguous to the Gotchen Creek Inventoried

Roadless Areas (delineated in GP Forest Plan and RARE II). Contiguous to the Gotchen Creek Inventoried Area is an unclassified unroaded area of approximately 1,190 acres. Vegetative and road management actions are proposed on the perimeter of Gotchen Creek Inventoried Roadless Area and the adjacent unclassified, unroaded area. These actions are assessed relative to their effect on recreation and wilderness capability.

Measurement Methods

Acres and type of vegetation treatment within roadless and unroaded areas.

Miles of road constructed or decommissioned with roadless and unroaded areas.

Change in wilderness capability

Alternative A – No Action

Direct, Indirect, Cumulative Effects (1-5 Years)

Mt. Adams Wilderness

No risk reduction or restoration actions would occur within or adjacent to the Mt. Adams Wilderness. There would be no direct or indirect short-term changes to vegetation or natural integrity.

Human use patterns in this part of the Mt. Adams Wilderness are not expected to change as a result of not implementing this project. Visitation may increase, following a general trend in population increase in Oregon and Washington. Visitation could also stay constant, particularly if a limited quota is established for South Climb. Either way, visitation trends in conjunction with the "no action" alternative cause no cumulative effects to wilderness capability or its sub-elements.

Gotchen Creek Inventoried Roadless Areas and Other Unroaded Areas

Under no-action, the inherent wilderness capabilities remain unchanged for Gotchen Creek Inventoried Roadless Area and the unroaded area to its immediate southeast.

Cumulative Effects (10 and 50 years)

No action implies a continuation of the current management policy to actively suppress wildfires in both the late-successional reserve and Wilderness. This is not expected to have an indirect long-term (50 year) impact to natural fire intervals in the high elevation grand fir to subalpine fir forests. Active fire suppression (fire exclusion) has had less impact on these high-elevation forests because this policy has been in affect for only a portion of the natural fire interval (Agee 2001). Given fire suppression for the past 90 years, and assuming continued suppression over the next 50 years, the total time is still less than the projected fire interval of 200-270 years. It may in fact lengthen the fire interval on some portion of the landscape, but this would

not be discernable. Wildfires would not expect to be of greater intensity on average. Fires in this subalpine fir plant association tend to be of high severity regardless.

Alternatives B, C, And D

Direct, Indirect, Cumulative Effects (1-5 Years)

Mt. Adams Wilderness

Under these alternatives, no risk reduction or restoration actions would occur within or adjacent to the Mt. Adams Wilderness. There would be no direct or indirect short-term changes to vegetation or natural integrity.

The action alternatives would reduce the threat of wildfire in the lower Gotchen Planning Area (Graham 1999, Omi and Martinson 2002). They would also increase options for suppressing a wildfire within the Gotchen Planning Area. Indirectly, this may reduce the threat of fire spreading into Mt. Adams Wilderness from lower elevations.

Gotchen Creek Inventoried Roadless Area and Other Unroaded Areas

Alternatives B, C and D do not propose any vegetation treatments with the Gotchen Creek Inventoried Roadless Area.

None of the action alternatives include new road construction of any kind within the Gotchen Creek Inventoried Roadless Area.

All action alternatives include road management actions to decommission or close roads that are currently open. These Forest Roads (8040-101, 8040-031,8040-040, 8040-050, 8040-027, 8225-150, 8225-791, 8200-071) are not located within Gotchen Creek Inventoried Roadless Area but are adjacent to it. Decommissioning these roads would further insulate Gotchen Creek Inventoried Roadless Area from motorized traffic. This would increase solitude and cause recreation to be more challenging. The magnitude of these indirect benefits would be small, yet it would still an enhancement of the area's wilderness capability.

In Alternative C-1, there would be no change in the wilderness capability of the Gotchen Creek Inventoried Roadless Area.

Other Unroaded Areas

Alternatives B and D include Unit U, which infringes upon the unroaded area between Road 82 and the Gotchen Creek Inventoried Roadless Area. Unit S in Alternative C would treat the same area.

Unit U or S would create a 250 foot wide Shaded Fuelbreak on both sides of Road 82 east of Bunnel Butte. Treatment on the north side of the Road 82 could be interpreted as entering an unroaded area. The Shaded Fuelbreak would be created by removing trees to attain a canopy closure of 40%. Alternative B is more intensive as larger trees would be removed. In Alternatives C and D, only trees with a dbh of 10 inches or less

would be cut. This manipulation would be apparent in the short-term (10 years). The silvicultural treatment attempts to emulate natural fire disturbance. Given the limits on cutting and its close proximity to the road, this treatment would not diminish the wilderness capability of this unroaded area.

No permanent road construction is proposed in this unroaded area. No road closure or decommissioning is proposed on its boundary.

Table 4-23. Treatment Acreage within Wilderness, Roadless, and Unroaded Areas.

Area	Alt. B - Acres	Alt. C - Acres	Alt. D - Acres
Mt. Adams Wilderness	0	0	0
Gotchen Creek Inventoried Roadless Area	0	0	0
Unroaded Area (south of Gotchen Creek Inventoried Roadless Area	30 (Unit U)	30 (Unit S)	30 (Unit U)
Total Acres	**30**	**45**	**30**

Table 4-24. New Road Construction Miles within Wilderness, Roadless, and Unroaded Areas.

Area	Alt. B - Miles	Alt. C - Miles	Alt. D - Mile
Mt. Adams Wilderness	0	0	0
Gotchen Creek Inventoried Roadless Area	0	0	0
Unroaded Area (south of Gotchen Creek Roadless Area	0	0	0
Total Miles	**0**	**0**	**0**

Table 4-25. Existing Road Closure/Decommission Miles Adjacent to Wilderness, Roadless, and Unroaded Areas.

Area	Alt. B - Acres	Alt. C - Acres	Alt. D - Acres
Mt. Adams Wilderness	0	0	0
Gotchen Creek Inventoried Roadless Area	5.5	5.5	5.5
Unroaded Area (south of Gotchen Creek Inventoried Roadless Area	0	0	0
Total Miles	**5.5**	**5.5**	**5.5**

Table 4-26. Change in Wilderness Capability for Wilderness, Roadless, and Unroaded Areas

Area	Alt. B - Acres	Alt. C - Acres	Alt. D - Acres
Mt. Adams Wilderness	No Change	No Change	No Change
Gotchen Creek Inventoried Roadless Area	Slightly Improved	Slightly Improved	Slightly Improved
Unroaded Area (south of Gotchen Creek Inventoried Roadless Area	No Change	No Change	No Change

Cumulative Effects (10 and 50 Years)

There are no other new projects scheduled to occur within Gotchen Creek Inventoried Roadless Area or the unroaded area to the southeast. Use limits on the South Climb of Mt. Adams may be implemented. Ongoing actions include trail maintenance and cattle grazing. No cumulative effects to the wilderness capability would be expected.

Mt. Adams Wilderness fire policy would not change nor would the policy for managing wildfire within the Gotchen LSR. This would not expected to have an indirect long-term (50 year) impact to natural fire intervals in the high elevation forests. Fires in this subalpine fir plant association tend to be of high severity, and would remain so.

Issue: Changes to Scenery

Proposed vegetation treatments may change the scenery along several routes used for recreation. This includes Road 80 and 82, principle routes leading to the South Climb Trailhead and Bird Creek Meadows (Yakama Indian Reservation), respectively. Scenery would also be altered along a number of lesser roads that double as cross-country ski trails in the winter. Scenic changes may also occur along summer trails such as the Morrison Creek Trail, Gotchen Creek Trail, and Cold Springs Trail.

Measurement Methods

Percent of scenic road corridors in an open condition

Total area of treatments within scenic corridors

Total length of treatments along trails

Alternative A – No Action

Direct, Indirect, Cumulative Effects (1-5 Years)

Roads 80 and 82

Scenery along both of these roads is primarily mature forest, which dominate the foreground and prohibit background views. Openings are defined as past clearcut harvests where regenerating trees are less than 20 feet tall. 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. Road 82 has 12% in opening within matrix lands (partial retention) and 3% in openings within LSR (retention). East Timber Sale thinned grand fir trees along both sides of 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 Late-Successional Reserve, stem density increases, as does the amount of dead and downed trees.

Trails

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 be manipulated. Under no action, vegetation would continue to develop on its own.

Along the new proposed trails (Eastside Trail Extension project) there is much logging disturbance that is evident. These trails are located on skid roads and decommissioned roads that were constructed to for timber removal. Under Alternative A, the vegetative growth would continue to occupy exposed soil and obscure stumps, while concentrations of slash compact and decay.

Groomed ski trails are on roads that pass through vegetative conditions similar to the summer trails. When used in the winter, snow obscures most evidence of logging (stumps and slash) that may be adjacent to the road.

Cumulative Effects (10 and 50 Years)

Roads 80, 82 and Trails

Past clearcut timber harvest has created openings within both scenic road corridors in the Gotchen Planning Area. The percent of land area in an open condition is currently within GPFP standards. When regenerating trees within cutover areas reach 20 feet in height, the stand is no longer considered an opening. As there are no actions within the foreseeable future that would create new openings, total openings would decrease over time. Table 4-8x displays the anticipated changes projected over time

Table 4-27. Percent Openings (Created) within Scenic Road Corridors.

Road Corridor and Objective	Maximum Permitted*	Current	10 Years Future	50 Years Future
Rd 80 Retention Foreground	10%	2%	0%	0%
Rd 82 Partial Retention Foreground	14%	12%	4%	0%
Rd 82 Retention Foreground	10%	3%	1%	0%

***** Per Gifford Pinchot LRMP Visual Quality Objectives

With only the East Timber Sale (2000) and the Gotchen Fuels Reduction Project (2002) to address fuels and vegetative condition, the threat of fire would increase. The scenic consequence of a large fire could be very significant. Severe fire resulting in large openings would greatly modify current foreground scenery and have long lasting impacts. To the extent large trees are lost, scenic quality would be degraded.

If a large, intense fire does not occur, foreground scenery is likely to become more uniform as tree densities increase, especially young trees within gaps. Dead and downed trees would be abundant. Viewing distances would decrease.

Alternatives B, C, And D

Direct, Indirect, and Cumulative Effects (1-5 Years)

The action alternatives include a variety of silvicultural prescriptions, which would change the appearance of vegetation. For simplicity in this scenic assessment, these treatments have been grouped as either affecting the overstory and understory of forest stands, or the understory only (trees less than 10 inches diameter).

None of the treatments within scenic corridors or the LSR would result in an "opening" per the scenic definition. Only Unit A would result in a created opening; it is situated within the General Forest (TS) Management Area and is not visible from any of the scenic travelways. All of the action alternatives would result in scenic changes that are consistent with the GPFP.

Scenic Road Corridors

Portions of treatment Units O, N, M, and R lie within the foreground of the Forest Road 80 Visual Corridor. Portions of treatment Units G, S, and U lie within the foreground of the Forest Road 82 Visual Corridor. All but one of these units would be within foregrounds managed for a retention objective; Unit G would be within a foreground managed for a partial retention objective. Table 4-28 provides the total acreages, by alternatives, within the scenic road corridors.

All of these treatment units are partial cuts, where canopy cover would be 40-60% post treatment. There may be small openings (> _ acre) near landings after treatment, but otherwise large trees would be standing throughout the unit. Stands would have more open understories and appear to be more single layered than multi-layered.

Immediately after treatment, soil and vegetation disturbance would be obvious. The appearance of disturbance would fade rapidly during the 2-5 years following treatment. The speed of recovery is relative to the degree in which scenic mitigation is implemented. Scenic mitigation seeks to reduce elements of disturbance (painted trees, tall stumps, landings, slash piles, and burn scars) that persist over time, in close proximity to either Road 80 or 82.

At a coarse scale and in the long-term (10+ years), these treatments would maintain a retention objective. There are no "openings" created, per scenic criteria. Leave tree density would be sufficient to maintain the appearance of mature forest. The trees left, the large ponderosa pine, western larch and Douglas-fir, would become more visible, exhibiting the stands' old-growth character. A canopy cover of 40-60% meets forest standards for foreground retention (Tilton and Becker 1999) of dispersed large trees. Scenery along both of these roads is primarily mature forest, and would remain so, post-treatment.

Table 4-28. Treatment Acreage within Scenic Road Corridors.

Road Corridor and Objective	Alt. B - Acres	Alt. C - Acres	Alt. D - Acres
Rd 80 - Retention	146	68	146
Rd 82 - Partial Retention	284	284	284
Rd 82 - Retention	202	313	202
Total Acres	**623**	**665**	**623**

Road 80

Treatment Units M, N, and O are located adjacent to Forest Road 80/8040. In Alternative B, the overstory would be partial cut, leaving 40-60% canopy cover. A canopy cover of 40-60% meets LRMP standards for foreground retention (Tilton and Becker 1999). In Alternative D, only the understory would be felled. Table 4-10X displays the treatments and associated acreages with the Road 80 corridor. Immediately after treatment, soil and vegetation disturbance would be obvious. More disturbance would be apparent in Alternative B than C or D. The appearance of disturbance would fade rapidly during the 2-5 years following treatment. The speed of recovery is relative to the intensity of disturbance and the degree in which scenic mitigation is implemented. Scenic mitigation seeks to reduce elements of disturbance (painted trees, tall stumps, landings, slash piles, and burn scars) that persist over time, in close proximity to Road 80.

Table 4-29. Treatment within Road 80 Corridor .

Treatment	Alt. B Acres	Alt. C - Acres	Alt. D - Acres
Overstory and Understory	144 (Units M, N, O)	45 (Unit M)	-
Understory Only	2 (Unit BB)	23 (Unit BB)	146 (Units M, N, O, BB)
Total Acres	**146**	**68**	**146**

Road 82 (Matrix - Partial Retention)

The action alternatives are nearly identical in their impact to scenery along Forest Road 82 within Matrix. The exception is Unit S; this Shaded Fuelbreak is located primarily within LSR, but one acre is located within matrix along Road 82. All other units (B, C, D, E, and G) within the Road 82 Visual Emphasis allocation are located 250 feet or more away from Road 82. Table 4-30 reflects the treatments and acreages, by alternative, within this section of the Road 82 corridor.

Within these units, overstory trees would be cut, leaving a minimum of 20-30% canopy cover (moderate forest retention). A canopy cover of 20% meets LRMP standards for foreground partial retention (Tilton and Becker 1999). Because these units are not immediately adjacent to the road, the scenic impacts of disturbed brush, soils, and slash are not critical to mitigate in order to maintain scenic quality. Greater harvest intensity of mortality pockets in these stands would result in small gaps 1-2 acres. These gaps would not be readily apparent to passing motorists.

Table 4-30. Treatment within Road 82 Corridor (Matrix - Partial Retention) .

Treatment	Alt. B - Acres	Alt. C – Acres	Alt. D - Acres
Overstory and Understory	284 (Units B, C, D, E, G, S)	284 (Units B, C, D, E, G, S)	283 (Units B, C, D, E, G)
Understory Only	-		1 (Unit S)
Total Acres	**284**	**284**	**284**

Road 82 (LSR – Retention)

Treatment Units S, U, and X are located adjacent to Road 82 within the Gotchen LSR. In Alternative B, the overstory would be partial cut, leaving 40% canopy cover, consistent with LRMP standards for foreground retention. In Alternative C, Unit S is greatly expanded, resulting in treatment of the entire segment of Road 82 within Gotchen LSR. In Alternative D, unit size is similar to Alternative B, but only the understory would be felled. Table 4-31 displays the treatments and associated acreages within the LSR portion of the Road 82 corridor.

Forest stands along Road 82 in this area are thick with skinny lodgepole pine, 20-60 feet tall. Because of the high numbers of small diameter trees, Alternative D would result in as much site disturbance as Alternative B. Viewing distance into these stands would change considerably. Mitigation to minimize the details of disturbance would not be as effective in these stands. The appearance of disturbance would be evident longer.

The retention of untreated patches is important. This adds scenic diversity to these treatment units. Otherwise, the current dense tree uniformity would merely be replaced by the uniformity of a thinned stand. At a larger scale, Alternative B and D would provide more scenic diversity than Alternative C, in that the forests along Road 82 in the vicinity of Smith Butte Sno-Park are not treated.

Table 4-31. Treatment within Road 82 Corridor (LSR – Retention).

Treatment	Alt. B - Acres	Alt. C - Acres	Alt. D - Acres
Overstory and Understory	202 (Units S, U, X)	313 (Units S, U, X)	-
Understory Only (< 10 inch trees)	-	-	202 Units S, U, X
Total Acres	**202**	**313**	**202**

Trails

With their slow speed, trail users scrutinize the scenery much more than do car passengers, and disturbance to foreground vegetation cannot be obscured, except in winter. 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 be manipulated. Under the

action alternatives, some vegetative treatments would occur along existing summer trails.

Summer Trails

Table 4-32 compares the length of treatment along existing "summer trails". Thinning (Shaded Fuelbreaks) would occur at the southern Gotchen Creek Trailhead and the relocated Snipes Trailhead, both Level I managed trails. Thinning would occur along 250 linear feet at the start of each trail. Immediately after treatment, soil and vegetation disturbance would be obvious. The appearance of disturbance would fade rapidly during the 2-5 years following treatment. The speed of recovery is relative to the degree in which scenic mitigation is implemented. Scenic mitigation seeks to reduce elements of disturbance (painted trees, tall stumps, landings, slash piles, and burn scars) that persist over time. This nominal amount of impact is consistent with Level I managed trails.

Plantation maintenance (underburning) would occur along 0.3 miles of the Morrison Creek Trail. The burn may be unsightly, but it would green-up within 2-5 years. This scenic impact is consistent with Level III managed trails.

Table 4-32. Treatment Length along Summer Trails.

Trail	Alt. B – Miles (Unit)	Alt. C – Miles (Unit)	Alt. D – Miles (Unit)
Buck Creek (#54)	-	-	-
Cold Springs (#72)	-	-	-
Crofton Ridge (#73)	-	-	-
Gotchen Creek (#40)	0.1(Q)	-	0.1 (Q)
Morrison Creek (#39)	0.3 (R)	0.3 (R)	0.3 (R)
Pineway (#71)	-	-	-
Snipes (#11)	0.1 (T)	-	0.1 (T)
Total Miles	**0.5**	**0.3**	**0.5**

Along the new future trails (Eastside Trail Extension project) there would be additional disturbance. (A decision on the Eastside Trail Extension project was made by the Responsible Official on March 3, 2003, during preparation of this Statement. Trails construction will begin during the summer of 2003.) Unit M is located along the proposed Wicky Creek Trail. The Wicky Creek Trail follows skid trails for most of its length, through stands that were partial cut in the past. Even portions of Unit M were partial cut in the past. New disturbance would be clearly evident over the short term 2-10 years. In the long-term (>10 years) there would be little difference in the vegetative appearance within Unit M verses other areas along the trail. Table 4-32 displays the treatment length along these yet-to-be constructed trails. Unit O would create a Shaded Fuelbreak along the Big Tree Trail. Some sapling thinning may also be visible from the trail where it passes through Unit BB.

Table 4-32. Treatment Length along Summer Trails.

Treatment	Alt. B – Miles (Unit)	Alt. C – Miles (Unit)	Alt. D – Miles (Unit)
Buck Creek Extension	-	-	-
Big Tree	2.0 (O,BB)	1.0 (BB)	2.0 (O,BB)
Wicky Creek	0.3 (M)	0.3 (M)	0.3 (M)
Total Miles	**2.3**	**1.3**	**2.3**

Winter Trails

Snow obscures shrub disturbance, stumps, skids roads, slash, and burn scars during the winter when cross-country ski trails (roads) are used. Thus the foreground concerns that apply to summer trails do not apply to ski trails. In treated units where the understory is reduced, viewing distance into the stands would increase. Reduction in the overstory would permit greater snow accumulation on groomed routes and off-trail areas. This would improve skiing conditions.

There would be substantial treatment in all action alternatives along the Pipeline and Eagle Ski Trails. Table 4-15X displays the miles of treatment along winter trails. The majority of these trails would traverse mature forests that have been recently thinned, given the cumulative effect of Gotchen and East Timber Sale.

Table 15. Treatment Length along Winter Cross-Country Ski Trails.

Trail	Alt. B – Miles (Unit)	Alt. C – Miles (Unit)	Alt. D – Miles (Unit)
Big Tree XC	0.7 (O)	-	0.7 (O)
Pipeline XC	5.0 (C,F,H,L,Y,AA)	5.0 (C,F,H,L,Y,AA)	5.0 (C,F,H,L,Y,AA)
Eagle XC	1.0 (D, E)	1.0 (D, E)	1.0 (D, E)
Total Miles	**6.7**	**6.0**	**6.7**

Cumulative Effects (10 and 50 Years)

Roads 80, 82 and Trails

Along Roads 80 and 82, no new foreground openings would result from Alternatives B, C, or D. There are no other known projects in the foreseeable future that would create openings along these roadways. Thus total created openings over time would be similar to Alternative A (see Table with Percent Openings (Created) within Scenic Road Corridors).

At a coarse scale and in the long-term (10+ years), these treatments maintain either a partial retention or a retention objective. Leave tree density is sufficient to maintain the appearance of mature forest. The trees left, the large ponderosa pine, western larch and Douglas-fir, would become more visible, exhibiting the stands' old-growth character. A canopy cover of 40-60% meets forest standards for foreground retention (Tilton and Becker 1999) of dispersed large trees. Scenery along Roads 80 and 82 is primarily mature forest, and would remain so.

The Shaded Fuelbreaks and stand- level treatments in Alternatives B, C, and D would reduce the extent of a high intensity fire should it occur (Graham 1999, Omi and Martinson 2002). High intensity fire could still create large opening in untreated mature stands, but the Shaded Fuelbreaks along Roads 80 and 82 would be more resilient (Graham 1999, Omi and Martinson 2002). The potential for fire to create openings along the scenic foreground of Roads 80 and 82 would be reduced.

Public Safety and Recreation Facilities

Public safety may decrease as result of no action due to the increase in snag hazards and wildfire potential. At recreation facilities, public safety may be affected during project implementation due to tree felling and traffic hazards.

Measurement Methods

Number of recreation facilities and trails affected

Alternative A – No Action

Direct, Indirect, and Cumulative Effects (1-5 Years)

Under no action there would be no change to facilities or trails as a result of direct action by the Forest Service. Regardless, there would be impacts to facilities and public safety, due to the gradually changing condition of the forest.

Cumulative Effects (10 and 50 Years)

Grand fir trees surrounding many of these facilities have been defoliated by spruce budworm. Many of these trees have died, will die, or will have dead tops. In the next 10 years, most of the grand fir snags would fall to ground (Everett 1999). Because of the need to protect facilities and the public, hazardous trees and snags would be cut down where they threaten to fall on sno-parks, shelters, and campgrounds. Recreation crews fall hazardous trees and snags annually at developed sites. Along trails, where people are dispersed and transient, snags are not routinely felled. Snag fall hazards to the public on trails would increase unabated. The totality of this hazard is small.

Alternatives B, C, And D

Direct, Indirect, and Cumulative Effects (1-5 Years)

Stand treatments proposed in the action alternatives would result in a short-term direct hazard to the public recreating or driving through this area. Mitigation is proposed to reduce these hazards. Trails and facilities would be closed to the public when nearby treatments are being implemented. Road signing and flaggers are a contract requirement when felling trees adjacent the major roadways (e.g. Roads 80 and 82). Any log or other wood product haul would be suspended on summer weekends between July Fourth and Labor Day, when road traffic is highest. No

conflict is anticipated in winter when ski trails and sno-parks are used. Table 4-33 displays the trails and facilities that would be subject to closure during risk reduction project implementation.

Table 4-33. Trails and Facilities to be Closed During Treatment Implementation.

Site	Alt. B (Unit)	Alt. C (Unit)	Alt. D (Unit)
Big Tree Interpretive Site	O	-	O
Gotchen Creek Guard Station	Z	Z	Z
Cherry Flats Dispersed Campsite	M	M	M
Gotchen Creek Trail #40	Q	-	Q
Morrison Creek Trail #39	R	R	R
Snipes Trail #11	T	-	T
Wicky Creek Trail (proposed)	M	-	M
Big Tree Trail (proposed)	O, BB	BB	O, BB
Total Sites Affected	**8**	**4**	**8**

Cumulative Effects (10 and 50 Years)

In the long term, treatments implemented around these facilities would reduce hazards from falling snags.

White Salmon River – Recommended Wild and Scenic River

All Alternatives

The segment of the White Salmon River that flows on the boundary of the Gotchen Planning Area has been recommended for "scenic river" designation under the Wild and Scenic Rivers Act (refer to Upper White Salmon River FLEIS, July 7, 1997). Its outstandingly remarkable values include its spring fed hydrology, scenic beauty, and presence of spotted owls. The proposed activities for Gotchen are located further than 1 mile from the river. This is beyond the canyon rim and river's _ mile scenic boundary. There would be no impact to free flowing character or the river's remarkable scenic beauty from any alternative.

SOILS

Issues: Effects on Soil Productivity, Soil Organisms and Soil Biology

A number of the proposed activities could have negative effects on the soil resource; timber harvest, the use of ground-based equipment, prescribed fire and site preparation could result in soil damage and loss of site productivity. Past management activities have already adversely affected soils within portions of the Gotchen Planning Area. The potential effects of the proposed activities on soil productivity are compaction, puddling, displacement, erosion, severe burning and loss of soil organic matter. (Explanations of these processes are noted in the Soils report in the Project file and defined in the Glossary.)

Ground disturbing activity that causes compaction, displacement, severe burning, loss of soil organic matter, or changes in canopy cover may affect soil dwelling organisms. Some of these organisms, called mycorrhizae, profoundly affect forest growth and productivity. Decayed wood can be a major site of the mycorrhizae during the dry portion of the growing season. Logging and site preparation can affect the numbers of species and abundance of soil organisms (Amaranthus et al. 1989).

The Gifford Pinchot National Forest Land and Resource Management Plan, (USDA, 1990) states that no more than 20 percent of an activity area may be compacted, puddled, displaced, or subjected to a severe burn as a result of the activity. Prescribed burning activities must result in less than 10 percent of the activity area rated as severely burned. An activity area is the total area for which ground-disturbing activity is planned and includes the transportation system (including landings) in and directly adjacent to the activity area. Soil Management Guidelines for Gifford Pinchot National Forest, as amended by the Soil Resource Inventory (Wade et. al. 1992), would apply unless on-the- round assessment indicates a change in the guidelines is necessary.

Measurement Method

Activity-area changes in % area with detrimental soil impacts such as: compaction, displacement and burning

Soil Management Objectives

The soil management objectives for the Gotchen Fuels Reduction project are to conserve and maintain soil and water resources. Specifically, management activities are designed to maintain or improve soil physical properties, preserve or build soil organic matter, avoid erosion, and protect soil dwelling organisms related to soil productivity.

Alternative A—No Action

Direct, Indirect and Cumulative Effects

In the No Action alternative, no road rehabilitation or other watershed improvement activities would be accomplished. This alternative would avoid construction of new permanent features on the landscape, such as roads.

No decrease in soil productivity would occur due to additional compaction and displacement, or severe burning. Little or no observable increase in soil productivity or nutrient cycling would be expected. Past detrimental disturbances would be likely to persist in the activity areas, particularly where ground based logging or site preparation occurred and within dispersed recreation areas. Soil would continue to recover 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). Detrimental condition in the activity areas would be limited to less than 20%, and would continue to meet Forest Plan standards.

Non-system roads and landings with detrimental compaction would not likely be subsoiled. In those roads and landings, detrimental soil conditions due to existing compaction would remain.

Recreation and grazing activities would continue, while not creating a significant increase in soil damage (Esteves 2001).

No adverse effects to soil organisms would be expected to occur due to additional compaction and displacement, severe burning, or changes in canopy cover.

Past compaction and displacement are the prominent conditions that affect soil productivity in the area. Puddling and erosion are minimal, and not a foreseeable problem at this time. Effects due to soil dwelling organisms are not predicted to change. These factors, combined with foreseeable soil disturbance in the future, would not hinder attainment of the soil management objectives.

Cumulative effects on the soil resource of past and present/on-going actions combined with the existing conditions in the watershed would be minor in extent. Detrimental conditions in the activity areas would be limited to less than 20%, and would continue to meet Forest Plan standards. Approximately 2 acres of soils would be dedicated to the National Forest trails system and associated facilities, not a significant percentage of the Gotchen Planning Area.

Soils would continue to recover from the effects of past disturbances through natural processes such as biological activity and weathering. Recreation and grazing activities would continue, while not creating a significant increase in soil damage.

The extent and timing of the "reasonably foreseeable actions" have not been developed adequately to quantify effects to the soil resource and soil dwelling organisms.

Populations of soil dwelling organisms may be reduced in the event of a stand-replacing fire over most of the area. A complete consumption of the litter and duff layer has the highest potential to impact these populations. Organisms can re-colonize severely burned areas when conditions become favorable. Areas with the smallest, least intense burning of the litter and duff layer would likely experience the quickest recovery of soil dwelling organism populations.

Heat from fires can kill nitrifying bacteria. Some soil microflora can be affected by heat from burning to a greater degree in wet soil than in dry soil. Mortality from heat is greatest when litter and duff layers are completely consumed by fire.

A report by Wells, et al., [1979] advises that uncontrolled burning of the forest floor can affect soil organic matter and the physical, chemical, and biological properties of the soil that are dependent upon soil organic matter. Intense fires are believed to destroy more soil organic matter, volatilize excessive amounts of nitrogen and other nutrients, disrupt soil structure, and may induce water repellency. In comparison, low intensity fires such as prescribed burns may facilitate cycling of some nutrients and help control plant pathogens.

Effects Common to Alternatives B, C, and D

Direct, Indirect and Cumulative Effects

With the implementation of management requirements, mitigation measures, and site-specific Best Management Practices, all of the action alternatives would be consistent with Region 6 standards for soil quality. (Refer to Chapter 2 for applicable soil mitigation measures). Improvements in soil physical properties can be realized where mitigation measures are applied to existing detrimental soil conditions.

- The probable extent of detrimental disturbance is expected to be less than the Forest Plan Standard and Guideline of 20 percent in any of the planned activity areas.
- Visible soil erosion would be limited to areas of 100 square feet.
- Prescribed burning activities would result in less than 10 percent of the activity area rated as severely burned.
- Puddling and erosion associated with high soil moisture levels are not expected to be significant.
- Ground cover requirements would not likely be exceeded for underburn plantations because enough unburned slash would remain, and an annual drop of conifer needles would soon replenish the burned areas.

Soil Productivity

Changes in soil productivity are a function of the type, timing, and location of disturbances, and of soil properties in the disturbed areas. The proposed management activities would cause physical soil disturbances that cannot be avoided. Minor amounts would actually qualify as detrimental soil disturbance. Increases in amounts of detrimental soil conditions and erosion would be minimized through unit design that utilizes the transportation system and existing skid trails and landings. Constraints and mitigation measures such as requiring the use of existing roads and skid trails (Mitigation Measure S3, Chapter 2 and rehabilitation of any excesses by subsoiling (Mitigation Measure S6, Chapter 2), would keep the impacts below the threshold established by Standards and Guidelines. Losses in soil productivity due to soil disturbing activities would be limited to permanent features of the transportation system such the system roads, non-system roads, landings and skid trails that are left for future entries. Direct effects due to soil disturbing activity would occur on-site and affect only the area where they occur. Any off-site effects, such as sedimentation to streams, would occur some time after or some distance away from the disturbance to soil. Due to funding limitations, existing skid trails or skid roads that are not utilized by this project would not likely be restored in this project.

Effects to the soil resource due to recreation and grazing activities are the same as the No Action alternative.

These prescriptions place a more rigorous standard on soil management than the existing standards and guidelines. The new activities are designed to not exceed detrimental soil conditions on more than 20 percent of an activity area. The degree or intensity of soil productivity losses is variable depending on the nature of the impacting mechanism. Losses in the soil condition and soil productivity associated with permanent features of the transportation system, including system roads, temporary roads and landings, are essentially permanent (lasting longer than 50 years). Restoration by subsoiling, fertilization, and revegetation would initiate and accelerate recovery of productivity, but is unlikely to return the soil to its original condition and productivity in the short term.

Prescribed Burning

Impacts from severe burning would be minimized by limiting prescribed burning to periods when soil and duff moisture is sufficient to prevent consumption of more than about ten percent of the duff layer. This should also prevent large down wood from being consumed. Fertilizing and seeding areas where piles have been burned would accelerate recovery of vegetation and nutrient cycling to those areas. Effects to the soil resource in the event of a stand replacing wildfire are the same as described in No Action Alternative.

No changes in soil density are expected. Soil organic matter loss would be limited to severely burned areas, where changes may also occur in soil structure and pore space within a few centimeters of the surface (Childs et al. 1989). Burning would reduce

organic matter from the surface and redistribute it into the soil profile (Evers et al. 1994).

Implementation of Mitigation Measure S7 (preservation of litter and duff during prescribed burning) would limit losses in nutrients and soil organic matter. This is appropriate for Soil Mapping Units 93 and 1795. In order to protect soil and litter dwelling organisms, the Forest Plan requires site treatment practices and harvest methods on Matrix lands, particularly the use of fire and pesticides be modified to minimize soil and litter disturbance.

Slash Burning

Burning in slash piles would likely result in localized severe burning, which is believed to result in localized nutrient loss through volatilization and perhaps from accelerated leaching of nutrients (Wells 1970) that are important to these soils. Water-repellency can also be induced which may lead to increased erosion. Invasive species of annual vegetation, the scattered pattern and small size of severely burned areas, the prevalence of gentle slopes, and Mitigation Measure S8 (seeding and fertilizing under machine piled slash), would combine to dissipate runoff and accelerate recovery of soil organic matter and nutrients.

Severely burned areas from slash piles burns in the Gotchen Planning Area would be expected to be relatively small and have a scattered pattern, which would dissipate adverse effects to the area. Hand piles would not be expected to result in changes in soil density. Changes in soil physical properties due to machine piling would depend on the number of passes and turns that occur. Variable increases in soil density and topsoil displacement would likely occur under the machine tracks. Mitigation measures for the extent of these areas are sufficient to reduce a significant impact to soil physical properties. Detrimentally burned soil from slash burning has been estimated to be less than 0.2 percent of activity areas (Harm 2003, Nielsen 2003). Soil organic matter losses would vary with both hand and machine piling, but would most likely be more extreme (up to 50%) in slash piled by machines (Childs et al. 1989).

Implementing Mitigation Measure S8 would limit losses in nutrients and soil organic matter, and is appropriate for Soil Mapping Units 93 and 1795. Mitigation Measure S4 (operation of mechanize equipment while piling slash) would limit the extent of soil damage due to mechanized slash piling and is appropriate for Soil Mapping Units 3, 93, 95, 1594, and 1795.

Road Decommissioning

The decommissioning of approximately 6 miles of the transportation system would result in a net reduction in area dedicated to the transportation system. Discussion of the effects of not implementing the decommission of these roads are found in Alternative C'. Improvements would be locally concentrated and limited to areas where soils were restored.

Subsoiling, or tilling deeply compacted soils, is believed to increase the rate of recovery of soil productivity. Improvements in physical properties, mainly soil

compaction, may be recovered to initial conditions, such that they are managed to maintain soil productivity (Childs et al. 1989).

Improvements in soil physical properties should accelerate recovery of soil productivity. These would be locally concentrated and limited to areas where soils were restored.

Soil Organisms and Soil Biology

Ground disturbing activities that cause compaction, displacement, severe burning, or changes in canopy cover may affect soil dwelling organisms. Removing plant canopy or the soil litter layer can affect the diurnal temperature regime because shading and the insulating effects have been lost (Wells et. al. 1979).

Limiting the degree and extent of the effects listed above provides protection for the majority of the populations of soil organisms within the activity areas. The following mitigation measures are designed to protect the soil, maintain organic matter, and encourage rapid revegetation of native species in order to conserve soil organisms and facilitate their re-colonization: S3, S4, S6, S7 and S8.

Silvicultural Treatments – Nutrient Cycling and Organic Matter

Logging slash is an important source of organic matter that supplies sites with nutrients and reduces the potential for surface erosion. Harvesting only the bole of trees does not greatly deplete nutrients; losses tend to be associated with whole tree harvest and short rotations. Neither whole tree harvest nor short rotations would be employed in this project.

To help maintain soil organic matter and accomplish a soil management objective, mitigation measures specify that slash would be left on the ground and placed onto subsoiled skid trails. This would also serve to provide for populations of soil dwelling organisms that could affect soil productivity.

Puddling and Erosion

Effects due to puddling and erosion are not expected to be significant. The extent would be limited due to the implementation of mitigation measures, the design of the proposed activities, and the relatively low potential for erosion in these soils.

Cumulative Effects

The action alternatives would not be expected to create any irreversible commitments of the soil resource. No detrimental cumulative effects to soil productivity would expected from construction of temporary roads and landings because they would be subsoiled, per Mitigation Measure S6. This mitigation measure is most appropriate for Soil Mapping Units 93, 95, 1594, and 1795. Conditions in disturbed areas would have improved where restored by subsoiling, fertilization and revegetation.

The combined effects of these mitigation activities would cumulatively improve conditions for populations of soil dwelling organisms in the Gotchen Planning Area,

mostly due to restoration activity, i.e. subsoiling or obliterating compacted roads. The extent and timing of the "reasonably foreseeable actions" have not been developed adequately to quantify effects to soil dwelling organisms. Assuming adherence to standards and guidelines, implementation of Best Management Practices, and proper use of mitigation measures to protect soil dwelling organisms, future actions would not be detrimental to populations of soil dwelling organisms.

Populations of soil dwelling organisms would continue to recover naturally. Follow up treatments would not involve ground-based equipment, avoiding effects due to further compaction or displacement. Restoration by subsoiling, fertilization and revegetation, intended to accelerate recovery of soil productivity, would improve conditions in disturbed areas. The organisms could then re-colonize the disturbed areas when conditions become favorable.

Design of Unit R (the underburn plantations) would not likely damage more than ten percent of each unit's area due to severe burning. If herbaceous, grassy and shrub vegetation respond favorably to prescribed burning, this would provide a food source for certain soil dwelling organisms. However, the dominant species may change with the localized conditions (Wells 1979). For most species, an increase in vegetation would likely accelerate recovery.

Areas with repeated prescribed burns may experience a relatively higher loss in nitrogen through volatilization. Prescribed burns that remove less than 5 percent of the duff layer and conserve down wood would likely cause little or no soil damage. The area's history of frequent wildfires was adapted to repeated cycles of nutrient losses and would be less likely to be affected by prescribed burning.

Table 4-34. Acres of repeated prescribed burns within the same area.

Alternative	Acres with 2 Rx Burns in a Unit	Acres with 1 Rx Burn in a Unit
A	0	0
B	859	1296
C	797	2052
D	827	1296

Alternative B

Direct and Indirect and Cumulative Effects

Soil Productivity

Approximately 1449 acres would be treated using ground-based equipment; 346 of those acres would also be underburned. An additional 197 acres would be hand piled and burned, and 38 acres would be underburned. Underburning is scheduled for a total of up to 2155 acres within a period of 30 years; some of those acres more than once (Table 4-33). Approximately 5.3 acres of new temporary roads and landings would be constructed in the Shaded Fuelbreaks and Unit X to allow access by larger equipment that would remove the merchantable logs. The new temporary roads

accommodate the Visual Quality Objectives along Forest Roads 80 and 82; landings would not be allowed on these roads.

Losses in soil productivity may occur due to additional compaction and displacement, or severe burning. This would be mostly local to areas left with excessive soil compaction, removal of all soil organic matter, and topsoil loss. The extent and distribution of these losses are expected to be minor and would not likely affect soil productivity in the activity areas. Other possible effects to these areas include a situation in which short-term conditions required for survival are not met (Childs et al. 1989). Reduced soil productivity is an issue for Units N, O, and W due to the amount of soil already in a detrimental condition (Table 23, Chapter 3, Existing Detrimental Soil Conditions – Alternatives B and D). The extent of detrimental soil conditions increases the concern over cumulative effects on the soil resource. Unit O is slated for new skid road construction that could result in exceeding standards and guidelines for detrimental soil conditions if these roads are not restored subsequent to use.

Increases in amounts of other soil damage, such as erosion, are expected to be minor with Best Management Practices, mitigation measures, and treatment design.

No significant change in soil productivity would occur with Units R, V, Y, Z, AA and BB, where no ground equipment would operate.

Table 4-35. Predicted Net Increase in Soil Disturbance – Units in Alternative B.

Unit	Unit Area (Acres)	Existing Detrimental Condition, (%)	Proposed Temp Roads and Landings (Acres)	Predicted Soil Disturbance[6] (%)	Net Increase in Soil Disturbance (%)
J	34	4.2	1.6	8.9%	4.7%
N	75	15.0	1.3	16.7%	1.7%
O	51	18.3	0.8	19.8%	1.5%
Q	44	12.5	0.3	13.1%	0.6%
S	34	12.4	0.1	12.7%	0.3%
T	82	4.3	6.0	11.6%	7.3%
U	146	4.7	10.9	12.2%	7.5%
X	51	0.3	1.5	3.2%	2.9%

The extent of soil disturbance due to ground-based equipment, summarized by Table 4-35 should not be interpreted as the extent of future detrimental conditions. Mitigation measures specify restoration of proposed and some existing roads.

Avoidance of the steep volcanic cinder cone in Units C, T, and U by ground-based equipment should minimize displacement of the loose tephra-dominated soils on the slope. Constraints and mitigation measures such as subsoiling, revegetation and fertilization are intended to restore productivity, further reducing the extent of impacts. Ground based equipment on steep slopes would have a higher displacement potential.

[6] Includes use of both new and existing skid roads.

Because some root growth by grand fir has made progress with breaking up compacted skid roads, refraining from subsoiling these skid roads where significant growth exists is recommended. The recovery of soils may not be great enough in some of these cases to warrant the economic cost of doing the work. Thus, dense sapling patches of Unit F need not be subsoiled unless compacted by ground-based equipment. Mitigation Measure S6 specifies subsoiling, and notes these exceptions.

Factors to consider with slash burning in the Gotchen Planning Area include higher elevations, loose thin duff layers, relatively dry forest, southwest aspect, and coarse textured soils. All of those factors apply in parts of the highest elevation units S, T, U, and X. Where they occupy Soil Mapping Unit 95, some loss of surface materials with possible fertility losses may occur. Units S, T, and U are scheduled for two prescribed burns (Table 1) and are more vulnerable than the rest of the units to permanent damage. Thus if burning conditions do not favor adherence to meeting Forest Plan standards for severe burning in these units, permanent damage to the soils may occur. Mitigation measures and established standards and guidelines are sufficient to prevent lasting effects to burned soils in these units. Significant productivity losses in Units S, T, U and X are expected to be minor and would not likely affect soil productivity in these activity areas.

Alternatives C, C-1

Direct, Indirect, Cumulative Effects

Soil Productivity

Approximately 2142 acres would be treated using ground-based equipment; 586 of those acres would also be underburned. An additional 40 acres would be hand pile and burned, and 38 acres underburned. Underburning is scheduled for a total of up to 2849 acres within a period of 30 years; some of those acres more than once (Table 4-34).The new temporary roads accommodate the Visual Quality Objectives along Forest Road 80; landing are not allowed on this road.

Other than the differences in layout from Alternative B (listed in Table 4-36 Chapter 3, Existing Detrimental Soil Conditions), Units AA through FF in Alternatives C and C-1 would be treated using ground-based equipment. Both of these alternatives would avoid construction of new permanent features on the landscape, such as roads.

Losses in soil productivity may occur due to additional compaction and displacement, or severe burning. This would be mostly local to areas left with excessive soil compaction, removal of all soil organic matter, and topsoil loss. Other possible effects to these areas include a situation in which short-term conditions required for survival are not met (Childs et al. 1989). Constraints and mitigation measures such as requiring the use of existing roads and skid trails and rehabilitation of any excesses by subsoiling – Mitigation Measures S3 and S6 – should keep the impacts below the threshold established by standards and guidelines. Additional soil damage is expected to be minor with Best Management Practices, mitigation measures, and prescribed logging system design.

Table 4-36. Predicted Net Increase in Soil Disturbance – Units in Alternative C.

Unit	Acres	Proposed Temp Roads and Landings (Acres)	Existing Detrimental Condition, (%)	Predicted Soil Disturbance[7] (%)	Net Increase in Soil Disturbance (%)
J	34	1.6	4.2	8.9%	4.7%
X	51	1.5	0.3	3.2%	2.9%

The extent of soil disturbance due to ground-based equipment, summarized by Table X-4-36 should not be interpreted as the extent of future detrimental conditions. Mitigation measures specify restoration of proposed and some existing roads. The net increase in soil disturbance is predicted in Units J and X, where more landings and road would be constructed than already exist.

No significant change would occur with Units R and Z, where no ground equipment would operate. Reduced soil productivity is an issue for Unit FF because of the amount of soil already in a detrimental condition. Additional soil damage would be expected to be minor with Best Management Practices, mitigation measures, and prescribed logging system design.

Because some root growth by grand fir has made progress with breaking up compacted skid roads, refraining from subsoiling these skid roads where significant growth exists is recommended. The recovery of soils may not be great enough in some of these cases to warrant the economic cost of doing the work. Thus, dense sapling patches of Units F, AA & BB need not be subsoiled unless compacted by ground-based equipment. Mitigation Measure S6 specifies subsoiling, and notes these exceptions.

Factors to consider with slash burning in the Gotchen Planning Area include higher elevations, loose thin duff layers, relatively dry forest, southwest aspect, and coarse textured soils. All of those factors apply in parts of the highest elevation units S and X. Where they occupy Soil Mapping Unit 95, some loss of surface materials with possible fertility losses may occur. Units S, T, and U are scheduled for two prescribed burns (Table 1) and would be more vulnerable than the rest of the units to permanent damage. Thus if burning conditions do not favor adherence to meeting Forest Plan standards for severe burning in these units, permanent damage to the soils may occur. Mitigation measures and established standards and guidelines are sufficient to prevent lasting effects to burned soils in these units. Significant productivity losses in Units S and X would be expected to be minor and would not likely affect soil productivity in these activity areas.

Alternative C-1

Without the decommissioning of approximately 6 miles of the transportation system there would be no net increase or reduction in area dedicated to the transportation system. National Forest System Roads constitute a conscious decision to dedicate areas to the transportation system, and soils are essentially in a non-productive condition.

[7] Includes use of both new and existing skid roads.

Choosing not to decommission these roads would not hinder soil management objectives in the Gotchen Planning Area, and management direction concerning protection of the soil resource would not be violated.

Alternative D

Direct, Indirect, Cumulative Effects

Approximately 1416 acres would be treated using ground-based equipment; 320 of those acres would also be underburned. An additional 191 acres would be hand pile and burned, and 38 acres underburned. Underburning is scheduled for a total of up to 2123 acres within a period of 30 years; some of those acres more than once (Table 34). Approximately 0.3 acres of new temporary roads and landings would be constructed in the Unit X.

Compared to Alternative B, there would be no major differences in the effects to the soil resource in the short or long-term. Differences in the extent of prescribed burning are listed in Table 4-34. Differences in the proposed temporary road construction/reconstruction are listed below. The extent of new construction does not pose a risk of reaching the 20% limit set by standards and guidelines for detrimental conditions.

Table 4-37. Predicted Net Increase in Soil Disturbance – Units in Alternative D.

Unit	Unit Area (Acres)	Existing Detrimental Condition, (%)	Proposed Temp Roads and Landings (Acres)	Predicted Soil Disturbance[8] (%)	Net Increase in Soil Disturbance (%)
J	34	4.2	1.6	4.7%	0.5%
T	82	4.0	6.0	7.3%	3.3%
U	146	4.7	10.9	7.5%	3.0%
X	51	0.3	1.5	2.7%	2.9%

The extent of soil disturbance due to ground-based equipment, summarized by Table 4-37 should not be interpreted as the extent of future detrimental conditions. Mitigation measures specify restoration of proposed and some existing roads.

HYDROLOGY

Issue: Peak Flows and Water Quality

The issue is how proposed changes in forest cover and road density combine with the effects of past harvest and road activities to affect peak flows and water quality in streams draining the Gotchen Planning Area, and in the White Salmon River.

Forest cover throughout a substantial portion of the Gotchen Planning Area has been affected by past timber cutting and the exclusion of fire. In addition, road densities are high across the Gotchen Planning Area. The proposed activities would result in

[8] Includes use of both new and existing skid roads.

additional reductions in forest cover in treated areas, and in reduced or maintained road density levels. The combination of changes in forest cover and road density could affect snow accumulation and snowmelt in the area, and could affect routing of runoff through the watershed. These hydrologic modifications could alter peak streamflows as well as water quality in streams in the Gotchen Planning Area, and in the White Salmon River.

Measurement Methods

Acres of modified forest canopy

Degree of change in forest canopy

Final canopy closure of forest canopy

Changes in Road Density

Connectivity of Gotchen streams with the White Salmon River

In addition, this section of the report would deal with each of the Aquatic Conservation Strategy Objectives (ACSO's). The ACSO's have been grouped into four topical areas for analysis: 1) Watershed Conditions and Hydrology; 2) Riparian Reserves; 3) Stream Channels; and 4) Water Quality. The ACSO's that are covered under each of these four topical areas are listed next to the heading for that section

Watershed Conditions and Hydrology—ACSO's #6,7

Peak Flows

Scale of Analysis

The aquatics analysis is done at a range of scales to ensure that effects at any particular scale are not overlooked. Stand or site-scale descriptions and processes are described where appropriate, and direct or indirect effects occurring at that scale are documented. Stand-scale effects are aggregated to the 6th field subwatershed scale to provide subwatershed context and further effects analysis at that scale.

The 6th field subwatershed was selected as the primary scale for analyzing the cumulative effects of this project because this scale offers the best resolution of effects in a watershed context. In addition, the 6th field subwatershed is the smallest scale that integrates all (or a very large majority) of the proposed activities. At larger scales (i.e. at the 5th field watershed scale), the effects of the Gotchen project would be entirely lost due to the relatively small size of the treatment areas when compared to the entire White Salmon River watershed. Nevertheless, some effort would be made to address the effects at this scale because public comment usually includes questions about the effects at larger scales. See the Hydrology section of Chapter 3 for maps of the White Salmon River watershed and the 6th field subwatersheds within it.

(Note: Since the time of the most recent Watershed Analysis of the Upper White Salmon River (which contains the Gotchen planning area), the Gifford Pinchot National Forest has redefined 5th field watersheds and 6th field subwatersheds across the Forest. This has been done in a joint effort with other land management and regulatory agencies with the intent of making watershed and subwatershed sizes and delineative criteria consistent across agencies. As a result of this process, the 6th field subwatersheds that were used for analysis in the Upper White Salmon River Watershed Analysis (USDA 1998) would not be the same areas as those used in this and subsequent analyses.)

Processes and Analysis Description

The timing and magnitude of both peak and low streamflows can be affected by forest harvest, thinning, or other vegetation management practices. Vegetation manipulation can affect hydrologic processes at the stand- scale, including changes in the interception of precipitation, changes in snow accumulation, and changes in rates and timing of snowmelt. These hydrologic changes brought about by vegetation modification can affect the amount and timing of water that is available for runoff from a site, and thus can cumulatively affect streamflows. The degree to which these stand- scale changes are manifested at the subwatershed scale in terms of changes in streamflow is dependent upon a number of factors related to both the extent and intensity of the forest manipulation, and characteristics of the site and subwatershed.

Importantly, the climatic characteristics of the drainage, as a result of its location and elevation, are fundamental to the types of responses likely to be experienced. In addition, physical traits inherent to the watershed largely control the mechanics of water movement from hillslopes to the stream channels, and ultimately to the watershed outlet. Although these inherent characteristics of the watershed are of overriding importance to watershed processes and functioning, they can be influenced by land management activities including both vegetation management and road management.

The Aggregate Recovery Percentage (ARP) is one analysis tool used to cumulate stand-scale vegetative conditions to the subwatershed scale. The ARP provides an index of the proportion of a watershed in a "hydrologically mature" condition. As forest cover is removed (such as through forest cutting or stand-replacing fire), the ARP for that watershed is reduced from 100%, reflecting the loss in hydrologically mature forest cover. Hydrologic maturity is defined for this purpose in terms of the ability of a forest stand to intercept snow and protect the microclimate at the snow surface.

On the Gifford Pinchot National Forest, Aggregate Recovery Percentages above 75 have generally not been considered to indicate a high risk of negative impacts from increased peak flows (GPNF, 1988). More recent research however, has pointed out that measurable changes in flow can occur at lower disturbance levels (i.e. with higher ARP values) (Jones and Grant, 1996). In particular, when clearcut harvest is combined with high road densities, the combination of increased rates of water available for runoff (from the clearcuts) and a more efficient and expanded drainage network (from the road system) can lead to increased frequency and magnitude of

peak flows. Streamflows most likely to be affected in this way are those that occur in early fall and the more frequent (smaller) peak flow events. The significance of changes in peakflows to stream channels, water quality, and fish habitat are not well described in the literature, in large part because of the high degree of variability of streamflows naturally, and the difficulty in partitioning out effects of flow increases due to forest management from natural flow variability.

Road systems are another factor affecting how watersheds process incoming precipitation, and in this can be important to evaluating potential changes in peak flows. Working in the western Cascades of Oregon, Wemple and others (1996) found that on average, 57% of the road system in the study watershed contributed ditch flow to active stream channels during periods of runoff. This illustrates how roads can be important avenues in re-routing water, and delivering it rapidly to streams. The change in flow pathways brought about by roads is important because if water is moved more rapidly from hillslopes to stream channels, the shape, size, and timing of runoff peaks can be modified. Evaluations of changes in road density and drainage network density are two methods of indexing the effect of individual road proposals on the cumulative effect of roads at the subwatershed or watershed scale.

This assessment uses the analysis tools described above in conjunction with information specific to the inherent conditions of the Gotchen Planning Area to arrive at a determination of the effects of each alternative on peak streamflows.

Alternative Summaries

Alternative A proposes no forest cover modification or road treatments. Alternatives B, C, and D propose to modify forest cover in a number of stands within the Gotchen Planning Area, to construct or reconstruct small segments of temporary road totaling 7.5 miles, and to treat some 25 miles of existing road by either closing or decommissioning. Alternative C^{-1} is identical to Alternative C, except that it includes no road closures or decommissions. summarizes the acres of vegetative treatment and miles of road treatment by subwatershed.

Table 4-38. Summary of vegetative and road decommission treatments by subwatershed.

	Alternative A		Alternative B		Alternative C [Alternative C^{1}]		Alternative D	
6th Field Subwatershed	**Upper White Salmon River**	**Gotchen Creek**	**Upper White Salmon River**	**Gotchen Creek**	**Upper White Salmon River**	**Gotchen Creek**	**Upper White Salmon River**	**Gotchen Creek**
Effective Treatment Acres*	0	0	34	1551	34	2191	34	1611
Hydrologically Modified Acres**	0	0	34	938	34	925	32	611
Hydrologically Converted Acres***	0	0	0	97	0	97	0	97
Roads Built#/ Roads Decommissioned##	0/0.6	0/5.7	0/0.6	3.1/5.7	0/0.6 [0/0]	0.4/5.7 [0/0]	0/0.6	0.2/5.7

* Effective Treatment Acres: Calculated as (Total unit acres)*(% of unit treated).
** Hydrologically Modified Acres: Acres in which the proposed treatment changes the stand canopy cover by from 10% to 30%. These acres are a subset of the acres shown as Effective Treatment Acres.
***Hydrologically Converted Acres: Acres in which the stand canopy cover changes by 30% or more, and in which final canopy closure is 40% or less. These stands are considered to be hydrologically converted in that they shift from stands in which snow interception processes are dominant, to stands in which snow accumulation on the ground is the dominant process. These acres are a subset of the acres shown as Effective Treatment Acres.
"Roads Built" refers to miles of new temporary roads to be constructed.
##Road decommissions are not proposed in Alternative C[1].

Alternatives B, C and D include thinning treatments that would modify the forest canopy to different levels. Table 4-39 summarizes the current canopy cover and projected canopy cover for each of the units proposed for treatment.

Table 4-39. Changes in canopy cover by unit and alternative.

	Alternative A			Alternative B			Alternative C			Alternative D		
UNITS	CCC	RCC	ΔCC	CCC	RCC	ΔCC	CCC	RCC	ΔCC	CCC	RCC	ΔCC
A	35	35	0	35	15	20	35	15	20	35	15	20
B	70	70	0	70	30	40	70	30	40	70	30	40
C	55	55	0	55	40	15	55	40	15	55	40	15
D	60	60	0	60	30	30	60	30	30	60	30	30
E	60	60	0	60	50	10	60	50	10	60	50	10
F	60	60	0	60	40	20	60	40	20	60	40	20
G	70	70	0	70	50	20	70	50	20	70	50	20
H	<45	<45	0	<45	<45	0	<45	<45	0	<45	<45	0
I	45	45	0	45	35	10	45	35	10	45	40	5
J	<40	<40	0	<40	<40	0	<40	<40	0	<40	<40	0
K	<40	<40	0	<40	<40	0	<40	<40	0	<40	<40	0
L	<40	<40	0	<40	<40	0	<40	<40	0	<40	<40	0
M	80	80	0	80	60	20	80	60	20	80	70	10
N	>50	>50	0	>50	40	>10	>50	NT	0	>50	>50	0
O	>50	>50	0	>50	40	>10	>50	NT	0	>50	>50	0
P	>50	>50	0	>50	40	>10	>50	NT	0	>50	>50	0
Q	>50	>50	0	>50	50	0	>50	NT	0	>50	>50	0
R	55	55	0	55	30	25	55	30	25	55	30	25
S	>50	>50	0	>50	40	>10	>50	40	>10	>50	>50	0
T	>50	>50	0	>50	40	>10	>50	NT	0	>50	>50	0
U	>50	>50	0	>50	40	>10	>50	NT	0	>50	>50	0
V	>50	>50	0	>50	40	>10	>50	NT	0	>50	NT	0
W	>50	>50	0	>50	40	>10	>50	NT	0	>50	>50	0
X	80-90	80-90	0	80-90	40	40-50	80-90	40	40-50	80-90	40	40-50
Y	70	70	0	70	>40	<30	70	>40	<30	70	>40	<30
Z	20	20	0	20	20	0	20	20	0	20	20	0
AA	55	55	0	55	55	0	55	55	0	55	55	0
BB	55	55	0	55	55	0	55	55	0	55	55	0
CC	?	NC	0	?	NT	0	?	NC	0	?	NT	0
DD	?	NC	0	?	NT	0	?	NC	0	?	NT	0
EE	?	NC	0	?	NT	0	?	>40	?	?	NT	0
FF	?	NC	0	?	NT	0	?	>40	?	?	NT	0

CCC: Current Canopy Cover
RCC: Resultant Canopy Cover
ΔCC: Change in Canopy Cover
NT: No Treatment
NC: No Change
? = No Data

Alternative A—No Action

Direct, Indirect, and Cumulative Effects (1-5 years)

Vegetative conditions would not be significantly changed in the short term, except as they change in response to the continued defoliation and disease, or other unplanned

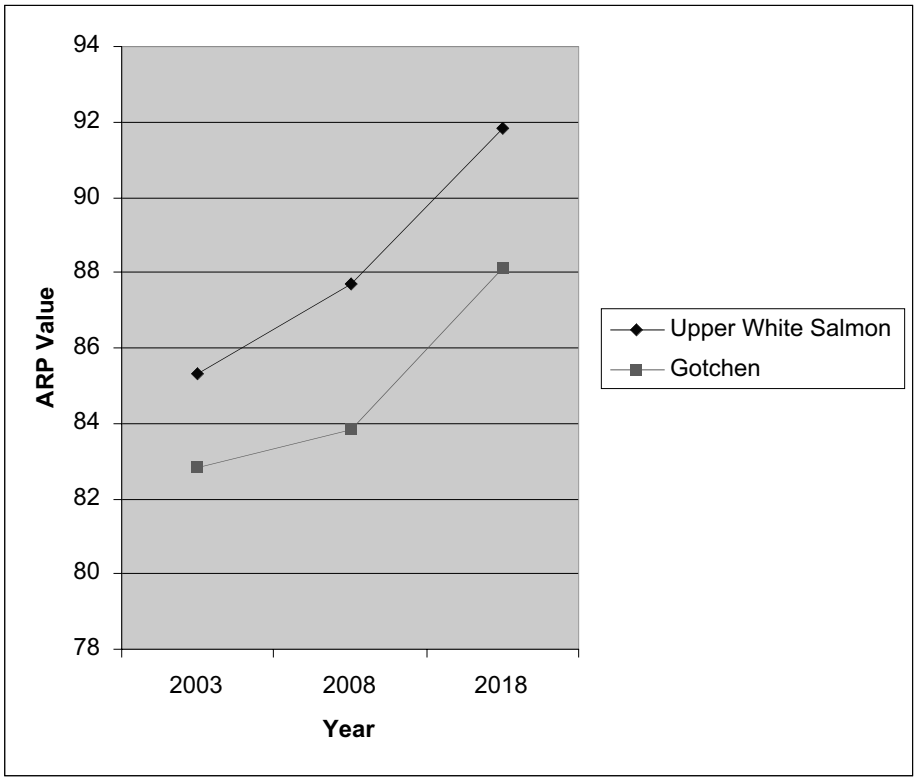
disturbance such as wildfire. Current rates of snow interception and accumulation would continue at approximately what they are today. Over time, if the forest is left untreated, canopy density would change as a result of continued defoliation, loss of standing dead and dying trees, as well as from regeneration of young trees. As these processes occur, snow interception in the forest canopy and accumulations on the forest floor would also change in response to the change in forest canopy cover. If a large-scale wildfire were to occur, canopy cover would become significantly lower across the affected area, and snow interception would be dramatically lessened in favor of increased snow accumulation on the ground.

Microclimate and snowmelt rates would not be affected in the immediate short term, since there would be no change in canopy density or forest cover. The untreated forest would continue to experience changes in forest canopy density through natural disturbance processes and regeneration. These changes would affect microclimate, but because we know very little about the rate or direction of change in the canopy density, projections about how microclimate might change are as yet undetermined. However, in the event of a stand-replacing fire that covers a substantial portion of the Gotchen Planning Area, microclimates could be dramatically shifted, as the cover provided by the forest canopy is lost. Under this scenario, both snow accumulations and subsequent snowmelt rates would be increased across the affected area. Those areas that lost canopy cover would be expected to generate more water for runoff, particularly during rain-on-snow type conditions, but also potentially during early spring melt conditions.

At the subwatershed scale, Aggregate Recovery Percentages would not be directly changed by the implementation of this alternative. Current ARP values of 83 in the Gotchen Creek subwatershed, and 85 in the Upper White Salmon River subwatershed would remain as they are. Over time, ARP levels would continue to increase as a result of the continued development of young stands in the subwatershed. However, it is possible that the insect and disease infestations would delay that recovery or slow the rate of recovery.

Figure 4-1 shows the current and expected ARP levels over the next 5 and 15 years if forests were to continue developing and to experience no further disturbance. Although this is not a likely scenario, there are too many different permutations of what might happen to model them all. This simply shows a point of reference from which other scenarios can be run. For cumulative effects considerations, potential outyear treatments, as noted in the Summary of Cumulative Activities Table located in Appendix G, are considered in the analyses. ARP levels would be expected to change as a result of these potential activities, with the amount of change in ARP dependent on the timing, location and specific treatment.

Figure 4-1. Current and projected ARP levels over the next 5 and 15 years within the Gotchen Planning Area (assuming no timber harvest or other forest cover disturbances).



Road densities would not change from their current levels of 2.0 miles per square mile (mi/mi^2) in the Gotchen Creek subwatershed, and 2.5 (mi/mi^2) in the Upper White Salmon River subwatershed.

With no change in the stand-level conditions, and no change at the subwatershed scale, there would be no expected changes to peak streamflows as a direct result of implementing this alternative. However, because this alternative would not take actions to reduce the threat of a potential wildfire in the Gotchen Planning Area, there may be an indirect risk of increased peak streamflows in the event that a large portion of the Gotchen Planning Area were to be burned by a wildfire.

The magnitude of change in peak streamflows that would occur as a result of fire-induced loss of forest cover in the Gotchen watershed is a function of a number of factors related to the fire itself, the types of precipitation events following the event, and the responsiveness of the watershed. A number of characteristics of the Gotchen Creek subwatershed suggest that increases in peak streamflows here—were they to occur—would be considerably smaller than they might in other drainages. In summary, these key characteristics include: 1) precipitation volumes and intensity in this drainage are relatively low (i.e. only about 50% of the volume and intensity of precipitation measured in the Wind River watershed); 2) primary runoff pathways in the Gotchen Planning Area appear to be through the subsurface (so transmission of water is slower than in watersheds with a more well-developed surface stream network); and 3) there is little or no evidence of surface water connectivity within

tributaries in the Gotchen Creek subwatershed, and between Gotchen Creek and the White Salmon River. A more in depth discussion of these factors is included in the Hydrology report filed in the Project Record.

As a result of the factors noted above, the potential for significant changes in peak flows in the Gotchen Planning Area as a result of the loss of forest canopy is low under most scenarios. The actual amount of increase in discharge that would result from a large-scale stand-replacing fire is unknown, and would be dependent upon the extent of the fire, and the intensity of the burn. If soils were burned to the degree that they became hydrophobic, overland flow of runoff could occur, and in this scenario could significantly affect peak streamflows. On the other hand, if the fire was less intense, it is likely that much of the increased water made available for runoff at the stand-level (i.e. from the loss of forest cover) would rapidly infiltrate the ground, and have minor effects on streamflow levels.

Alternative B

Direct, Indirect, and Cumulative Effects (1-5 years)

Alternative B includes treatments that would modify the canopy cover on 1,237 acres of forest. This alternative also includes construction of 3.1 miles of temporary road, reconstruction of 4.4 miles of road, closure of 18.4 miles of road, and decommissioning of 6.3 miles of road.

Forest Treatments

On approximately 1,139 of the forested acres proposed for treatment, canopy cover would be reduced by less than 30%, and another 98 acres would have canopy cover changes of 30% or more. Although the treatments resulting in canopy cover changes of less than 30% would have some effect on snow interception and retention in the forest canopy, the effect would be relatively small. However, once the change in canopy cover begins to reach and exceed 30%, the effect is considered to be of greater importance to both snow interception and to microclimate

It is important to note that most of the stands in which canopy cover is modified by 30% or more are also stands in which the proposed treatment converts the canopy cover to an actual level of less than 40%. Stands with canopy cover of less than 40% probably tend to function more similar to openings than to fully stocked forest stands in terms of their capacity for snow interception and retention, and in terms of their ability to create and maintain a microclimate that differs significantly from that of its surroundings.

In summary, the 98 acres of proposed treatment resulting in canopy cover changes of 30% or more (units B, D, and X) all lie in the Gotchen Creek subwatershed. The proposed treatments would allow for increased snow accumulation in those stands, and increased rates of snowmelt both during rain-on-snow conditions and during periods of spring snowmelt.

The 1,139 acres of proposed treatment that result in canopy cover changes of less than 30% are largely within the Gotchen Creek subwatershed (just 34 acres of these treatments would occur in the Upper White Salmon River subwatershed). The proposed treatment of these stands would be expected to have some effect on rates of snow interception and retention, but probably less effect on changes to microclimate within those stands. As a result, snow accumulation on the ground may be incrementally increased in these 1,139 acres of treatment, but snowmelt rates would probably be unaffected or changed to a negligible degree.

Cumulatively, the changes described in the previous two paragraphs hydrologically convert less than 1% of the forest stands in the Gotchen Creek and Upper White Salmon River subwatersheds to an unrecovered condition, and as such have no effect on the ARP levels for those drainages. As described above, most of the proposed treatments have only minor effects to forest canopies, and consequently hydrologic processes within stands and across the subwatershed are maintained.

Roads

When the road treatments are included, watershed conditions are further affected by the construction of 3.1 miles of temporary road, the reconstruction of 4.4 miles of existing road, and the decommissioning of approximately 6.3 miles of road. The roads proposed for reconstruction consist of old roads that have varying levels of vegetation encroachment. The new temporary roads consist of short spurs into the Shaded Fuelbreaks. None of the newly constructed temporary roads, or the reconstructed roads would require stream crossings, pass through Riparian Reserves, or require culverts. As a result, there would be no direct hydrologic link between these roads and the drainage network, and no cumulative effect to streamflows from construction or reconstruction of these roads. As temporary roads, these roads would be built and decommissioned during implementation of the Gotchen project, and as such their persistence on the landscape would be limited.

The decommissioning of 6.3 miles of road would be expected to have beneficial effects to on-site drainage issues including improved water infiltration and reduced overland flow during precipitation or snowmelt periods. Most of the roads to be decommissioned have no stream crossings, and only minor cutslopes, so there would be little potential for improvement in existing drainage network densities or modification of drainage pathways. Road 8225-150 is the exception, having several stream crossings and clear evidence of flow re-routing and modification. Elimination of this road would improve on-site drainage conditions, and would provide incremental improvement to subwatershed-scale hydrologic function.

With approximately 87 miles of existing road in the Gotchen Creek subwatershed, and 77 miles in the Upper White Salmon River subwatershed, this alternative proposes a reduction of approximately 7% of the roads in Gotchen, and less than 1% of the roads in the Upper White Salmon River subwatershed (temporary roads are not included in these calculations because of their limited persistence. Road densities would be reduced by 0.1 miles per square mile in Gotchen, and less than 0.1 miles per

square mile in the Upper White Salmon River subwatershed. Table 4-3 summarizes the effects of this alternative on road density.

Table 4-40. Current and projected road densities by subwatershed, Alternative B.

Subwatersheds	Current Road Density (mi./square mi.)	Proposed Road Density (mi./square mi.)
Gotchen Creek	2.0	1.9
Upper White Salmon River	2.5	2.5

Combined Effects of Forest and Road Treatments

The effects of this alternative are expected to be undetectable at the 6th field subwatershed scale in terms of their effect on peak streamflows. In essence, the lack of high intensity precipitation, the relative lack of connectivity (and even presence of stream channels) throughout much of the subwatershed, and the exceptionally high rates of infiltration and subsurface water movement, make the Gotchen Creek subwatershed relatively unresponsive to changes in forest cover with respect to changes in peak streamflows. While most watersheds tend to concentrate incident precipitation in stream channels, routing that water to the watershed outlet, the Gotchen Creek subwatershed shows less concentration of water, and a more dispersed mode of transporting water from the system.

In addition, because of the limited surface runoff in this area and the relatively gentle slopes, effects of the existing road system on streamflows are presumably very minor if existent. The construction or reconstruction of 7.5 miles of road, decommissioning of 6.3 miles and closure of 18.4 miles would not be expected to affect streamflow levels either positively or negatively.

Alternatives C and C-1

Direct, Indirect, and Cumulative Effects (1-5 years)

Alternative C includes treatments that would modify the canopy cover on 1,114 acres of forest. It includes just 0.4 miles of new temporary road construction, 3.9 miles of road reconstruction, and the same decommissioning and closures proposed in Alternatives B and D. Alternative C-1 proposes the same vegetation treatments as C, but does not include the road decommissioning or closure proposals.

Combined Effects of Forest and Road Treatments

The hydrologic effects of the vegetative and road treatments within Alternative C at both the stand-scale and subwatershed scale would be essentially identical to those described for Alternative B.

The effects of Alternative C1 at the site scale would be identical to those of Alternative C, with the exception that none of the existing roads would be closed or decommissioned. The localized drainage issues associated with the 8225-150 would

not be resolved under this subalternative. Because the existing road system in the Gotchen Creek subwatershed is not seen as exerting a significant influence on the hydrology of Gotchen Creek, the effects of Alternative C-1 are indistinguishable from those of Alternative C at the subwatershed scale.

Alternative D

Direct, Indirect, and Cumulative Effects (1-5 years)

This alternative includes treatments that would modify the canopy cover on 746 acres of forest. It also includes 0.2 miles of new temporary road construction, 3.9 miles of road reconstruction, and the same road closure and decommissioning treatments that are included in Alternatives B and C.

Forest Treatments

In terms of forest treatments, this alternative is nearly identical to Alternative B in terms of the extent of treatment, but under this alternative, only smaller trees would be cut (i.e. cutting would include only trees that are less than 10 inches in diameter). As a result, in many cases, the trees forming the overstory canopy would not be removed, so canopy cover would not be changed. The results of the treatments proposed in this alternative would be similar to those described for Alternative B, except that they would occur to a lesser degree and would occur over fewer acres of land.

Thee 98 acres of proposed treatment that would result in canopy cover changes 30% or more (units B, D, and X) all lie in the Gotchen Creek subwatershed. The proposed treatments would allow for increased snow accumulation in those stands, and increased rates of snowmelt both during rain-on-snow conditions and during periods of spring snowmelt.

The 648 acres of proposed treatment that results in canopy cover changes of less than 30% are largely within the Gotchen Creek subwatershed; just 34 acres of these treatments would occur in the Upper White Salmon River subwatershed. The proposed treatment of these stands would be expected to have some effect on rates of snow interception and retention, but probably less effect on changes to microclimate within those stands. As a result, snow accumulation on the ground may be incrementally increased in these 648 acres of treatment, but snowmelt rates would probably be unaffected or changed to a negligible degree.

Cumulatively, the changes described in the previous two paragraphs hydrologically convert less than 1% of the forest stands in the Gotchen Creek and Upper White Salmon River subwatersheds to an unrecovered condition, and as such have no effect on the ARP levels for those drainages. As described above, most of the proposed treatments would have only minor effects to forest canopies, and consequently hydrologic processes within stands and across the subwatershed would be maintained.

Roads

The effects of the road construction, reconstruction, decommission, and closures on watershed conditions would be minimal. The most substantive changes in terms of effects to water routing and hydrologic function would occur on the decommissioning of Forest Road 8225-150. The other roads planned for decommissioning under this alternative have very little interaction with surface water flows, and the roads proposed for closure without decommissioning would continue to function as they currently do in terms of their hydrologic function. As previously described, roads to be constructed or reconstructed do not interact substantively with the aquatic system, so would have very limited and localized effect. At the subwatershed scale, the road treatments would represent an incremental improvement in hydrologic function, but essentially the effects would be undetectable due to the limited effect of the roads on hydrologic processes in this subwatershed.

Combined Effects of Forest and Road Treatments

The effects of the combined vegetative and road treatments proposed under this alternative are expected to be undetectable at the 6th field subwatershed scale in terms of their effect on peak streamflows. In essence, the lack of high intensity precipitation, the relative lack of connectivity (and even presence of stream channels) throughout much of the subwatershed, and the exceptionally high rates of infiltration and subsurface water movement, make the Gotchen Creek subwatershed relatively unresponsive to changes in forest cover with respect to changes in peak streamflows. While most watersheds tend to concentrate incident precipitation in stream channels, routing that water to the watershed outlet, the Gotchen Creek subwatershed shows less concentration of water, and a more dispersed mode of transporting water from the system.

Watershed-Scale Cumulative Effects For All Alternatives(1-5 years)

The incremental effect of any alternatives on peak streamflows at the 5th field watershed scale would be undetectable when considered in context with all other activities occurring in the White Salmon River watershed.

Cumulative Effects For All Alternatives (10 and 50 years)

This cumulative effects discussion focuses on the 6th field subwatershed scale, per the rationale described earlier in this Statement for using this scale as the primary analysis unit. As a result of the relative minor differences in treatment among the alternatives, and the nearly indistinguishable differences in hydrologic effects among the alternatives, the following description of out-year cumulative effects apply to all alternatives

The to peak streamflows would be negligible at the 6th field subwatershed scale and the differences in hydrologic effects among the alternatives are nearly indistinguishable at this scale. It is even less likely that there would be detectable cumulative effects at the (larger) 5th field watershed scale.

Ongoing or scheduled activities associated with the Gotchen project and not identified below (i.e. including underburning, young stand thinning, etc) are considered to have negligible cumulative effects to aquatic resources and are not addressed here.

The Forest Service may harvest some 1300 acres of trees over the next five decades in the Gotchen and Upper White Salmon River subwatersheds, and commercially thin another 1900 acres. The State Department of Natural Resources is planning to cut approximately 300 acres of timber within the Gotchen Creek subwatershed within the next year. All of these activities would entail cumulative reductions in forest canopy cover within the Gotchen and Upper White Salmon River subwatersheds, although over a relatively long period (up to five decades).

The actual location of future potential harvest on National Forest lands is unknown at this time, so the effects cannot be well defined. The 300 acres of cutting on State lands are clearly within the Gotchen Creek subwatershed, so would be cumulative with most of the activities proposed in this FEIS. The 300 acres proposed by the State for harvest would reduce the ARP in the Gotchen Creek subwatershed by approximately 2%, changing it from 83 to 81. However, as described previously, peak streamflows in the Gotchen Creek subwatershed are relatively insensitive to changes in forest canopy cover, so the cumulative effect of this project along with the proposed treatments would be small.

The annual grazing activity associated with the Mt. Adams Cattle Allotment does not modify forest canopy cover or water routing; the approximate 5.4 miles of new trail would not substantially modify forest canopy cover or water routing. Hence, neither activity would contribute to changes in peak streamflows in the future.

Riparian Conditions and Function—ACSO's #1, 2, 8

Descriptions of Relevant Processes

Riparian Reserves were established under the Northwest Forest Plan as one of the four primary components of the Aquatic Conservation Strategy. Riparian Reserves are located along all aquatic features and around unstable or potentially unstable soils. Because of the importance of riparian areas to aquatic conditions and habitats, management objectives within these areas are focused on maintaining and improving conditions for aquatic-and riparian-dependent species.

The exclusion of fire and selective harvest of ponderosa pine and other species in riparian areas of the Gotchen planning area has left a range of conditions within Riparian Reserves that differ from what might have once occurred there. Riparian conditions currently range from very open stands that provide little shade to the streams, to overly dense stands of younger conifers.

Silvicultural treatments are one of the management tools that can be applied within Riparian Reserves to improve stand conditions and habitat. Thinning of overly dense riparian forests can improve the health of the remaining trees and accelerate their growth, by reducing competition from other trees. The intensity of thinning is often

directly correlated with the degree of benefit and the duration of the effect, in that heavily thinned forests typically show more dramatic and longer-term response to the thinning. However, heavier thinning can also modify microclimate, and reduce shade levels and the availability of down wood in riparian areas. Optimal prescriptions for riparian treatment are balanced to achieve the longer-term benefits of thinning while retaining critical (immediate) benefits in terms of shade, microclimate protection, and retention of potential large down wood. This element would be evaluated based on the number of acres of riparian area proposed for treatment, and how the proposed treatment affects the structure and function of the riparian area.

Alternative Summaries

Each of the action Alternatives proposes some level of vegetation treatment within Riparian Reserves. In addition, some of the roads proposed for decommissioning or closure under the main Alternatives either lie in or cross through Riparian Reserves. None of the new temporary roads or reconstructed roads is in Riparian Reserves. For each Alternative and for each subwatershed in the Gotchen Planning Area, Table 4-41 identifies the acres of Riparian Reserve proposed for vegetative treatment, the stands in which the treatment would occur, and the acres of Riparian Reserve directly affected by the proposed decommission. Sub-alternative C-1 does not include any road decommissioning or closure proposals.

Table 4-41. Current and projected road densities by subwatershed, Alternative B.

	Alternative A		**Alternative B**		**Alternative C [Sub-Alternative C-1]**		**Alternative D**	
6th Field Subwatershed	Upper White Salmon River	Gotchen Creek	Upper White Salmon River	Gotchen Creek	Upper White Salmon River	Gotchen Creek	Upper White Salmon River	Gotchen Creek
Acres of Riparian Treatment Proposed	0	0	0	44	0	57	0	38
Units Proposed for Riparian Treatments	none	none	none	L,V,Z,AA,BB	none	L,Z,AA,BB,FF	none	L,Z,AA,BB
Acres of Riparian Reserve Directly Affected by Road Decommissions	0.3	0.9	0.3	0.9	0.3 [0]	0.9 [0]	0.3	0.9

Alternative A – No Action

Direct, Indirect and Cumulative Effects (1-5 years)

Riparian conditions would continue to exist and change as they have, in response to natural disturbance, and to ongoing effects of past activities or current practices.

In general, forest stands within Riparian Reserves would continue to deteriorate as a result of insect infestations, disease, and competition. The potential for a wildfire of significant size and intensity would continue to increase, as the amount of dead organic material continued to increase. In the event that a stand-replacing fire did not occur in the near term, the Riparian Reserves would continue to experience the cycle of over-densification of the riparian forest canopy and subsequent re-opening of the canopy in response to insects, disease, and over-competition. Combustible material would continue to accumulate on the forest floor, and the potential for some form of fire would increase.

In the event of a wildfire, the Riparian Reserves would be as likely to burn as any part of the Gotchen Planning Area because during late summer months they do not have the moisture levels typical of many riparian areas, nor the topographic differentiation from the surrounding forest. If the Riparian Reserves burned in a wildfire, the existing fuel loadings and canopy connectivity could in some areas lead to the loss of the entire forest canopy. Microclimates would be affected by the loss of forest cover, and the streams would experience a period of relatively high inputs of down wood, and possibly increases in both sediment and streamflow (depending on the severity and extent of the fire).

Alternative B

Direct, Indirect and Cumulative Effects (1-5 years)

This alternative proposes vegetation treatment in approximately 44 acres of Riparian Reserve within the Gotchen Creek subwatershed, and road decommissions that directly affect approximately 1.2 acres of Riparian Reserve in the Gotchen Creek and Upper White Salmon River subwatersheds. The total acreage of Riparian Reserve proposed for vegetative and road treatments represents just over 1% of the Riparian Reserves in the Gotchen Creek subwatershed, and well under 1% of the Reserves in the Upper White Salmon River subwatershed. In this alternative, vegetative treatments are proposed in Riparian Reserves within units L, V, Z, AA, and BB. The intent of the riparian proposals is to move the riparian areas toward a condition more similar to what is presumed to have been there historically (i.e. prior to the period of selective timber harvest and wildfire exclusion). (Details of the riparian treatments are identified in the Alternative Details in Appendix E, as well as in the Hydrology Report filed in the Project Record.)

The health and vigor of riparian forests would be expected to improve incrementally with implementation of this alternative. Overly dense stands of lodgepole pine would be thinned to improve the growth and vitality of the remaining forest, and fuels would be reduced from unnaturally high levels to decrease the risk and hazard of subsequent fires within the Reserves. Overstory canopy closures within the Reserves would not be affected, or would change only incrementally as a result of the proposed treatments. Understory stand densities would be reduced to various levels within the Reserves, with higher densities remaining closer to streams, and in the areas closest to the stream, no treatment of vegetation at all.

The untreated buffer along all streams would ensure that bank stability is maintained, and allow for maintenance of any vegetation that might protect the stream from direct disturbance. A limited change in overstory canopy, along with the retention of a substantial number of snags within the Riparian Reserves would help ensure a future source of down wood for recruitment to streams and riparian areas. As a result of understory thinning, it is likely that riparian areas would experience some level of change in microclimate due to the reduced density of vegetation in the understory, and the increased exchange of heat, humidity and wind with areas outside. The amount of change in microclimate would be variable depending on the current and resultant conditions on any given site, but overall changes would be expected to be relatively minor, and to be limited by the maintenance of a substantial portion of the overstory. The reduction of fuels and fuel connectivity within the Reserves would benefit riparian areas by reducing the potential for stand-replacing wildfire within the Reserves that might otherwise compromise their long-term integrity and function.

The effect of the road decommissions on Riparian Reserves is generally positive, in that decommissioning allows for revegetation of the road surface and elimination of culverts that often interrupt connectivity of channels. Over longer periods, the decommissioned roads would be expected to host shade-producing forest vegetation, provide large down wood, and generally increase diversity and habitat quality within the Reserves. However, in the short term, the scarification of road surfaces and removal of culverts would substantially disturb the soils within the road prism, and in channel banks. These disturbed areas would be expected to remain exposed until revegetation occurs, which is expected after the first year of implementation. Because all decommissioning activities occur within the road prism, the expected disturbance is limited to effects on the ground and stream channel—forest cover and vegetative conditions within the Riparian Reserves would not be impacted.

Alternative C

Direct, Indirect and Cumulative Effects (1-5 years)

Alternative C proposes vegetation treatment in approximately 57 acres of Riparian Reserve within the Gotchen Creek subwatershed, and road decommissions that would directly affect an additional 1.2 acres of Riparian Reserve in the Gotchen Creek and Upper White Salmon River subwatersheds. The total acreage to be treated represents just fewer than 2% of the Riparian Reserves in the Gotchen Creek subwatershed and well under 1% of the Riparian Reserves in the Upper White Salmon River subwatershed. None of the new temporary roads or reconstructed roads is in Riparian Reserves. In this alternative, treatments are proposed in units L, Z, AA, BB, and FF. The road treatments are the same as described for Alternative B. The intent of this alternative is to conduct treatments that would in general move the riparian areas toward a condition more similar to what is presumed to have been there historically (i.e. prior to the period of selective timber harvest and wildfire exclusion).

The health and vigor of riparian forests would be expected to improve incrementally with implementation of this alternative. Overly dense stands of lodgepole pine would

be thinned to improve the growth and vitality of the remaining forest, and fuels would be reduced from unnaturally high levels to decrease the risk and hazard of subsequent fires within the Reserves. Overstory canopy closures within the Reserves would not be affected, or would change only incrementally as a result of the proposed treatments. Understory stand densities would be reduced to various levels within the Reserves, with higher densities remaining closer to streams, and in the areas closest to the stream, no treatment of vegetation at all.

The untreated buffer along all streams would ensure that bank stability is maintained, and allow for maintenance of any vegetation that might protect the stream from direct disturbance. A limited change in overstory canopy, along with the retention of a substantial number of snags within the Riparian Reserves, would help ensure a future source of down wood for recruitment to streams and riparian areas. As a result of understory thinning, it is likely that riparian areas would experience some level of change in microclimate due to the reduced density of vegetation in the understory, and the increased exchange of heat, humidity and wind in areas outside of the Reserves.

Under this alternative, there would be a slightly greater change in microclimate over a larger area due to the increased treatment within Riparian Reserves. But as in other alternatives, the amount of change in microclimate on any given site would be variable, and dependent on the current and resultant conditions on any given site. Overall changes are expected to be relatively minor, limited by the maintenance of a substantial portion of the overstory. The reduction of fuels and fuel connectivity within the Reserves would benefit riparian areas by reducing the potential for stand-replacing wildfire within the Reserves that might otherwise compromise their long-term integrity and function.

The effect of the road decommissions on Riparian Reserves is generally positive, in that decommissioning allows for revegetation of the road surface and elimination of culverts that often interrupt connectivity of channels. Over longer periods, the decommissioned roads would be expected to host shade-producing forest vegetation, provide large down wood, and generally increase diversity and habitat quality within the Reserves. However, in the short term, the scarification of road surfaces and removal of culverts would substantially disturb the soils within the road prism, and in channel banks. These disturbed areas would be expected to remain exposed until revegetation occurs, which is expected after the first year of implementation. Because all decommissioning activities occur within the road prism, the expected disturbance is limited to effects on the ground and stream channel—forest cover and vegetative conditions within the Riparian Reserves would not be impacted.

Alternative C-1

Direct, Indirect and Cumulative Effects (1-5 years)

This alternative is identical to Alternative C except that it excludes the road treatments. Effects of this Alternative are identical to those described for Alternative C except that the short term soil disturbance and long term benefits of the

decommissioning within Riparian Reserves would not occur. These roads would continue to occupy space within the Riparian Reserves, and would preclude revegetation on sites occupied by the roads. In addition, sediment generation from road surfaces and from cut and fill slopes would continue to occur.

Alternative D

Direct, Indirect and Cumulative Effects (1-5 years)

Alternative D proposes vegetation treatment in approximately 38 acres of Riparian Reserve within the Gotchen Creek subwatershed, and road decommissions that would directly affect an additional 1.2 acres of Riparian Reserves in the Gotchen Creek and Upper White Salmon River subwatersheds. The acreage to be treated represents approximately 1% of the Riparian Reserves in the Gotchen Creek subwatershed, and well under 1% of the Reserves in the Upper White Salmon River subwatershed. None of the new temporary roads or reconstructed roads is in Riparian Reserves. In this alternative, treatments are proposed in units L, Z, AA, and BB. The road treatments proposed under this Alternative are the same as those described in Alternative B. The intent of this alternative is to conduct treatments that would in general move the riparian areas toward a condition more similar to what is presumed to have been there historically (i.e. prior to the period of selective timber harvest and wildfire exclusion).

The effects of Alternative D on Riparian Reserves are identical to those described for Alternative B, except that this Alternative treats less area (drops Unit V from treatment).

The health and vigor of riparian forests would be expected to improve incrementally with implementation of this alternative. Overly dense stands of lodgepole pine would be thinned to improve the growth and vitality of the remaining forest, and fuels would be reduced from unnaturally high levels to decrease the risk and hazard of subsequent fires within the Reserves. Overstory canopy closures within the Reserves would either not be affected, or are changed only incrementally as a result of the proposed treatments. Understory stand densities would be reduced to various levels within the Reserves, with higher densities remaining closer to streams, and in the areas closest to the stream, no treatment of vegetation at all.

The untreated buffer along all streams would ensure that bank stability is maintained, and allow for maintenance of any vegetation that might protect the stream from direct disturbance. A limited change in overstory canopy, along with the retention of a substantial number of snags within the Riparian Reserves would help ensure a future source of down wood for recruitment to streams and riparian areas. As a result of understory thinning, it is likely that riparian areas would experience some level of change in microclimate due to the reduced density of vegetation in the understory, and the increased exchange of heat, humidity and wind with areas outside. The amount of change in microclimate would be variable depending on the current and resultant conditions on any given site, but overall changes would expected to be relatively minor, and to be limited by the maintenance of a substantial portion of the overstory. The reduction of fuels and fuel connectivity within the Reserves would

benefit riparian areas by reducing the potential for stand-replacing wildfire within the Reserves that might otherwise compromise their long-term integrity and function.

The effect of the road decommissions on Riparian Reserves is generally positive, in that decommissioning allows for revegetation of the road surface and elimination of culverts which often interrupt connectivity of channels. Over longer periods, the decommissioned roads would be expected to host shade-producing forest vegetation, provide large down wood, and generally increase diversity and habitat quality within the Reserves. However, in the short term, the scarification of road surfaces and removal of culverts would substantially disturb the soils within the road prism, and in channel banks. These disturbed areas would be expected to remain exposed until revegetation occurs, which is expected after the first year of implementation. Because all decommissioning activities would occur within the road prism, the expected disturbance is limited to effects on the ground and stream channel—forest cover and vegetative conditions within the Riparian Reserves would not be impacted.

Watershed- Scale Cumulative Effects for all Alternatives (1-5 years)

When considered in context with all other activities occurring in the White Salmon River (5th field) watershed, the incremental effect of any Gotchen alternative on Riparian Reserves at the watershed scale would be undetectable.

Cumulative Effects for All Alternatives (10 and 50 years)

The 6th field subwatershed is the scale where any cumulative effects are most appropriately described, and where any potential effects would be most evident. At larger scales, much of the White Salmon River watershed is either under private or State ownership, so designated Riparian Reserves do not exist. Nevertheless, the benefits to the riparian systems described in the preceding paragraphs hold at the watershed scale, although are extremely small relative to the entire riparian network across the watershed.

Although the locations of the potential future timber harvest within the Gotchen Planning Area have not been identified, these projects would avoid Riparian Reserves unless the treatments were prescribed to benefit aquatic and riparian conditions. Any future State timber sales would similarly follow state Forest Practice Act requirements for protection of riparian areas, so the effects of the State's projects would presumably have neutral or beneficial effects to riparian areas as well.

The annual, on-going grazing is unrestricted in the Gotchen Planning Area, including grazing of riparian areas. None of the treatments proposed in the Gotchen Alternatives would enhance the grazing of riparian areas; in some areas they would actually inhibit grazing near streams by implementing mitigation measures that leave an assortment of downed trees jackstrawed along specific reaches of stream where banks are unstable. In addition, the Gotchen alternatives would retain all vegetation within 25 feet of streams to avoid opening more streamside areas to active grazing.

Approximately 5.4 miles of new trails are proposed within the Gotchen planning area. Most of these trails would follow existing abandoned roadways, although there is

some new trail construction both within and outside of Riparian Reserves. The Gotchen project would in no way enhance or exacerbate effects from these trails on Riparian Reserves.

Other ongoing or scheduled activities associated with the Gotchen alternatives and not addressed above (i.e. underburning, young stand thinning) would have negligible cumulative effects to aquatic resources.

Channel Conditions and Dynamics—ACSO #1, 2, 3, 7, 8, 9

Descriptions of Relevant Processes

Stream channels are at the core of the aquatic systems on the forest, providing habitat for fish and other aquatic organisms, water for riparian and upland species, and avenues for movement of water, wood, sediment, nutrients and other materials and organisms. Channel conditions can be affected by direct modifications to the channel from road construction, decommissioning, or any type of heavy machinery use in the channel, or from forest activities that would remove trees that provide important bank stability functions. Channels can be more indirectly affected by changes in sediment inputs, discharge levels, or down wood. The potential for the proposed project to affect channel conditions would be evaluated by examining the proximity of project activities to channels, the types of activities proposed, and the extent of changes in offsite conditions that might influence channel conditions. Since all channels are surrounded by Riparian Reserves, proposals that include activities within the Riparian Reserves would have the greatest potential for directly affecting stream channels.

Alternative Summaries

The Gotchen project includes both riparian stand treatments, and road-related work within riparian areas. Table 4-42 summarizes the proposed treatments that may directly affect channel conditions.

Table 4-42. Acres of proposed treatment within Riparian Reserves, and number of stream crossings potentially affected by proposed road treatments under each alternative.

	Alternative A		Alternative B		Alternative C [Sub-Alternative C-1]		Alternative D	
6th Field Subwatershed	Upper White Salmon River	Gotchen Creek	Upper White Salmon River	Gotchen Creek	Upper White Salmon River	Gotchen Creek	Upper White Salmon River	Gotchen Creek
Acres of Riparian Treatment Proposed	0	0	0	44	0	57	0	38
Number of Stream Xings Affected by Road Proposals*	0	4	0	4	0	4 [0]	0	4

*Road treatments are proposed under all Alternatives except for C[1].

Alternative A – No Action

Direct, Indirect and Cumulative Effects (1-5 years)

In the immediate future, channel conditions in the Gotchen Planning Area would remain unchanged except where change occurs as a result of natural disturbances or ongoing conditions and activities. Without any treatment of forest vegetation in the Gotchen Planning Area, the existing stands would likely continue to deteriorate, and dead trees would topple into the stream, providing additional structure to the channels. Under this scenario, the risk and hazard of wildfire may increase with the increased buildup of dead organic debris. In the event of a subsequent wildfire, these channels would likely experience increases in sediment delivery, possibly increases in discharge, and increases in down wood as burned trees fell into the channel. The severity and extent of such a fire would dictate the degree of any of these impacts to stream channels.

Alternative B

Direct, Indirect and Cumulative Effects (1-5 years)

Alternative B includes 44 acres of vegetation treatment within Riparian Reserves in the Gotchen Creek subwatershed, along with approximately 6.3 miles of road decommissioning that includes 4 perennial or intermittent stream crossings. None of the new temporary roads or reconstructed roads is in Riparian Reserves, and none crosses stream channels. Under this alternative, riparian treatments are proposed in Units L, V, Z, AA, and BB. Within each of the riparian stands to be treated, there would be a 25-foot buffer on each side of the stream that would remain untreated. This buffer is intended in part to ensure that the thinning would have no direct effects to stream channels, and that trees that are essential for bank stability would not be removed during project implementation. As a result of this buffer, there would be no effects to the channels from vegetative treatments.

All four of the stream crossings to be affected by the decommissioning proposals are on Forest Road 8225-150. Two of these crossings are on perennial streams, and two are on intermittent streams. The decommissioning of the road would include removal of these four culverts, and removal of an additional five culverts that don't appear to be associated with either perennial or intermittent streams. Removal of the culverts would require heavy equipment operating in and around the stream channel to remove fill material from around the culvert, and then to remove the culvert itself. Following removal of the culvert, the equipment would be used to shape the banks of the channel to a stable configuration, and to remove any remaining fill material. During this process, the bed and banks of the channel would be heavily disturbed. The disturbance would be confined to the immediate area of the culvert removal, with the exception of some sediment deposition that would occur in the channel downstream of the project. The disturbed portion of the channel banks would be covered with mulch and revegetated with native grasses and tree cuttings. Over time, these areas

would revegetate, and over longer periods, would begin to function more similar to a natural channel at the locations of the existing crossings.

Previous sections of this Statement find that there would be no substantial changes to discharge levels that would indirectly affect channel conditions from modified streamflow levels. Overall, channel conditions under this alternative would be expect to be maintained as a result of the lack of any direct or indirect effects of the vegetation treatments on the channels. Channel conditions would be somewhat compromised in the short-term on the four stream crossing sites affected by the road decommissioning but would improve over the long term at those same culvert removal sites.

Alternative C

Direct, Indirect and Cumulative Effects (1-5 years)

The Alternative includes 57 acres of vegetation treatments within Riparian Reserves in the Gotchen Creek subwatershed, along with approximately 6.3 miles of road decommissioning that includes four perennial or intermittent stream crossings. None of the new temporary roads or reconstructed roads is in Riparian Reserves, and none crosses stream channels. The proposed vegetative treatments under this alternative would occur in Units L, Z, AA, BB, and FF. As in Alternative B, there would be a 25-foot buffer on each side of all streams in which no treatment activities would occur. This treatment setback would provide protection to the streams from any direct effects related to the vegetative treatment activities. As a result of this buffer, there would be no effects to the channels from vegetative treatments.

Road treatments proposed under this Alternative are the same as those proposed under Alternative B, and as such, the effects to channel conditions are identical to those described for Alternative B.

Overall, channel conditions under this Alternative would be expected to be maintained due to the lack of effects of the proposed vegetation treatments on the channels. The channel conditions would be somewhat compromised in the short term at the four stream crossing sites affected by the road decommissioning, but would be improved over the long term at those same culvert removal sites.

Alternative C-1

The vegetation proposals in this alternative are identical to Alternative C; it does not include road treatment proposals. Effects of this alternative would be identical to those described for Alternative C, except that the short term negative effects to stream channels and the long term positive effects caused by the road decommissioning would not occur.

Alternative D

Direct, Indirect and Cumulative Effects (1-5 years)

This Alternative includes 38 acres of vegetation treatment within Riparian Reserves in the Gotchen Creek subwatershed, and the same treatment of roads as described in Alternative B. None of the new temporary roads or reconstructed roads is in Riparian Reserves, and none crosses stream channels. Riparian treatments under this alternative would be similar to those described under Alternative B, except this alternative would not treat Unit V. As a result of the untreated buffers along all streams, the vegetative treatments are not expected to have any effects on stream channel conditions. Effects of this Alternative on channel conditions would be essentially the same as those described for both Alternative B and C.

Watershed Scale Cumulative Effects for All Alternatives (1-5 years)

When considered in context with all other activities occurring in the White Salmon River (5^{th} field) watershed, the incremental effect of any Gotchen alternative on stream channel conditions at the watershed scale would be undetectable.

Cumulative Effects for All Alternatives (10 and 50 years)

The actions associated with the Alternatives are not expected to contribute to any cumulative effects on channels at either the 6^{th} field or 5^{th} field watershed scale, due to the limited effects evident at the site scale, and most of the effects moving toward improvement of conditions. Other ongoing or scheduled activities associated with the Gotchen project and not addressed below (i.e. underburning, young stand thinning, etc.) are considered to have negligible cumulative effects to aquatic resources.

Although grazing activities may have effects to stream channels in localized areas, implementation of the Gotchen project may offer some reduction of impacts to channels from grazing, simply due to the mitigation that would leave some thinned material jackstrawed along specific stream lengths and effectively reduce access to those streams by ungulates.

Decommissioning of Forest Road 8225-150 road and the associated relocation of the Snipes Mountain Trailhead would cumulatively improve stream channel conditions at crossings on this road, by allowing the culverts to be removed and crossing sites rehabilitated.

None of the potential future Forest Service timber sale projects would remove forest vegetation from locations that would affect stream channel stability, but channels should indirectly benefit from thinning and improved forest health in riparian areas.

Water Quality—ACSO #2, 3, 4, 5, 6, 8, 9

Descriptions of Relevant Processes—Water Temperature

Water temperature and turbidity are two of the more important water quality parameters that have the potential to be affected by a proposal such as the Gotchen project. Currently, there are no streams in the Gotchen planning area on the 303(d) list for either water temperature or turbidity.

Water temperatures can be affected by the removal or reduction of shade provided by forest canopies around perennial water bodies, and/or by changes to channel morphology that cause widening of the channel. The potential for water temperatures to be elevated as a result of this project would be evaluated by examining the amount and type of forest cutting to occur in proximity to perennial streams in the Gotchen Planning Area, and the potential for project activities to modify channel morphology either directly or indirectly.

Alternative Summaries

Proposed treatments of Riparian Reserves under each of the proposed alternatives are summarized in Table 4-43.

Table 4-42. Acres of proposed treatment within Riparian Reserves, and number of stream crossings potentially affected by proposed road treatments under each alternative.

	Alternative A		Alternative B		Alternative C		Alternative D	
6th Field Subwatershed	Upper White Salmon River	Gotchen Creek	Upper White Salmon River	Gotchen Creek	Upper White Salmon River	Gotchen Creek	Upper White Salmon River	Gotchen Creek
Acres of Riparian Treatment Proposed	0	0	0	44	0	57	0	38

Alternative A

Direct, Indirect and Cumulative Effects (1-5 years)

Riparian forests and shade levels over perennial streams would not be affected by implementation of this alternative, and water temperatures would not be affected in the immediate future. Under this alternative, no actions are taken to reduce fuel loadings, to improve forest health, or to provide fuelbreaks. As a result, the Gotchen Planning Area may be more susceptible to the continued cycle of forest densification, insect infestation, continued deterioration of the forest canopy, and potential for stand replacement fire. Under these scenarios, riparian forest cover may become increasingly dense, then thinned by insects, disease, and competition, and then possibly eliminated by fire. Throughout the cycle, the effectiveness of the riparian forest canopy in providing shade to streams would vary with the existence and density of the forest canopy.

In the event of a stand-replacing fire that burns through the riparian areas, shade could be entirely eliminated, causing substantial heating of stream waters. However,

because most of the perennial streams in the Gotchen Planning Area have a limited spatial extent of perennial flow (i.e. in general, even the perennial streams in this area are only perennial over a limited length before they infiltrate the channel bottom and become subterranean flow), any increase in water temperature resulting from the loss of forest canopy in riparian areas would probably be localized and affect only the limited segments of surface flow that exist. Water temperature increases in these short perennial reaches would not be translated downstream, because as streamflow infiltrates the channel bottom and moves downslope through subsurface pathways, water temperatures would tend to decrease.

Alternative B

Direct, Indirect and Cumulative Effects (1-5 years)

This Alternative proposes to thin 44 acres of Riparian Reserve in the Gotchen Creek subwatershed. In addition, approximately 3.1 miles of new temporary road would be constructed, 4.4 miles of existing road would be reconstructed, and 6.3 miles of road would be decommissioned. Approximately 1.2 acres of the roads to be decommissioned are in Riparian Reserves. None of the new temporary roads or reconstructed roads are in Riparian Reserves. The thinning under this alternative would occur in Units L, V Z, AA and BB. The thinning in L, V, and AA is along Gotchen Creek, an intermittent stream that typically does not have any flow during the summer months. Unit Z lies between Gotchen Creek and a perennially flowing ditch that crosses Gotchen Meadow and goes past the Gotchen Creek Guard Station. Although the feature with perennial flow is actually a constructed ditch, it is treated like a stream and given protection because it has been in place for decades, and currently functions as a stream. Unit Z follows this stream for approximately 0.1 miles. Proposed treatment of this riparian area includes removing conifers of up to 10” in diameter that are encroaching on aspens in the meadow, and removal of hazard trees in the vicinity of the Gotchen Creek Guard Station. There would be no tree removal within 25 feet of the stream in this alternative.

Much of the vegetation that provides shade to this perennial stream during midday hours of the summer lies within 25 feet of the stream, and it is this vegetation that would not be treated under this alternative. As a result, the stream would continue to be shaded and protected from heating during the primary heating periods of the summer. However, forest canopies that lie outside of the 25-foot buffer also play a role in shading the stream, particularly during morning and late afternoon hours, and during the early and late summer season. Removal of forest cover within the riparian area and outside of the 25-foot buffer may affect the shade on the stream during these “off peak” periods. Although the heating potential of the sun is not at its greatest during these periods, there may still be some heating that occurs following removal of forest cover that is currently providing shade during hours of oblique solar impact. The amount of heating would be very small, if measurable, and would be limited by the retention of the shade trees growing immediately adjacent to this stream. Because this flow does not continue down Gotchen Creek past the meadow, any small increase that occurred would remain localized to the meadow area.

The treatment area identified as BB includes approximately 1.3 miles of Hole in the Ground Creek. While this 1.3-mile length of stream is classified as perennial, during some years, the perennial flow in this reach is interspersed with sections where the stream goes dry. Water temperatures in this reach have not been systematically measured, but grab samples taken at various locations suggest that the stream remains relatively cool. In this alternative, the proposed treatment along Hole in the Ground Creek focuses on thinning dense patches of grand fir saplings that are growing on old landings and roads. The saplings to be thinned within treatment area BB are at this time just three to six feet tall, so generally don't provide any shade to the stream. Thinning of these patches would not result in any loss of shade to the stream, but would allow the remaining trees to grow at accelerated rates due to the reduced competition for light, water and nutrients. Over time, the trees that remain after the thinning would be expected to provide shade to the stream more quickly than would be the case in the absence of thinning.

The proposed road decommissions under this Alternative are in both the Gotchen Creek and Upper White Salmon River subwatersheds. Only one of the roads proposed for decommissioning (Forest Road 8225-150) crosses any perennial streams, so this is the location where decommissioning would be most likely to affect late summer water temperatures. However, there is no expected change in water temperature as a result of the decommissioning, because no shade-producing vegetation would be removed during the decommission. Work activities would be confined to the road prism. Over longer time frames, the decommissioning should provide increased shade to streams as roads and slopes adjacent to streams are revegetated. None of the roads to be constructed or reconstructed is in proximity to streams, so there are no projected effects to water temperatures from these roads.

Alternatives C and C-1

Direct, Indirect and Cumulative Effects (1-5 years)

Both Alternatives C and C-1 propose to thin approximately 57 acres of Riparian Reserve in the Gotchen Creek subwatershed. Alternative C includes the same road treatments as included in Alternative B. The thinning under these alternatives would occur in Units L, Z, AA, BB, and FF. The thinning in Units L, AA, and FF is along Gotchen Creek, an intermittent stream that typically does not have any flow during the summer months. Thinning in these treatment areas would not affect water temperatures in Gotchen Creek because there is no surface water in that channel to be heated during the summer months. Unit Z lies in between Gotchen Creek and a perennially flowing ditch that crosses Gotchen Meadow and goes past the Gotchen Creek Guard Station. Although the feature with perennial flow is actually a constructed ditch, it is treated like a stream and given protection because it has been in place for decades, and currently functions as a stream. Unit Z follows this stream for approximately 0.1 miles. Proposed treatment of this riparian area includes removing conifers of up to 10" in diameter that are encroaching on aspens in the meadow, and removal of hazard trees in the vicinity of the Gotchen Creek Guard

Station. There would be no tree removal within 25 feet of the stream in this alternative.

Much of the vegetation that provides shade to this perennial stream during midday hours of the summer lies within 25 feet of the stream, and it is this vegetation that would not be treated under this alternative. As a result, the stream would continue to be shaded and protected from heating during the primary heating periods of the summer. However, forest canopies that lie outside of the 25-foot buffer also play a role in shading the stream, particularly during morning and late afternoon hours, and during the early and late summer season. Removal of forest cover within the riparian area and outside of the 25-foot buffer may affect the shade on the stream during these "off peak" periods. Although the heating potential of the sun is not at its greatest during these periods, there may still be some heating that occurs following removal of forest cover that is currently providing shade during hours of oblique solar impact. The amount of heating would be very small, if measurable, and would be limited by the retention of the shade trees growing immediately adjacent to this stream. Because this flow does not continue down Gotchen Creek past the meadow, any small increase that may occur would be localized to the meadow area.

Unit BB includes approximately 1.3 miles of Hole in the Ground Creek. This 1.3-mile length of stream is classified as perennial, however during some years, the perennial flow in this reach is interspersed with sections where the stream goes dry. Water temperatures in this reach have not been systematically measured, but grab samples taken at various locations suggest that the stream remains relatively cool. In this alternative, the proposed treatment along Hole in the Ground Creek focuses on thinning dense patches of grand fir saplings that are growing on old landings and roads. The saplings to be thinned within treatment area BB are at this time just three to six feet tall, so generally don't provide any shade to the stream. Thinning of these patches would not result in any loss of shade to the stream, but would allow the remaining trees to grow at accelerated rates due to the reduced competition for light, water and nutrients. Over time, the trees that remain after the thinning would be expected to provide shade to the stream more quickly than would be the case in the absence of thinning.

The proposed road decommissions under this Alternative are identical to those in Alternative B, as are the effects. None of the new roads to be built or reconstructed in either Alternative C or C-1 are near streams, and as such would have any effect on water temperature.

The effects resulting from the vegetation proposals in Alternative C-1 are identical to those of effects of Alternative C. The beneficial effects of the road decommissions on long term shade levels would not be realized, however under Alternative C-1.

Alternative D

Direct, Indirect and Cumulative Effects (1-5 years)

Alternative D proposes to treat approximately 38 acres of Riparian Reserve in the Gotchen Creek subwatershed, to built 0.2 miles of new temporary road, to reconstruct 3.9 miles of existing road, and to decommission and close the same roads that are included in Alternatives B and C. With one exception—elimination of Unit V—the thinning in Alternative D would occur in the same stands and with the same prescriptions within the riparian Reserves as those described under Alternative B. The effects of treatment under this alternative would be the same as those described under Alternative B, with that one exception.

Descriptions of Relevant Processes—Turbidity

Turbidity in streams varies seasonally and with changes in runoff and glacial melt, but can also be affected by activities that increase either mass wasting or surface erosion, or that disturb channel banks. Because mass wasting is relatively infrequent in the Gotchen Planning Area (Upper White Salmon River Watershed Analysis), this analysis focuses on the effects of the Gotchen project on sediment increases from surface erosion and stream channel modifications. The potential for turbidity levels to be affected by this project is evaluated by analyzing the proximity of cutting and yarding activities to stream channels, the potential for direct or indirect effects to channels, the number of roads that are proposed to be constructed across streams, and the number of road crossings that are to be eliminated through decommissioning.

Alternative Summaries

Because Riparian Reserves surround all aquatic features, the proposed treatments within Riparian Reserves indicate the areas of potential for sediment introduction from thinning activities. Riparian Reserve treatments are summarized in Table 4-42 (a previous table in the report). Since none of the new roads to be constructed under any of the alternatives has stream crossings or is near or directly linked hydrologically with the stream network, the other likely source of sediment to streams is the proposed decommissioning of roads that would occur under Alternatives, B, C and D. Table 4-43 summarizes the road decommissions proposed by subwatershed and drainage area under each of the alternatives.

Table 4-43. Summary of the miles of proposed road treatments.

	Alternative A		Alternatives B and D		Alternative C		Alternative C-1	
6th Field Subwatershed	Upper White Salmon River	Gotchen Creek	Upper White Salmon River	Gotchen Creek	Upper White Salmon River	Gotchen Creek	Upper White Salmon River	Gotchen Creek
Miles of Road Proposed for Decommission	0.6	5.7	0.6	5.7	0.6	5.7	0	0
Number of Stream Xings to be Affected	0	4	0	4	0	4	0	0

Alternative A

Direct, Indirect and Cumulative Effects (1-5 years)

Under this alternative, no actions are taken that would create additional sediment or erosion within forested stands in the Gotchen Planning Area, and no actions would be taken to treat existing roads or road crossings. Current erosion and sediment-related processes would not be affected by implementation of this alternative. Within forest stands, current low-level surface erosion would continue to occur, primarily during rainfall and primarily in locations where mineral soil is exposed. In the absence of some form of treatment of forest stands in the Gotchen Planning Area, the existing condition of the forest is likely to continue to deteriorate, and the potential for a large, and/or intense wildfire would remain or increase. In the event of such a fire, erosion rates could increase dramatically, particularly if riparian areas are excessively burned.

Road systems in the Gotchen Planning Area would continue to generate sediments, particularly during wet weather and when vehicle traffic is high. Chronic sediment production from roads that are actively being encroached by vegetation would likely decrease as vegetation overtakes the road surface. However, roads that are not regularly maintained may be at higher risk of erosion on road surfaces and ditches, or from fill failure resulting from obstruction of inadequately maintained drainage structures.

Evidence suggests that erosion from most of the roads in the Gotchen Planning Area is not great, due in large part to relatively gentle topography in the area, and the lack of large cuts and fills. The exception is road 8225-150, which crosses directly beneath the Aikin Lava Bed. This road has well-established gullies and has had a history of drainage problems associated with some of the stream crossings. This road would continue to generate sediment both through continued erosion of gullies in the road surface, and from failures or overwhelming of the existing drainage structures during future floods or when debris accumulates at the culvert inlet. Sediment introduction to the aquatic system from this road would be likely to occur during average wet conditions, but also in more episodic events associated with heavy runoff and failure of drainage structures. Sediment from these sources would enter either Gotchen

Creek, and/or the perennial stream that flows from the western side of the Aikin Lava Bed. Because a surface water connection has not been found between either of these streams and the White Salmon River, any sediment introduced to these systems would likely be deposited within these channels or their floodplains, or at the terminus of the surface flow in each of these streams. It would not be expected to reach any waters that support fish.

Alternative B

Direct, Indirect and Cumulative Effects (1-5 years)

This Alternative includes approximately 44 acres of vegetative treatment within Riparian Reserves associated with Gotchen and Hole in the Ground Creeks. In addition, this Alternative proposes to construct 3.1 miles of new temporary road, to reconstruct 4.4 miles of existing road, to decommission 6.3 miles of road, and to close 18 miles of road.

Turbidity levels in Gotchen Creek or Hole in the Ground Creek would be affected only at very low levels, if at all, as a result of implementing fuels treatment activities in this alternative. The 25-foot no-treatment buffer prescribed on either side of all streams provides a limited area for any sediment from upslope activities to be deposited before surface flows reach the stream. In addition, very little ground disturbance is foreseen within Riparian Reserves from this project because no heavy equipment would be operated within the Riparian Reserves; all thinning and fuel treatment activities would be done by hand. Moreover, the gentle slopes bordering most of the stream reaches within treatment units combine with the highly porous ground surface to limit any surface flow and severely limit the energy available to transport sediment.

The roads to be constructed or reconstructed have no stream crossings, and do not lie near any stream channels. Surface erosion from these roads is expected to remain onsite or in the proximity of the roads themselves. The 18 miles of road closures would provide some measure of reduction in the surface erosion that currently occurs on those roads, though the effect on turbidity levels in surface channels would probably be negligible. Simply denying vehicular access to these 18 miles of road would improve their condition because vehicles tend to disturb the road surface and increase surface erosion—particularly when they are driven on in wet conditions. As stated in the description of Alternative A, most of the roads in the Gotchen Planning Area are not seen as major sediment producers, so the magnitude of the reduction would not be great. Moreover, many of these roads have no stream crossings and do not have ditches linked directly to streams.

Over the long-term, the largest reduction in road-related sediment and in actual turbidity levels in surface streams would be provided by the decommissioning of 6.3 miles of road within the Gotchen and Upper White Salmon River subwatersheds, and in particular the decommissioning of the 8225-150 road. Once decommissioned and revegetated, sediment production from this road through both erosion of the road surface and erosion related to drainage structure failure would be expected to decline.

In the short term, the decommissioning process itself would generate direct inputs of sediment to the streams that are crossed by the road. Turbidity levels would be expected to increase substantially as culverts are removed from stream crossing locations. The increase in turbidity, while marked, would be of short duration. Over longer periods, the stabilization of the original stream channel at those points of crossing and the elimination of the road drainage water that is now channeled down the road surface would substantially reduce the sediment contributions from this road.

Alternatives C and C-1

Direct, Indirect and Cumulative Effects (1-5 years)

Alternative C includes approximately 57 acres of treatment within Riparian Reserves associated with Gotchen and Hole in the Ground Creeks, 0.4 miles of new temporary road construction, 3.9 miles of road reconstruction, and the same road decommission and closure proposals that are included in Alternative B and D. The effects of this Alternative on turbidity would be similar to those described above for Alternative B (above). The topography, soils, geology, and the 25-foot setback from all streams would be expected to limit any sediment introduction to active streams.

Alternative C^{-1} is the same proposal as Alternative C, without the road closure and decommissions. The vegetative effects of this Alternative are identical to those of Alternative C. The roads would continue to affect turbidity in the same way as they currently do and as described under the Alternative A description of effects.

Alternative D

Direct, Indirect and Cumulative Effects (1-5 years)

This Alternative includes approximately 38 acres of treatment within Riparian Reserves associated with Gotchen and Hole in the Ground Creeks, and the same road closure and decommission treatments described under Alternative B. Approximately 0.2 miles of new temporary road would be constructed, and 3.9 miles of road would be reconstructed. None of the new construction or reconstructed roads would be in proximity to stream channels. Turbidity levels in Gotchen Creek or Hole in the Ground Creek would be affected only at very low levels, if at all, as a result of implementing fuels treatment activities in this alternative. For the vegetative treatments, a 25-foot no-treatment buffer on either side of these streams is prescribed. This buffer would provide a limited area for any sediment from upslope activities to be deposited before surface flows reach the stream. Very little ground disturbance from this alternative is foreseen within Riparian Reserves, because all thinning and fuel treatment activities would be done by hand. There would be no heavy equipment operated in the Riparian Reserves under this Alternative. Moreover, the gentle slopes bordering most of the stream reaches within treatment units combine with the highly porous ground surface to limit any surface flow and severely limit the energy available to transport sediment.

Effects related to the road treatments would be identical to those described for Alternative B.

Watershed Scale Cumulative Effects for All Alternatives (1-5 years)

When considered in context with all other activities occurring in the White Salmon River (5th field) watershed, the incremental effect of any Alternative of the Gotchen project on water quality at the watershed scale would be undetectable.

Cumulative Effects for All Alternatives (10 and 50 years)

As stated previously, water quality effects (temperature and turbidity) are not expected to be evident at the 6th field subwatershed scale, and would not cumulatively affect water quality at the 5th field watershed. At the 5th field watershed scale, no increase in temperature or sediment would be expected due to the cumulative effects of any Gotchen action alternatives along with grazing, new trail construction or potential future vegetation proposals. Other ongoing or scheduled activities associated with the Gotchen project and not addressed below (i.e. underburning, young stand thinning, etc.) are considered to have negligible cumulative effects to aquatic resources.

Implementing any of the Gotchen Alternatives would introduce small amounts of sediment, primarily due to use of the road system, and decommissioning of some 6.3 miles of road. The sediment increases from the Gotchen project would be cumulative with sediment introduction that occurs at locations where cattle congregate in or around stream channels. However, as described previously, the Gotchen project should actually reduce some of the sediment introduction from grazing by leaving forest material lying on the ground or jackstrawed in the vicinity of specific stream reaches, and thereby reducing the direct access to the streams by cattle. Although the Gotchen project could affect water temperatures in some limited reaches of Hole in the Ground Creek, there should be no cumulative effects with grazing relative to water temperatures.

Construction and use of the approximately 5.6 miles of new trail is likely to introduce sediment that would be cumulative with the small amounts of sediment contributed by the Gotchen Action Alternatives. This material, however, is not expected to reach the White Salmon River, and would not affect water quality there.

All of the potential future vegetation activities would likely contribute to increases in turbidity. The degree of the effect is probably small, as Riparian Reserves would protect streams on the National Forest from direct impacts or introductions of sediment. State Forest Practices Act rules for riparian treatment should similarly limit sediment introduction there.

FISHERIES

Issue: Effects to Fish Habitat And Fish Populations

Fish populations could be affected if the implementation of this project affects the water quality (namely sediment and stream temperature) in fish-bearing streams in and downstream of the Gotchen Planning Area. Water quality may be altered if the prescribed harvest activities result in changes to streamside shade; peak or low stream flows; and/or increased sediment delivery to streams. When management activities change the hydrology of an area to such an extent that the sedimentation rate is increased above that which a stream has the capacity of transporting out of the system, the result is a loss in fish habitat quality. The decommissioning of roads, specifically culvert removal, is also a contributor of sediment to stream systems in the short term.

The Measurement Methods noted below are the basis for the fisheries effects determinations; the fisheries effects are based, to a large extent, on the hydrology analysis in previous section.

Measurement Methods

Acres of activity type and resulting changes to streamflows, stream temperatures, and sediment input into fish-bearing streams.

Amount, type, and proximity of tree removal to streams with above- surface flow to the White Salmon River.

Number of culverts removed and resultant sediment input into fish-bearing streams.

Alternative A – No Action

Direct, Indirect, and Cumulative Effects (1-5 years)

Sediment levels in the White Salmon River are naturally high due to glacial runoff from Mt. Adams. Additional sediment input from increases in the drainage network caused by existing roads would continue to affect the stream hydrology and sediment input at current levels. Because there are no fish-bearing streams or above- surface stream channels which flow into the White Salmon River from the Gotchen and King Mt. 7th field drainages (11G and 11H), there would be no sediment input from these subwatersheds into any fish-bearing stream.

The streams in the Gotchen planning area with direct flow into the White Salmon River include Wicky Creek, Buck Creek, and Cait Creek. Sediment input into streams in Wicky and Buck Creek drainages is most likely currently elevated to some extent from the presence of nearby roads and stream crossings. Cait Creek only flows _ mile and there are no roads adjacent to this stream. The only potential sediment source to

Cait Creek is the Buck Creek Trail bridge crossing, but this input is considered to be negligible.

There would be direct concerns for fisheries in these streams since none have been determined to be fish-bearing. Downstream effects to fish and fish habitat from sediment flushing down these tributaries and depositing in the White Salmon River would expect to be minimal and likely of low concern due to the high flows of the White Salmon River, which quickly dissipates sediment input. The downstream riverbanks are well armored against bank erosion by boulder and bedrock. No changes in fish habitat in the White Salmon River would be expected, although it is difficult to determine the effects on aquatic resources if extensive forest mortality occurs in the future.

It is unknown if water quality (i.e. stream sediment input or temperature) or quantity in the White Salmon River would change if the Gotchen planning area remains untreated. The condition of the forest canopy greatly determines watershed conditions and hydrology (see Hydrology Assessment, previous section), and it is an uncertainty if the forest canopy would continue to defoliate or begin to recover in the future. However, low flows and stream temperatures in the White Salmon River would not be a concern due to the steady supply of cold, glacial snowmelt into the river during the hot summer months.

Cumulative Effects (10 and 50 years)

Ongoing actions that would likely add some sediment to the White Salmon River include trail maintenance and cattle grazing. The amount of sediment input from these activities to fish-bearing streams in and downstream of the Gotchen Planning Area is considered to be minimal, short term, and within the range of natural variability. The 100 miles of existing roads in the Gotchen Planning Area would also contribute sediment into fish-bearing streams, although the extent is unknown. Several hundred acres of pre-commercial plantation thinning and commercial timber harvest is projected for future decades. While no harvest is anticipated in areas where stream channels would be negatively impacted, the degree of impacts from future harvest activities is undetermined at this time.

Effects To Fisheries Common To All Action Alternatives

Direct, Indirect, and Cumulative Effects (1-5 years)

There are no fish-bearing streams in or adjacent to any of the proposed harvest units or roads to be decommissioned in the Gotchen planning area. The closest proposed activity to a fish-bearing stream is located more than _ mile from the White Salmon River. Any harvest of the riparian area would occur only on streams that are non fish-bearing and have no above-surface connection to the White Salmon River.

There would be no anticipated effects to fish populations in the White Salmon River within or downstream of the Gotchen Planning Area. Therefore, all of the action alternatives would have ***no effect*** to PETS fish species. Table 4-44 summarizes the

fish PETS species considered in the analysis and effects from the proposed alternatives on (PETS) fish species that may occur in the Gotchen Planning Area. Fish species listed are taken from the Pacific Northwest Region, USDA Forest Service Threatened, Endangered, and Species Proposed for Listing document, effective November 11, 2000, and updated in September 2002.

Table 4-44. Summary of effects to PETS fish species from the Gotchen project, Gifford Pinchot National Forest, WA.

	Alternatives					
	Pre-field Review	Field Recon.	**A No Action**	**B Action**	**C Action**	**D Action**
Fish Species	Existing Sightings	Habitat or Species Present				
ENDANGERED/THREATEND						
Columbia River bull trout *(Salvelinus confluentus)*	No	Potential habitat	No Effect	No Effect	No Effect	No Effect
Lower Columbia River steelhead *(Oncorhynchus mykiss)*	No	No	No Effect	No Effect	No Effect	No Effect
Middle Columbia River steelhead *(Oncorhynchus mykiss)*	No	No	No Effect	No Effect	No Effect	No Effect
Lower Columbia River chinook *(Oncorhynchus tshawytscha*)	No	No	No Effect	No Effect	No Effect	No Effect
Puget Sound chinook *(Oncorhynchus tshawytscha)*	No	No	No Effect	No Effect	No Effect	No Effect
CANDIDATE OR SENSITIVE SPECIES						
Southwestern Washington/Columbia River coastal cutthroat trout *(Oncorhynchus clarki)*	No	Potential habitat	No Impact	No Impact	No Impact	No Impact
Lower Columbia River/Southwest Washington coho *(Oncorhynchus kisutch)*	No	No	No Impact	No Impact	No Impact	No Impact
Interior Red Band Trout *(Oncorhynchus gairdneri)*	No	No	No Impact	No Impact	No Impact	No Impact
Pygmy Whitefish *(Prosopium coulteri)*	No	No	No Impact	No Impact	No Impact	No Impact

PET species – NE=No Effect, NLAA=Not Likely to Adversely Affect, LAA= Likely to Adversely Affect
NLJ=Not Likely to Jeopardize Sensitive species (S) – No Impact/May Impact

The Hydrology analysis included in this Statement found minimal- to no- impacts to the hydrology, riparian areas, channel conditions, or water quality of the White Salmon River from any of the action alternatives. No detectable changes in sediment input, stream temperatures, streamflows, or quality of fish habitat would be anticipated from the implementation of any of the action alternatives. All Aquatic Conservation Strategy Objectives would be met as described in the Hydrology analysis.

Alternative B

Direct, Indirect, and Cumulative Effects (1-5 years)

The majority of acres treated in Alternative B (as well as the other action alternatives) would occur in the Gotchen (11G), King Mt. (11H), and the two northern fingers of the Lower White Salmon (11I) 7th field drainages. None of these areas contain fish-bearing streams or streams that contribute above surface flow into the White Salmon River. Table 4-45 illustrates the number of net acres by activity types within each of the 7th field drainages for Alternative B. The key differences in Alternatives C, C-1 and D, compared to Alternative B that are pertinent to the fisheries analysis are summarized following Table 4-45.

Of the three 7th field drainages with potential bull trout habitat in the Gotchen planning area, 11I, 11Z and 11Y, no treatments are proposed in 11Z, the Middle White Salmon River drainage. Of the three subwatersheds with potential bull trout habitat in the Gotchen planning area, 11I, 11Z and 11Y, no treatments are proposed in 11Z, the Middle White Salmon River. Two activities are proposed in Cait Creek (11Y) which would occur in the next ten years. This includes 32 acres of plantation maintenance and 9 acres of thinning and under-burning which both take place in existing plantations. Fuel inventories would be conducted after thinning to determine fuel loadings and subsequent under-burning would occur if needed. None of these actions take place within a mile of a perennial stream and are anticipated to have ***no effect*** to fish populations or habitat.

Of the drainages with above surface stream flow into the White Salmon River, approximately 0.6 miles of road is proposed for decommissioning in the Wicky/Morrison Creek (11F) drainage, and 0.4 miles is proposed in the Lower White Salmon River drainage (11I) (table 4-45). There are no stream crossings on these roads, and no sediment is expected to reach any fish-bearing stream from these decommissions. Four stream crossing culverts from Forest Service road 8225-150 road would be removed during decommissioning. All of these culverts lie in the Gotchen Creek drainage (11G). Streams associated with these culverts are not fish-bearing and have no above surface flow to the White Salmon River. Therefore, no effects to fisheries or fish habitat are expected from road decommissioning within the project planning area.

There are no fish-bearing streams in or adjacent to any of the proposed harvest units or roads to be decommissioned in the Gotchen planning area. The closest proposed activity to a fish-bearing stream is located more than _ mile from the White Salmon

River. Any harvest of the riparian area would occur only on streams that are not fish-bearing and have no above surface connection to the White Salmon River. Of the 294 treatment acres and 0.44 miles of road decommissioning in the Lower White Salmon River 7th field drainage (11I) (a fish-bearing drainage due to the inclusion of the White Salmon River), none of the treatment acres lie near streams or riparian reserves.

Table 4-45. Number of net acres of activity types by 7th field drainage in Alternative B.

Altern. B Activity Type	Wicky/Morrison (11F)	Gotchen/Hole in the Ground (11G)	King Mtn. (11H)	Lower White Salmon (11I)	Buck Creek (11J)	Cait Creek 11Y
Aspen Restoration		10				
Fuels Reduction & Reforestation		8		36		
Fuels Reduction & Reforestation		307				
Gap Sapling Thin		96		4		
Harvest Heavy Retention		45		20		
Harvest Light Retention			80			
Harvest Medium Retention		4	165	61		
Legacy Tree Culture		81				
LP Understory Thin			51			
Plantation Maintenance		6				32
PP Understory Thin	2	46		20		
Sanitation Thin			37	55		
Shaded Fuelbreak		222	157	98		
Shaded Fuelbreak Rip. Res.		6				
Thin/Underburn Yrs 11-20	19	215	183		4	16
Thin/Underburn Yrs 21-30	28	53	25		69	93
Thin/Underburn Yrs 6-10	12	140	43		11	9
Uneven Age Management			48			
Total Treatment Acres	61	1235	785	294	84	150
Miles of Road Decom.	0.58	4.8	0.50	0.44	0	0
Total Road Miles by 7th field	9.9	38.1	30.1	18.1	16.6	6.8

Alternatives C, C-1 and D

Direct, Indirect, and Cumulative Effects (1-5 years)

It is anticipated that the direct, indirect, and cumulative effects to fisheries from the implementation of Alternatives C, C-1 and D would be the same as described in Alternative B. The differences between each of these alternatives and Alternative B, pertinent to the Fisheries analysis, are summarized below.

Alternative C

Fewer Shaded Fuelbreak acres would be treated. In Alternative C, 145 acres would be treated in Unit S only, which lies in the King Mtn. (11H) 7th field drainage. Alternative B proposes treating 475 acres in the Gotchen (11G), King Mtn. (11H), and Lower White Salmon (11I) 7th field drainages.

Less acres of canopy would be opened. Thirty acres of Landing Gap Sapling Thinning would occur in the Gotchen (11G) drainage, as opposed to 102 acres proposed in the same drainage in Alternative B.

More thinning around legacy trees is proposed. In the Gotchen 7th field drainage (11G), 251 acres would be thinned, as opposed to 81 acres in Alternative B.

The majority of trees harvested would be small diameter (10 inch dbh or less).

More of the grand fir understory would be eliminated. In Alternative C, 756 acres would be treated; 699 of these acres lie in the Gotchen drainage (11G), and 56 acres are in the Lower White Salmon River (11I) drainage. No Understory Density Reduction is proposed in Alternative B.

Alternative C-1

Since there are no anticipated effects to fisheries or fish habitat from road decommissioning, the direct, indirect, and cumulative effects to fisheries from the implementation of Alternative C-1 would be the same as Alternative C.

Alternative D

In summary, the resultant differences of Alternative B from D.

Only small diameter trees would be harvested (10 inch dbh or less) in Alternative D.

No treatment of Unit V, a 7 acre Shaded Fuelbreak unit in the Gotchen (11G) 7th field drainage would occur.

No harvest of the riparian area except in unit Z, the aspen regeneration unit, located in the Gotchen (11G) 7th field drainage would occur.

Cumulative Effects (10 and 50 Years) for all alternatives

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this analysis.

Since there would be no effect on PETS fish species or habitat as a result of implementing any of action alternatives, there would be no cumulative effects on fish species or habitat in the long-term in conjunction with the potential projects included in the cumulative effects analysis. Effects of the Gotchen project would have no downstream effects to the fish populations in the White Salmon River watershed since there would be minimal-to-no impacts to the hydrology, riparian areas, channel conditions, or water quality of the White Salmon River from the implementation of this project (see Hydrology Analysis).

Any changes that may result in grazing practices after project implementation was considered in this analysis. Future thinning and under-burning is planned to occur within the next 10-30 years in existing plantation stands (table 4-45). This action is not expected to have any cumulative negative effects to fish populations or habitat.

Consultation With USFWS And NOAA Fisheries

This project would have no effect on bull trout or its habitat as described on page 11 of "A Framework to Assist in Making Endangered Species Act Determinations of effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale" (USDI, 1998). In addition, this project would have no effect on Lower Columbia River steelhead, Middle Columbia River steelhead, and Lower Columbia River Chinook. No consultation or conferencing is required with the USFWS or the NOAA Fisheries.

Future federal actions that may affect PET fish species would require separate consultation pursuant to section 7 of the ESA.

CULTURAL RESOURCES

Issue: Effects to Prehistoric and Historic Sites

Several prehistoric sites have been documented within the Gotchen planning area, as well as a number of historic sites relating to grazing. Historic sites include the Gotchen Creek Guard Station, which functioned as the headquarters for the Mt. Adams Ranger District from its construction in 1909 until 1916. The site was selected to allow the District Ranger to administer grazing activities. It is the oldest standing structure on the Gifford Pinchot National Forest. Removing any large trees within the two meadows surrounding the Gotchen Creek Guard Station could negatively affect its historical setting. The potential effect of proposed activities on all of the known cultural resource sites would be assessed.

Measurement Method

Number of known prehistoric or historic sites potentially affected.

Alternative A—No Action

Direct, Indirect Cumulative Effects

Prehistory/Native Use

Habitat for traditional food and medicinal plants could be reduced within the next ten years, due to tree encroachment into grassy openings and meadows. Input from representatives of the Yakama Indian Nation indicates that the gathering of plants for food and medicinal use was an important activity, which occurred in the Gotchen Planning Area. Habitat for many of these species occurs in grassy openings and

meadows. Prior to 1900, fire was the primary means of maintaining habitat for many of these species.

Forest Service Administrative History

Within the next five years, little direct change would be discernible in the vicinity of the Gotchen Creek Guard Station, although tree encroachment within the adjacent meadow would continue.

Unless a wildfire occurs, the area surrounding the Gotchen Creek Guard Station would likely be covered with a dense stand of grand fir and lodgepole pine. Historic photos indicate that in 1910, shortly after it was constructed, the surrounding area contained primarily mature aspen trees.

The threat of wildfire would likely increase in the long-term, particularly in the untreated bug kill areas. A wildfire in the area could destroy not only the historic setting of the Gotchen Creek Guard Station, but the actual structure itself.

Dendroglyphs

Within the next 50 years, most of the carved aspens which have been documented within the Gotchen Planning Area would have exceeded their natural life span and died.

Effects Common to All Action Alternatives

Direct, Indirect, Cumulative Effects

Prehistory/Native Use

Within the next five years, there would be little direct or indirect impact on prehistoric cultural resources within the Gotchen Planning Area. Although two units within Alternatives B, C, and D propose activities in the vicinity of recorded prehistoric sites, no ground disturbing activities would be allowed within site boundaries.

Historic Grazing

Unit M within alternatives B, C, and D proposes harvest in the vicinity of an historic corral at Cherry Flats. The site would be designated for protection, and directional felling away from the site should result in no impacts. Unit AA within Alternatives B, C and D proposes harvest in the vicinity of a log trough dating to 1920. The site would be designated for protection, and directional felling away from the site should result in no impacts. Unit Q in alternatives B and D proposes harvest in the vicinity of the historic Gotchen Creek Corral. The site would be designated for protection, and directional felling away from the site should result in no impacts.

Dendroglyphs

Within the next five years, there should be minimal impact on carved aspen sites within the Gotchen Planning Area. Although there are a total of 114 carved aspen trees documented within proposed units, all of the carved trees would be designated for protection. Under proposed harvest prescriptions, aspen would not be selected for harvest in any units. Slash treatment activities pose the biggest threat to carved aspen sites. In order to mitigate this potential effect, slash piles would not be placed within 50 feet of any carved aspen trees. In units where underburning is proposed, all fuel material would be manually removed from within 50 feet of individual carved trees prior to treatment.

Forest Service Administrative History

Proposed activities in unit Z and unit EE would have a short-term negative visual impact on the setting of the Gotchen Creek Guard Station, resulting from sawdust, firewood piles and stumps.

Figure 4-2. Gotchen Creek Guard Station. Ca 1910.

Within the next ten years, the effects of harvest around the Gotchen Creek Guard Station would be less discernible, and the setting would more resemble the original, as seen in 1910 photographs. Over the long term, harvest of unit Z would likely restore the historic setting of the Gotchen Creek Guard Station.

Within the next 50 years, aspens would have reached maturity and it would more closely resemble the historic setting.

The potential for a large-scale wildfire to destroy the structure would be reduced.

SOCIO-ECONOMIC

Demographic

Alternative A

The rural makeup of communities surrounding the Gotchen planning area is not forecast to change.

The ethnicity of these communities is relatively stable. The increase in primarily Hispanic/Latino population throughout the region is offset locally by the migration of more affluent, predominantly white families into the Trout Lake area.

Proximity to place of employment is becoming less of a factor through telecommuting or retirement making scenic, rural communities such as Trout Lake desirable lifestyle options. With the migration from urban areas new rural populations expect many of the amenities of an urban lifestyle, including increased expectation for fire protection services.

Alternatives B, C, and D

Implementation of any of the action alternatives is not expected to have an effect on the demographic of the communities that surround the Gotchen Planning Area.

Economy

Alternative A

The continuing risk of fire originating in the Gotchen Planning Area presents a concern to both adjacent landowners and to those who rely on natural resources for livelihood or subsistence. The fear is that fire originating in the Gotchen Planning Area would spread off of the Gifford Pinchot National Forest and into adjacent private, State, or Reservation lands. The risks are exacerbated by poverty. Poorer rural households located in wooded, fire-prone areas are at risk for a variety of reasons: structures that are not fire-proofed, residents lack adequate fire insurance, and residents may have fewer economic reserves to absorb the economic shock of losses from fire[9]. Luxurious homes located in similar areas may be as susceptible to fire, however residents are better insured against such losses and are more economically resilient. Nevertheless, the potential for fire losses represents a considerable economic risk to the local economy.

[9] *Wildfire and Poverty: An Overview of the Interactions Among Wildfires, Fire-Related Programs, and Poverty in the Western States.* The Center of Watershed and Community Health, Mark O. Hatfield School of Government, Portland State University

The potential for fire to spread to adjacent industrial private or State forest lands represents a serious economic threat from direct resource loss and indirectly from the cost of suppression.

The cumulative effect of decades of fire suppression on the National Forest and on adjacent private, State, and Reservation lands would continue to increase economic risk as the fuel loading increases across the landscape.

Intense fire activity within the Gotchen Planning Area has the potential to have an impact to native plant sources of traditional foods and medicines. This impact would be negative in the short term by damaging or destroying plants within the burned area. Some species would benefit from fire in the long term. For instance, productivity of an important food source to American Indians, huckleberry *(Vaccinium membranaceum),* increases with low- to moderate-intensity fire by reducing competing vegetation. However, plants subjected to regular fire intervals may be better suited to surviving fire than individuals developed under fire suppression. Plants are consumed by fire only when adequate fuels are present to dry and preheat stems and foliage[10].

Alternatives B, C, and D

All action alternatives may have a positive short-term economic benefit to the economy of the local community by providing employment associated with logging and fuel treatment activities.

The cumulative economic effect of the implementation of any of the action alternatives would be additive in terms of the amount of increased employment. Fuel treatment activities are recurring and may supplement or extend employment for persons employed in agricultural or other natural resource jobs.

The risk of stand replacement fire is directly reduced from treatment of flammable fuels and indirectly from management of stand density. Economic losses from the spread of fire off of national forest lands into adjacent private, State, or Reservation lands is indirectly affected by these actions. Treatment of fuels and other risk reduction activities within the Gotchen Planning Area do not guarantee protection to property located miles away, however the risk is potentially reduced particularly when fire danger conditions are severe.

Fuel management activities on adjacent private, State, and Reservation lands are expected to remain at the same levels or be somewhat increased in the foreseeable future as a result of increased public awareness following the 2002 fire season. Cumulatively, the actions proposed for the Gotchen Planning Area together with increased emphasis on fuel reduction on (particularly) smaller private ownerships and State lands, should reduce the exposure to economic loss from fire. As fuel reduction activities become more widespread across the region, the economic risk is expected to

[10] Dahlgreen, Matthew Craig. 1984. Observations on the ecology of Vaccinium membranaceum Dougl. on the southeast slope of the Washington Cascades. Seattle, WA: University of Washington. 120 p. Thesis. [2131]

decrease further. However compliance is voluntary and there are (as yet) no direct incentives for landowners to undertake fuel reduction actions.

Areas that are historically important for the presence of medicinal and food plants would benefit from the reintroduction of low intensity, high frequency fire through Prescribed Fire treatment (common to all alternatives). Most of these plants benefit from this treatment by reducing competing vegetation that is more susceptible to fire than desirable species. Fire was used as a tool by American Indians to limit meadow encroachment, remove competing plants coming up in the understory of stands of desirable plants. The Prescribed Fire treatment would restore these conditions in select areas on a regular, controlled basis. Economics of Treatment Proposal

An economic analysis of the treatment alternatives was done to compare the benefits with their costs. A summary of the analysis is included here; the details are contained in the Economics report in the Project file. Because these benefits and costs are distributed through time, a meaningful comparison required that these figures be discounted to a common point in time (ten years after harvest treatment). Hence, the present value of the benefits was compared to the present value of the costs. This comparison is displayed as the present net value (PNV) for each alternative. NEPA planning costs and surveys were not included in the analysis. The PNV for all of the treatment alternatives is a negative value. The stumpage values received for the different alternatives were not sufficient to produce a positive PNV. The benefit/cost ratio is also displayed for the economic efficiency of the alternative.

Table 4-46. Economic Comparison of the Treatment Alternatives.

	Present Net Value (PNV)	Benefit/Cost
Alternative B	-$113,753	1:-1.14
Alternative C	-$657,285	1:-2.26
Alternative C-1	-$648,737	1:-2.25
Alternative D	-$476,185	1:-1.97

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GLOSSARY

Many of the definitions in this glossary are referenced to the following sources. The sources are identified by a number in parentheses following the definition. This number corresponds to the list below. Some other terms will be referenced to Forest Service Manuals (FSM), Forest Service Handbooks (FSH), or other sources which are too numerous to list. Finally, many other definitions are not referenced, but are those in general use on the Forest.

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A

Activity - An action, measure or treatment undertaken that directly or indirectly produces, enhances, or maintains forest and rangeland outputs, or achieves administrative or environmental quality objectives (FSM 1309, Management Information Handbook). An activity can generate multiple outputs. (2)

Activity Center [Spotted Owl Activity Center] - An area of concentrated activity of either a pair of spotted owls or a territorial single owl.

Administrative Site – Facilities required to accomplish the administration of the National Forest.

Alternative - One of several policies, plans, or projects proposed for decision making. (2) (10)

Amendment 11 – This amendment is an amalgam of the prevailing direction and standards and guidelines from the Northwest Forest Plan ROD and the Gifford Pinchot Forest Plan. This amendment replaces Gifford Pinchot Forest Plan , pages IV-45 through IV-150, Forest–wide and Management Area Standards and Guidelines.

Aquatic Conservation Strategy (ACS)– The aquatic conservation strategy is part of the Northwest Forest Plan standards and guidelines and contains four components: riparian reserves; key watersheds; watershed analysis; and watershed restoration.

Aquatic Ecosystem - Any body of water, such as a stream, lake or estuary, and all organisms and nonliving components within it, functioning as a natural system. (11)

Aquatic Habitat - Habitat that occurs in free water. (11)

Aquatic System – See Aquatic Ecosystem

Artifact - An object made or modified by humans. (4)

Associated Species - A species found to be numerically more abundant in a particular forest successional stage or type compared to other areas. (11)

At-risk Fish Stocks - Stocks of anadromous salmon and trout that have been identified by professional societies, fish management agencies, and in the scientific literature as being in need of special management consideration because of low or declining populations. (11)

B

Background - In visual management terminology, refers to the visible terrain beyond the foreground and middle ground where individual trees are not visible, but are blended into the total fabric of the stand. Also a portion of a view beyond three to five miles from the observer, and as far as the eye can detect objects. (6)

Biodiversity – See Biological Diversity.

Biological Diversity - The variety of life forms and processes, including a complexity of species, communities, gene pools, and ecological functions. (11).

Biomass - The total quantity (at any given time) of living organisms of one or more species per unit of space (species biomass), or of all the species in a biotic community (community biomass). (11)

C

CEQ - See Council on Environmental Quality

CFR - See Code of Federal Regulations

Candidate Species - Those plants and animals included in Federal Register "Notices of Review" that are being considered by the Fish and Wildlife Service for listing as threatened or endangered. Two categories that are of primary concern: Category 1 - Taxa for which there is substantial information to support proposing the species for listing as threatened or endangered. Listing proposals are either being prepared or have been delayed by higher priority listing work. Category 2 - Taxa information indicates that listing is possibly appropriate. Additional information is being collected. (11)

Canopy - The more-or-less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth. (3)

Canopy Closure - The degree to which the canopy (forest layers above one's head) blocks sunlight or obscures the sky. It can only be accurately determined from measurements taken under the canopy as openings in the branches and crowns must be accounted for. (11)

Catastrophic Fire – See Stand-Replacing Wildfire

Cavity - The hollow excavated in trees by birds or other natural phenomena; used for roosting, food storage, and reproduction by many birds and mammals. (2)

Cavity Nester - Wildlife species, most frequently birds, that require cavities (holes) in trees for nesting and reproduction. (11)

Ceded Land – Lands transfered to the Federal government from the Yakama Nation in the Treaty of 1855.

Class I Areas - National Parks or Wildernesses that receive the greatest air quality protection under the Clean Air Act's Prevention of Significant Deterioration (PSD) Program.

Climax - The culminating stage in plant succession for a given site where the vegetation has reached a highly stable condition. (6)

Climax Species - Those species that dominate a climax stand in either numbers per unit area or biomass.

Closely Associated Species - A species is designated as "closely associated" with a forest successional stage if the species is found to be significantly more abundant in that forest successional stage compared to the other successional stages, if it is known to occur almost exclusively in that successional stage, or if it uses habitat components that are usually produced at that stage. (11)

Coarse Woody Debris (CWD) - Portion of a tree that has fallen or been cut and left in the woods. Usually refers to pieces at least 20 inches in diameter. (11)

Code of Federal Regulations (CFR) - A codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal government. (11)

Commercial Timber Harvest – The removal of merchantable trees**.**

Commercial Thinning - The removal of generally merchantable trees from an even-aged stand, usually to encourage growth of the remaining trees. (11)

Community (natural) Refers to an assemblage of populations of plants, animals, fungi and bacteria that live in an environment and interact with one another, forming together a distinctive living system with its own composition, structure, environmental relations, development, and function.

Compaction - The packing together of soil particles by forces exerted at the soil surface, resulting in increased soil density.

Connectivity - A measure of the extent to which conditions among LS/OG forest areas provide habitat for breeding, feeding, dispersal, and movement of LS/OG-associated wildlife and fish species (see LS/OG Forest)**.** (11)

Connectivity Corridors – An area of land or habitat that provides for the passage and /or migration of wildlife.

Consultation - Formal consultation is a process that occurs between the Fish and Wildlife Service or the National Marine Fisheries Service and a federal agency that commences with the federal agency's written request for consultation under Section 7(a)(2) of the Endangered Species Act regarding a federal action which may affect a listed species or its critical habitat. It concludes with the issuance of the biological opinion under Section 7(b)(3) of the Act. Informal consultation is an optional process that includes all discussions, correspondence, etc., between the Fish and Wildlife Service and the federal agency, or the designated nonfederal representative, prior to formal consultation, if required. If the listing agency determines that there is no likely adverse affect to the listed species, it may concur with the action agency that formal consultation is unnecessary.

Corridor - A linear strip of land identified for the present or future location of transportation or utility rights-of-way within its boundaries. (1)

Cost efficiency - The usefulness of specified inputs (costs) to produce specified outputs (benefits). In measuring cost efficiency, some outputs, including environmental, economic, or social impacts, are not assigned monetary values, but are achieved at specified levels in the least costly manner. Cost efficiency is usually measured using present net value, although use of benefit cost ratios and internal rate-of-return may be appropriate. (1)

Council on Environmental Quality (CEQ) - An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters. (Abstracted from the National Environmental Policy Act of 1969, as Amended.)

Cover - Vegetation used by wildlife for protection from predators, or to mitigate weather conditions, or to reproduce. May also refer to the protection of the soil and the shading provided to herbs and forbs by vegetation. (11)

Critical Habitat - Under the Endangered Species Act, critical habitat is defined as (1) the specific areas within the geographic area occupied by a federally listed species on which are found physical and biological features essential to the conservation of the species, and that may require special management considerations or protection; and (2) specific areas outside the geographic area occupied by a listed species, when it is determined that such areas are essential for the conservation of the species. (11)

Critical Habitat Unit (CHU) – Critical habitat designated for the spotted owl occurs as 190 nindividual units on approximately 6.9 million acres of Federal lands distributed across the spotted owl's range in Washington, Oregon, and California. Each CHU is part of a larger network of habitat areas important for maintaining a stable and self-sustaining opulation of spotted owls. (Federal Register Vol. 57, No. 10, January 15, 1992. pp. 1796-1838).

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

Crown height - In a standing tree, the vertical distance from ground level to the base of the crown, measured either to the lowest live branch whorl, or to the lowest live branch (excluding shoots arising spontaneously from buds on the stem of a woody plant), or to a point halfway between. (3)

Cultural resource - The remains of sites, structures, or objects used by humans in the past—historic or prehistoric. (2)

Cumulative Effects- Those effects on the environment that result from the incremental effect of the action when added to the past, present, and reasonably foreseeable future actions regardless of what agency (Federal or nonfederal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. (11)

D

DBH - See Diameter at breast height

DEIS - See Draft Environmental Impact Statement

Decommission - To remove those elements of a road that reroute hillslope drainage and present slope stability hazards. Another term for this is "hydrologic obliteration." (11)

Deer and Elk Winter Range - See Big game winter range.

Defoliation – removal of all of the foliage from a tree, shrub, or herb.

Desired Future Conditions (DFC) – DFCs are established in the Gifford Pinchot Forest Plan and express the condition of the Forest as the Forest Plan is implemented.

Developed recreation site - Relatively small, distinctly defined areas where facilities are provided for concentrated public use, e.g., campgrounds, picnic areas, swimming areas, and downhill ski areas. (6)

Diameter at breast height (d.b.h.) - The diameter of a tree measured 4 feet 6 inches above the ground. (6)

Dispersal Habitat - Habitat that supports the life needs of an individual animal during dispersal. Spotted owl dispersal habitat consists of forest stands with adequate tree size and canopy closure to provide protection from predators and minimal foraging opportunities. Dispersal habitat plays a key role in providing habitat connectivity between patches of late-successional forest. (11)

Dispersed recreation - A general term referring to recreation use outside developed recreation sites; this includes activities such as scenic driving, hiking, backpacking, hunting, fishing, snowmobiling, horseback riding, cross-country skiing, and recreation in primitive environments. (2)

Disturbance - A force that causes significant change in structure and/or composition through natural events such as fire, flood, wind, or earthquake, mortality caused by insect or disease outbreaks, or by human-caused events, e.g., the harvest of forest products. (11)

Diversity - The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan. (2) (1)

Down Woody Material – Trees or portions of trees that have fallen or been cut and left in the woods. Particularly important as habitat for some LS/OG-associated species.

Draft Environmental Impact Statement (DEIS) The draft statement of environmental effects which is required for major federal actions under Section 102 of the National Environmental Policy Act, and released to the public and other agencies for comment and review. (6)

Drainage - An area (basin) mostly bounded by ridges or other similar topographic features, encompassing part, most, or all of a watershed and enclosing some 5,000 acres (see Subdrainage and Forest Watershed). (11)

Duff Layer - As specifically defined in the FEMAT Report, the layer of loosely compacted debris underlying the litter layer on the forest floor.

E

EIS - See Environmental Impact Statement

Early-Successional Forest - Forest seral stages younger than mature and old-growth age classes.

Eastside - Generally, east of the crest of the Cascade Range.

Ecological Health - The state of and ecosystem in which processes and functions are adequate to maintain diversity of biotic communities commensurate with those initially found there. (11)

Ecological Series – see Seral Stages

Ecosystem - An interacting system of organisms considered together with their environment, for example, marsh, watershed, and lake ecosystems. (2)

Ecosystem Management - The use of an ecological approach in land management to sustain diverse, healthy, and productive ecosystems. Ecosystem management is applied at various scales to blend long-term societal and environmental values in a dynamic manner that may be adapted as more knowledge is gained through research and experience.

Edge Habitat - An area where plant communities meet or where successional stages or vegetation conditions within the plant communities come together. (2)

Effects - Environmental changes resulting from a proposed action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action

and are later in time or further removed in distance, but which are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic quality, historic, cultural, economic, social, or healthy effects, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency believes that the effects will be beneficial. (40 CFR 1508.8, 2)

Endangered Species - Any species of plant or animal defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range, and published in the Federal Register. (11)

Endemic - A species that is unique to a specific locality. (11)

Environmental Consequences – A section of the Council on Environmental Quality (CEQ) regulations that forms the scientific and analytic basis for the comparisons of alternatives.

Environmental Impact Statement (EIS) - A statement of the environmental effects of a proposed action and alternatives to it. It is required for major federal actions under Section 102 of the National Environmental Policy Act (NEPA), and released to the public and other agencies for comment and review. It is a formal document that must follow the requirements of NEPA, the Council on Environmental Quality (CEQ) guidelines, and directives of the agency responsible for the project proposal. (6)

Erosion - (1) The wearing away of the land surface by running water, wind, ice, or other geologic agents, including such processes as gravitation creep; or (2) detachment and movement of soil or rock fragments by water, wind, ice, or gravity. The following terms are used to describe different types of erosion:

Accelerated Erosion - Erosion which is much more rapid than natural erosion, with the increase in erosion rate resulting primarily from the influence of human activities, or, in some cases, of other events that expose mineral soil surfaces, such as wildfire.

Gully erosion - The erosion process whereby water accumulates in narrow channels, and over short periods, removes the soil from this narrow area to considerable depths, ranging from 4 inches to as much as 75 to 100 feet.

Rill erosion - An erosion process in which numerous small channels less than 4 inches deep and 6 inches wide are formed.

Sheet erosion - The removal of a fairly uniform layer of soil from the land surface by runoff water.

F

FEMAT - See Forest Ecosystem Management Assessment Team

FEIS - See Final Environmental Impact Statement

Federally Listed Species – Species formally listed as a threatened ort endangered species under the federal Endangered Species Act; designations are made by the U.S. Fish and Wildlife Service or National Marine Fisheries Service.

Final Environmental Impact Statement (FEIS) - The final report of environmental effects of proposed action on an area of land. This is required for major federal actions under Section 102 of the National Environmental Policy Act. It is a revision of the draft environmental impact statement to include public and agency responses to the draft. (11)

Fire frequency - The return interval of fire.

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

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

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

Fish Stocks – Of or relating to fish populations**.**

Fish-Bearing Streams - Any stream containing any species of fish for any period of time.

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

Foraging Habitat - Spotted owl foraging habitat lacks the structural features (i.e., large, old-growth trees) required for nesting, but does provide suitable areas for foraging and roosting.

Forage - All browse and nonwoody plants that are available to livestock or game animals and used for grazing or harvested for feeding. (6)

Forb - Any herb other than grass. (7)

Foreground - A term used in visual management to describe the portions of a view between the observer and up to 1/4 to 1/2 mile distant. (6)

Forest Ecosystem Management Assessment Team (FEMAT) - As assigned by President Clinton, the team of scientists researchers and technicians who formulated and analyzed the ten options which became the alternatives examined in the FSEIS for the President's Plan

Forest Types - A classification of forest land based on the tree species presently forming a plurality of basal area stocking or crown cover of live trees.

Fractured - A rock mass separated into distinct fragments. (11)

Fragmentation - The process of reducing size and connectivity of stands that compose a forest. (11)

Fuel break - A zone in which fuel quantity has been reduced or altered to provide a position for suppression forces to make a stand against wildfire. Fuel breaks are designated or constructed before the outbreak of a fire. Fuel breaks may consist of one or a combination of the following: natural barriers, constructed fuel breaks, constructed barriers. (6)

Fuel Loading - The weight of fuel present at a given site, usually expressed in tons per acre. This value generally refers to the fuel that would typically be available for consumption by fire. Fuel loading varies as a result of disturbance (including human activities), the magnitude of that disturbance, the successional stage of the vegetation, and other conditions of the site.

Fuel treatment - The rearrangement or disposal of natural or activity fuels (generated by management activity, such as slash left from logging) to reduce fire hazard. Fuels are defined as both living and dead vegetative materials consumable by fire.

Fuels - Combustible wildland vegetative materials. While usually applied to above ground living and dead surface vegetation, this definition also includes roots and organic soils such as peat. (10)

Functioning Suitable Spotted Owl Habitat -- The forest vegetation with the age class, species of trees, structure, sufficient area, and adequate food source to meet some or all of the life needs of the northern spotted owl. (11)

G

GIS - See Geographic Information System

Game species - Any species of wildlife or fish for which seasons and bag limits have been prescribed and which are normally harvested by hunters, trappers, and fishermen under state or federal laws, codes, and regulations. (6)

Geographic Information System (GIS) - A computer system capable of storing and manipulating spatial (i.e., mapped) data.

Geomorphic - Pertaining to the form or shape of those processes that affect the surface of the earth. (11)

Goal - A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad general terms and is timeless in that it has no specific date by which it is to be completed. Goal statements form the principal basis from which objectives are developed. (2) (1)

Grass/forb - An early forest successional stage where grasses and forbs are the dominant vegetation.

High level - A regeneration harvest designed to retain the highest level of trees possible while still providing enough disturbance to allow regeneration and growth of the naturally occurring mixture of tree species. Such harvest should allow for the regeneration of intolerant and tolerant species. Harvest design would also retain cover and structural features necessary to provide foraging and dispersal habitat for mature and old-growth dependant species.

Low level - A regeneration harvest designed to retain only enough green trees and other structural components (snag, coarse woody debris, etc.) to result in the development of stands that meet old-growth definitions within 100 to 120 years after harvest entry, considering overstory mortality. (11)

Ground Based Suppression Tactics – Fire fighting using primarily ground forces employing safety zones and anchor points in suppressing wildfire.

H

Habitat - The place where a plant or animal naturally or normally lives or grows. (2)

Heavy Forest Retention - A harvest prescription which retains from 41 to 60 percent canopy cover after harvest.

Heterogeneity - The condition or state of being different in kind or nature.

Hibernacula - A case or covering which protects all or part of an animal or plant from extreme cold. A winter shelter for plants or dormant animals.

High Intensity Fire - A fire with the capability to be stand replacing or to cause excessive damage to late-successional forest characteristics.

Hydrology - The scientific study of the properties distribution and effects of water in the atmosphere, on the earth's surface, and in soil and rocks.

I

Impacts - See Effects

Incidental Take – Take of federally listed fish and wildlife lacks species that results from, but is not the purpose of carrying out an otherwise lawful activity.

Ingrowth - The period after successional growth of a forest stand when it reaches a specified age or structure class. For instance, spotted owl forage habitat. (11)

Interdisciplinary Team - A group of individuals with varying areas of specialty assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad enough to adequately analyze the problem and propose action. (11)

Interior Habitat – The area of late-successional and old-growth forest stands that are not influenced by edge effects. The amount of interior forest habitat on a landscape is an indicator of forest fragmentation.

Intermittent Stream - Any non-permanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria. (11)

Inter-tree competition-related stress – Crowded stands of trees were the density of trees causes growth stress to developing trees due to the competition for nutrients.

Irretrievable - Applies to losses of production, harvest, or commitment of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a winter sports site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible. (10)

Irreversible - Applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options. (10)

Issue - A point, matter, or question of public discussion or interest to be addressed or decided through the planning process. (See also Public issue*.) (2)*

K

Key Watershed - As defined by National Forest and Bureau Land Management District fish biologists, a watershed containing (1) habitat for potentially threatened species or stocks of anadromous salmonids or other potentially threatened fish (Tier 1), or (2) greater than six square miles with high-quality water and fish habitat (Tier 2). (11)

L

LSR - See late-successional reserve

Ladder Fuels – Shrubs and bushy trees close to the ground that can carry fire in to the canopy of dominant larger trees.

Land Allocation - The specification in forest plans of where activities, including timber harvest, can occur on a National Forests. (11)

Land management - The intentional process of planning, organizing, programming, coordinating, directing, and controlling land use actions. (6)

Land (use) allocation - The commitment of a given area of land or a resource to one or more specific uses—for example, to campgrounds or wilderness. (6)

Landscape - A heterogeneous land area with interacting ecosystems that are repeated in similar form throughout. (11)

Late Successional and Old Growth Related Species – Species that are dependent on late-successional and old growth structural complexity.

Late-Successional Forests - Forest seral stages which include mature and old-growth age classes.

Late-Successional Function And Resiliency – Structural characteristics that are with in late-successional and old growth forests.

Late-Successional Reserve (LSR) - A forest in its mature and/or old-growth stages that has been reserved. (11)

Late-Successional Reserve Assessment (LSRA) -- Required by the Northwest Forest Plan, a Late-Successional Reserve Assessment was completed prior to planning for risk reduction activities within the Gotchen LSR. The Gifford Pinchot National Forest Late-Successional Reserve Assessment (LSRA) was completed in 1997 and approved by the Regional Ecosystem Office. The LSRA was updated in 1999 to specifically address the fire threat in the Gotchen LSR.

Legacy Trees – Usually a mature or old-growth tree, that is retained on asite after harvesting or natural disturbance to provide a biological leagacy.

Light Forest Retention - A harvest prescription which retains from 15 to 20 percent canopy cover after harvest.

M

MAC - See Management Area Category

Management Activity - An activity undertaken for the purpose of harvesting, traversing, transporting, protecting, changing, replenishing, or otherwise using resources. (11)

Management Area Category (MAC) - Provides direction (practices) for specific portions of the Forest. Each MAC identifies a goal, or management emphasis, and the desired future condition of the land. Each MAC includes one or more management areas.

Management direction - A statement of multiple use and other goals and objectives, and the associated management prescriptions, and standards and guidelines for attaining them. (1)

Management Indicator species - A species selected because it's welfare is presumed to be an indicator of the welfare of other species using the same habitat. A species whose condition can be used to assess the impacts of management actions on a particular area. (8)

Matrix - Federal lands outside of the six designed areas. (11)

Medium Forest Retention - A harvest prescription which retains from 21 to 40 percent canopy cover after harvest.

Mesic - Pertaining to or adapted to an area that has a balanced supply of water; neither wet nor dry. (11)

Mitigation - Mitigation includes: (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or elimination the impact over time by preservation and maintenance operations during the life of the action; and, (e) compensating for the impact by replacing or providing substitute resources or environments. (40 CFR Part 1508.20)

Mitigation measures - Modifications of actions that (1) avoid impacts by not taking a certain action or parts of an action; (2) minimize impacts by limiting the degree or magnitude of the action and its implementation; (3) rectify impacts by repairing, rehabilitating, or restoring the affected environment; (4) reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or (5) compensate for impacts by replacing or providing substitute resources or environments(11)

Monitoring - A process of collecting information to evaluate if objective and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned. (11)

Multistoried - Forest stands that contain trees of various heights and diameter classes and therefore support foliage at various heights in the vertical profile of the stand. (11)

N

NEPA - See National Environmental Policy Act

NFMA - See National Forest Management Act

NFS - National Forest System

NRF - Nesting, roosting, and foraging habitat for the northern spotted owl.

National Environmental Policy Act (NEPA) - An Act passed in 1969 to declare a National policy that encourages productive and enjoyable harmony between humankind and the environment, promotes efforts that prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, enriches the understanding of the ecological systems and natural resources important to the nation, and establishes a Council on Environmental Quality (The Principal Laws Relating to Forest Service Activities, Agric. Handbook. 453. USDA Forest Service, 359 p.). (11)

National Forest Land and Resource Management Plan - A Plan which ". . . shall provide for multiple use and sustained yield of goods and services from the National Forest System in a way that maximizes long-term net public benefits in an environmentally sound manner." (1)

National Forest Management Act (NFMA) - A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring the preparation of Forest Plans and the preparation of regulations to guide that development. (11)

National Forest Systems (NFS) - All National Forest lands reserved or withdrawn from the public domain of the United States, all National Forest lands acquired through purchase, exchange, donation, or other means, the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012), and other lands, waters, or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system. (16 U.S.C. 1608)

Natural Mortality – Trees dying from natural causes, usually by size class in relation to sequential inventories or subsequent to incidents such as storms, wildfire, or insect and disease epidemics.

Natural regeneration - Reforestation of a site by natural seeding from the surrounding trees. Natural regeneration may or may not be preceded by site preparation.

Neotropical - Designating or of the biogeographic realm that includes South America, the Indies, Central America and tropical Mexico.

Nesting, Roosting, and Foraging Habitat (NRF) - The forest vegetation with the age class, species of trees, structure, sufficient area, and adequate food source to meet some or all of the life needs of the northern spotted owl. (11)

Non-significant Issues -- "Most important, NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail." 40 CFR 1500.1.

Northwest Forest Plan – All Northwest National Forest Plans Bureau of Management plans ere amended by the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (ROD*).* This Amendment was signed May 20, 1994. Attachment A to the ROD, *Standards and Guidelines for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl* (S&Gs), sets forth the management direction intended to facilitate implementation of the ROD. Collectively, the ROD and Attachment A are referred to as the "Northwest Forest Plan".

Notice of Intent (NOI) – A notice published in the Federal Register, after being submitted to the Environmental Protection Agency, that an environmental impact statement will be prepared and considered.

O

Objective - A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals. (1)

Old-growth stand (old growth) - Any stand of trees ten acres or greater generally containing the following characteristics: 1) contain mature and overmature trees in the overstory and are well into the mature growth stage; 2) will usually contain a multi-layered canopy and trees of several age classes; 3) standing dead trees and down material are present; and 4) evidences of man's activities may be present, but do not significantly alter the other characteristics and would be a subordinate factor in a description of such a stand. See the Regional Guide. (2)

Old-Growth Associated Species - Plant and animal species that exhibit a strong association with old-growth forests. (11)

Opening -

Silvicultural Context: a plantation less than 4 _ feet in height and/or not meeting the minimum reforestation stocking standards.a harvest prescription resulting in less than 40 percent crown closure.

Visual Quality Context: stands less than 5 inches dbh are considered openings.

Harvest prescriptions retaining less than Moderate Forest Retention are considered openings.

Open-Canopy –When crowns of trees prohibit light or space between the canopies.

Output - A good, service, or on-site use that is produced from forest and rangeland resources. See FSH 1309.11 for forest and rangeland outputs codes and units measure. Examples: X06-Softwood Sawtimber Production MBF; X80-increased Water Yield - Acre Feet; W01-Primitive Recreation Use RVD's. (FSM 1905)

Overstory - Trees that provide the uppermost layer of foliage in a forest with more than one roughly horizontal layer of foliage. (11)

Owl Activity Center – See Activity Center**.**

P

PSQ - See Probable Sale Quantity

Partial Cut - Covers a variety of silvicultural practices where a portion of the stand is removed and a portion is left.

Perennial Stream - A stream that typically has running water on a year-round basis. (11)

Planning Area - All of the lands within a Federal agency's management boundary addressed in land management plans. (11)

Plant communities (Associations) -- Refer to stable and distinctive groupings of plant species that reflect of local environmental conditions and species interactions. They are frequently described in terms of their diagnostic or dominant species in the tree, shrub and herbaceous layers.

Plant Zones - Areas where a particular tree species is expected to dominate in stable, mature stands approximating climax conditions.

Population Viability - Probability that a population will persist for a specified period across its range despite normal fluctuations in population and environmental conditions. (11)

Potentially Unstable (soils) – Soil that lacks the characteristics and structure to be stable.

Preferred Alternative – The alternative from a range of alternatives that after analysis of the alternatives has risen as the preferred alternativeby the deciding officer.

Prescribed fire - A wildland fire burning under specified conditions which will accomplish certain planned objectives. The fire may result from either planned or unplanned ignitions. Proposals for use of unplanned ignitions for this purpose must be approved by the Regional Forester. (2)

Prescription - A written direction for harvest activities and regeneration methods.

Preservation - A visual quality objective that allows only for ecological changes. (2)

Primitive recreation - Those types of recreational activities associated with unroaded land -- e.g., hiking, backpacking, cross-country travel. (6)

Public Involvement - A Forest Service process designed to broaden the information base upon which agency decisions are made by (1) informing the public about Forest Service activities, plan, and decisions, and (2) encouraging public understanding about and participation in the planning processes which lead to final decision making. (10)

R

RNA - See Research Natural Area

ROS - See Recreation Opportunity Spectrum

Range of the Northern Spotted Owl - The range of the northern spotted owl in the United States is generally comprised of lands in western Washington and Oregon, and northern California.

Range of Variability -- The components of healthy ecosystems fluctuate over time. The range of sustainable conditions in an ecosystem is determined by time, processes (such as fire), native species, and the land itself. For instance, ecosystems that have a 10-year fire cycle have a narrower range of variation than ecosystems with 200-300 year fire cycle. Past management has placed some ecosystems outside their range of variability.

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

Record of Decision - A document separate from but associated with an environmental impact statement that states the management decision, identifies all alternatives including both the environmentally preferable and selected alternatives, states whether all practicable means to avoid environmental harm from the selected alternative have been adopted, and if not, why not. (11)

Recreation opportunity - The availability of choices for users to participate in the recreational activities they prefer within the settings they prefer.

Recreation Opportunity Spectrum (ROS) - A framework for stratifying and defining classes of outdoor recreation environments, activities, and experience opportunities. The settings, activities, and opportunities for obtaining experiences have been arranged along a continuum or spectrum divided into seven classes: Primitive, Semiprimitive Nonmotorized, Semiprimitive Motorized, Roaded Modified, Roaded Natural, Rural, Urban.

1. Primitive - Area is characterized by an essentially unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is not permitted.

2. Semiprimitive Nonmotorized - Area is characterized by a predominantly natural or natural appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but would be subtle. Motorized recreation use is not permitted, but local roads used for other resource management activities may be present on a limited basis. Use of such roads is restricted to minimize impacts on recreational experience opportunities.

3. Semiprimitive Motorized - Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on site controls and restrictions use of local primitive or collector roads with predominantly natural surfaces and trails suitable for motor bikes is permitted.

4. Roaded Natural - Area is characterized by predominantly natural-appearing environments with moderate evidence of the sights and sounds of man. Such evidence usually harmonizes with the natural

environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities.

Reforestation - The natural or artificial restocking of an area with forest trees; most commonly used in reference to artificial stocking. (11)

Refugia - Locations and habitats that support populations of organisms that are limited to small fragments of their previous geographic range (i.e., endemic populations). (11)

Regeneration - The renewal of a tree stand, whether by natural or artificial means. Also, the young stand itself, which is commonly referred to as reproduction. (2)

Regeneration Harvest- Any removal of trees to make regeneration possible.

Region - A Forest Service administrative unit. The Region affected by this proposed action is the Pacific Northwest Region (Region 6) which includes National Forests in Oregon and Washington. (11)

Regional Ecosystem Office (REO) – An office that is referred to in the Northwest Forest Plan (NWP), Standards and Guidelines, that reviews actions for compliance with the NWP and typically makes recommendations to the Regional Interagency Executive Committee who has responsibilities for the decisions**.**

Regional Forester - The Forest Service official responsible for administering a single Region.

Regulations - Generally refers to the Code of Federal Regulations. (11)

Remnant Old-Growth – Large trees left after a previous disturbance.

Research Natural Area (RNA) - An area set aside by a public or private agency specifically to preserve a representative sample of an ecological community, primarily for scientific and educational purposes. In Forest Service usage, research natural areas are areas designated to ensure representative samples of as many of the major naturally occurring plant communities as possible. (11)

Responsible Official - The Forest Service employee who has the authority to select and/or carry out a specific planning action. (1)

Riparian - Pertaining to areas of land directly influenced by water. Riparian areas usually have visible vegetative or physical characteristics reflecting this water influence. Stream sides, lake borders, or marshes are typical riparian areas. (3)

Riparian Area - As specifically defined in the FEMAT Report, a geographic area containing an aquatic ecosystem and adjacent upland areas that directly affect it. This includes flood plain, woodlands, and all areas within a horizontal distance of approximately 100 feet from the normal line of high water of a stream channel or from the shoreline of a standing body of water.

Riparian-Dependent – Species that rely on riparian habitat.

Riparian Reserves - Designated riparian areas found outside Late-Successional Reserves. (11)

Riparian Zone - As specifically defined in the FEMAT Report, those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated high water tables, and soils that exhibit some wetness characteristics. Normally used to refer to the zone within which plants grow rooted in the water table of these rivers, streams, lakes, ponds, reservoirs, springs, marshes, seeps, bogs, and wet meadows.

Road Decommissioning --These roads will be permanently removed from the road system. Unstable fills will be removed and drainage problems corrected. Generally, roads that are having impacts on watershed quality or other resources, and are not needed for public or administrative access, are identified as candidates for decommissioning

Road Hydrologic Obliteration – Synonymous with road decommissioning.

Roadless Area - Areas typically exceeding 5,000 acres that were inventoried during the Forest Service's Roadless Area Review and Evaluation (RARE II) process and remain in a roadless condition.

S

Salvage harvest - Intermediate cuttings made to remove trees that are dead or in imminent danger of being killed by injurious agents. (10)

Sawtimber - Trees containing at least one 12-foot sawlog or two noncontiguous 8-foot logs, and meeting regional specifications for freedom from defect. Softwood trees must be at least 9 inches in diameter and hardwood trees 11 inches in diameter at breast height.

Scenic River – Those rivers or sections of rivers that are free of impoundments, with watersheds still largely undeveloped, but accessible in places by roads.

Scheduled timber harvests - Volumes and acres programmed for harvest which are within the allowable sale quantity. This does not include salvage and sanitation harvesting.

Scoping process - A part of the National Environmental Policy Act (NEPA) process; early and open activities used to determine the scope and significance of the issues, and the range of actions, alternatives, and impacts to be considered in an Environmental Impact Statement. (40 CFR 1501.7)

Second Growth - Relatively young forests that have developed following a disturbance (e.g., wholesale cutting, serious fire, or insect attack) of the previous old-growth forest. (11)

Sediment - Earth material transported, suspended, or deposited by water. (6)

Selective Timber Harvest - a method of uneven-aged management involving the harvesting of single trees from stands (single-tree selection) or in groups (group selection) without harvesting the entire stand at any one time. (11)

Sensitive Species - Those species that (1) have appeared in the Federal Register as proposed for classification and are under consideration for official listing as endangered or threatened species or (2) are on an official state list or (3) are recognized by the U.S. Forest Service or other management agency as needing special management to prevent their being placed on Federal or state lists. (11)

Seral - A biotic community which is a developmental, transitory stage in an ecologic succession. (6)

Seral Stages - The series of relatively transitory planned communities that develop during ecological succession from bare ground to the climax stage. There are five stages:

Early Seral stage - The period from disturbance to crown closure of conifer stands managed under the current forest management regime. Grass, herbs, or brush are plentiful.

Mid-Seral stage - The period in the life of a forest stand from crown closure to first merchantability, usually ages 15-40. Due to stand density, brush, grass or herbs rapidly decrease in the stand. Hiding cover for early and abundant production of seed. may be present.

Late-Seral stage - The period in the life of a forest stand from first merchantability to culmination of mean annual increment. This is under a regime including commercial thinning, or to 100 years of age, depending time. on wildlife habitat needs. During this period, stand diversity is minimal, except that conifer mortality rates will be fairly rapid. Hiding and thermal cover may bepresent. Forage is minimal. (11)

Shade-Tolerant – Having the capacity to compete for survival under direct sunlight conditions.

Significant Issues "Significantly" as used in NEPA requires considerations of both context and intensity: 40 CFR 1508.27

Silviculture - The art and science of controlling the establishment, composition, and growth of forests. (2)

Single-Story – A stand of trees where all trees are relatively the same height.

Site preparation - 1) An activity (such as prescribed burning, disking, and tilling) performed on a reforestation area, before introduction of reforestation, to ensure adequate survival and growth of the future crop; or **2**) manipulation of the vegetation or soil of an area prior to planting or seeding. The manipulation follows harvest, wildfire, or construction in order to encourage the growth of favored species. Site preparation may include the application of herbicides; burning, or cutting of living vegetation that competes with the favored species; tilling the soil; or burning of organic debris (usually logging slash) that makes planting or seeding difficult.

Site productivity - Production capability of specific areas of land.

Site-Specific Analysis – A site specific proposal requires a site specific analysis following NEPA guidelines

Skidding - A general term for hauling loads by sliding, not on wheels, as developed originally from stump to roadside, deck, skidway, or other landing. (3)

Slash - The residue left on the ground after tree felling and tending, and/or accumulating there as a result of storm, fire, girdling or poisoning. It includes unutilized logs, uprooted stumps, broken or uprooted stems, the heavier branchwood, etc. (3)

Slope Stability - The resistance of a natural or artificial slope or other inclined surface to failure by landsliding (mass movement). (11)

Snag - Any standing dead, partially dead, or defective (cull) tree at least 10 inches in diameter at breast height and at least 6 feet tall. A hard snag is composed primarily of sound wood, generally merchantable. A soft snag is composed primarily of wood in advanced stages of decay and deterioration, generally not merchantable. (11)

Soil - The portion of the earth's surface consisting of disintegrated rock and humus. (7)

Soil Organic Matter -- Soil at least partly derived from living matter, such as decayed plant material

Soil Productivity - Capacity or suitability of a soil, for establishment and growth of a specified crop or plant species, primarily through nutrient availability. (11)

Soil resource inventory - See Soil surveys.

Special Interest Areas - Areas managed to make recreation opportunities available for the understanding of the earth and its geological, historical, archeological, botanical, and memorial features. (6)

Spotted owl activity centers – See Activity Center.

Stand (Tree Stand) - An aggregation of trees occupying a specific area and sufficiently uniform in composition, age, arrangement, and condition so that it is distinguishable from the forest in adjoining areas. (11)

Stand-Replacing Wildfire – A wildfire that kills nearly 100 percent of the stand.

Standards and Guidelines - The rules and limits governing actions, and the principles specifying the environmental conditions or levels to be achieved and maintained.

Structural Diversity - The diversity of forest structure, both vertical and horizontal, that provides for a variety of forest habitats for plants and animals. The variety results from layering or tiering of the canopy and the die-back, death, and ultimate decay of trees. In aquatic habitats, the presence of a variety of structural features such as logs and boulders that create a variety of habitat. (11)

Structural Heterogeneity/Homogeneity – The differences and similarities of horizontal and verticle distribution of the componenet within a forest stand (height, diameter, canopy layers, number of trees, herbaceous understory, snags, and down woody debris

Substantive comment - A comment that provides factual information, professional opinion, or informed judgment germane to the action being proposed. (10)

Substrate - Any object or material upon which an organism grows or is attached.

Subwatershed - A part of a whole watershed. As used in the Forest Plan: the part of a watershed that lies within the boundary of the Gifford Pinchot National Forest.

Succession - A series of dynamic changes by which one group of organisms succeeds another through stages leading to potential natural community or climax. An example is the development of series of plant communities (called seral stages) following a major disturbance. (11)

Successional stage - A stage or recognizable condition of a plant community that occurs during its development from bare ground to climax; for example, coniferous forests in the Blue Mountains progress through six recognized stages: grass forb, shrub-seedling, pole-sapling timber, young timber, mature timber, and old-growth timber. (2)

Suitability - The appropriateness of applying certain resource management practices to a particular area of land as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices. (1) (2) (FSM 1905)

Suitable Habitat – Spotted owl nesting , roosting, and foraging habitat. The forest vegetation with the age class, species of trees, structure, sufficient area, and adequate food source to meet some or all of the life needs of the northern spotted owl.

Suppression - The process of extinguishing or confining fire. (2)

Surface Erosion - A group of processes whereby soil material are removed by running water, waves and currents, moving ice, or wind. (11)

T

T&E - See Threatened and Endangered Species

Take - Under the Endangered Species Act, take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect an animal, or to attempt to engage in any such conduct. (11)

Talus - A slope landform, typically covered by coarse rock debris forming a more or less continuous layer that may or may not be covered by duff and litter. (11)

Thinning - A felling made in an immature stand primarily to maintain or accelerate diameter increment and also to improve the average form of the remaining trees without permanently breaking the canopy. An intermediate cutting. (3)

Threatened and Endangered (T&E) species. See Threatened Species*;* see Endangered Species.

Threatened Species - Those plant or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future. A plant or animal identified and defined accordance with the 1973 Endangered Species Act and published in the Federal Register. (11)

Tier I Watershed - See Key Watershed.

Transition Zone – This zone is where the vegetation transitions from one ecosystem characteristic to another, i.e., a moist riparian area to a dry upland.

Turbidity - The degree of opaqueness, or cloudiness, produced in water by suspended particulate matter, either organic or inorganic. Measured by light filtration or transmission and expressed in Jackson Turbidity Units (JTU's).

U

Underburning - Prescribed burning of the forest floor or understory for botanical or wildlife habitat objectives, hazard reduction, or silvicultural objectives. (11)

Understory - The trees and other woody species growing under the canopies of larger adjacent trees and other woody growth. (11)

Uneven-aged Management - A combination of actions that simultaneously maintains continuous tall forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection. (11)

Unstable (soils) -- Soil that lacks the characteristics and structure to be stable.

Upland – General forest outside the riparian area**.**

V

VQO - See Visual quality objective

Vegetative management - Activities designed primarily to promote the health of the crop forest cover for multiple-use purposes.

Viability - The ability of a wildlife or plant population to maintain sufficient size so that is persists over time in spite of normal fluctuations in numbers, usually expressed as a probability of maintaining a specific population for a specified period. (11)

Visual Emphasis Management Area -- Scenic viewsheds which are sensiti9ve because they are viewed by many people from major roads, trails, and recreation sites, including lakes and streams.

Visual quality objective (VQO) - Categories of acceptable landscape alteration measured in degrees of deviation from the natural-appearing landscape.

Preservation (P) - Ecological changes only.

Retention (R) - Management activities should not be evident to the casual Forest visitor.

Partial Retention (PR) - Management activities remain visually subordinate to the characteristic landscape.

Modification (M) - Management activities may dominate the characteristic landscape but must" at the same time, follow naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

Maximum Modification (MM) - Human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

Enhancement(E) - A short-term management alternative which is done with the express purpose of increasing positive visual variety where little variety now exists. (2)

Visual resource - The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors. (2)

Visually Subordinate – Resources that contribute to the ambient visual affect.

W

Water Quality - The chemical, physical, and biological characteristics of water. (11)

Watershed - The drainage basin contributing water, organic matter, dissolved nutrients, and sediments to a stream or lake. (11)

Watershed Analysis - A systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives. Watershed analysis provides a basis for ecosystem management planning that is applied to watersheds of approximately 20 to 200 square miles. (11)

Watershed Restoration – Improving current conditions of watersheds to restore degrded fish habitat and provide long-term protection to aquatic and riparian resources.

Wetlands - Areas that are inundated by surface water or ground water with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetative or aquatic life that require saturated or seasonally saturated soil conditions for growth and reproduction (Executive Order 11990). Wetlands generally include, but are not limited to, swamps, marshes, bogs, and similar areas. (11)

Wildfire - Any wildland fire that is not a prescribed fire. (See also Prescribed fire*.) (2)*

Wildlife Special Area – Areas that afford unique habitat or other attraction to specific wildlife.

Windthrow - A tree or trees uprooted or felled by the wind. (11)

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