FOREST VEGETATION
SILVICULTURIST REPORT FOR THE WHITETAIL HAZARDOUS FUELS PROJECT

Ashland Ranger District
Custer National Forest
Northern Region

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BACKGROUND

This project proposes to reduce hazardous fuel conditions and lower the potential for high intensity stand replacing wildland fire on National Forest System (NFS) lands in the project area located northeast of Highway 212. A compiled Environmental Assessment (EA) will discuss the findings of analysis conducted for the Whitetail Hazardous Fuels Reduction Project by the individual specialists assigned to the project. This report will describe the proposed treatments in detail and analyze the effects on the forested resource as it relates to hazardous fuels and overall forest health. This report will be filed in the Project File located at the Ashland Ranger District Office in Ashland, Montana.

PROJECT AREA DESCRIPTION

The project area consists of approximately 9,767 acres of National Forest System Lands and is located approximately 17 miles north east of Ashland, Montana in Powder River County, Montana. The project can be found in all or portions of Township 1 South, Range 46 East, Sections 26, 25, 36 and 34; Township 1 South, Range 47 East, Sections 31, and 32; Township 2 South, Range 46 East, Sections 2, 1, 11, 12, 14, 13, and 24; Township 2 South, Range 47 East, Sections 6, 5, 7, 8, 18, 17, 16, 19, 20, 30, 29, 28.

PROPOSED ACTION

The Ashland Ranger District, Custer National Forest, proposes to move portions of the ponderosa pine, grassland, and woody draw ecosystems toward their desired conditions. The desired condition is contrasted with the existing condition in the following sections. Hazardous fuels reduction would be accomplished through the tools of timber harvest, thinning, and prescribed burning to restore or maintain the structure, function, and composition of the ecosystems across the Project Area. The proposal may reduce the quality of wildlife habitat for the short-term but would ensure the long-term diversity and quality of habitats for selected species and provide wood products from the area, consistent with Forest Plan direction.

The proposed action is to treat approximately 8,256 acres. Approximately 1,786 acres would be treated by mechanical means in the forested area which was identified as suited for commercial timber harvest. In addition, approximately 2,332 acres would be treated with prescribed fire only. About 4,138 acres would be non commercially thinned by a combination of manual and mechanical means followed by prescribed fire. These treatments will reduce ladder fuels, tree densities, crown cover and maintain surface fuels at acceptable levels. Silvicultural prescriptions will be designed to minimize impacts, improve and retain wildlife habitats, alter current forest structures to enhance our ability to manage fires, and provide wood products removal. See TABLE 1 for detailed treatment descriptions.

Actions connected to the proposed action may involve construction of temporary roads and reconstruction of existing roads (necessary for haul), timber harvest, restoration of the green ash

woody draws, slashing, thinning, hand piling, and prescribed fire within the forested ecosystems and prescribed burning within the non-forested ecosystem. In addition, the proposed action would reduce the risk of a large fire event, reintroduce fire into these ecosystems and reduce the incidence of epidemic levels of insect infestations and disease infections within the project area.

The harvesting of timber, thinning, prescribed burning, and construction and reconstruction of roads will be analyzed in accordance to the standards and guidelines identified in the Forest Plan, as well as, other requirements of pertinent Federal and State laws and regulations. These may include, but are not limited to, the National Forest Management Act, Endangered Species Act, Clean Water Act, National Historic Preservation Act, and State Water Quality Standards.

Adjustments in livestock stocking levels or season of use would be addressed during the allotment planning process under a separate analysis and National Environmental Policy Act (NEPA) decision.

The Interdisciplinary Team may identify additional resource concerns based on the environmental assessment of the project area. Resource concerns identified may require mitigation measures to reduce the level of impacts or effects on a particular resource located with the project area. Changes may result in limiting treatment activities or their intensity due to these measures.

PURPOSE AND NEED FOR ACTION

The primary purpose of this project is to achieve the goals of the Forest Plan while reducing hazardous fuel conditions and lowering the potential for high intensity stand replacing wildland fire considering recent scientific research and as directed by the Forest Service. Secondary objectives include: timber stand improvement, wood product removal, soil and watershed improvement, rangeland improvement, increased forage production on transitory range, and wildlife habitat enhancement. This would be accomplished by the use of management tools such as mechanical commercial, manual or mechanical non-commercial treatment and prescribed fire to move affected ecosystems toward the desired condition for grassland, ponderosa pine stands, and woody draw ecosystems as directed for the affected Management Areas in the Forest Plan.

Forest Vegetation

Currently the project area is dominated by a late development closed conditions. Early development (post disturbance), mid development closed, mid development open, and late development open conditions are limited on the landscape (see fuels report for a summary of these conditions on the landscape). Without a diversity of these conditions on the landscape the risk of large stand replacement events is higher. There is a need for more early development condition, open and closed mid development and late development open conditions to promote historic disturbance regimes and processes on the landscape.

The health and condition of the ponderosa pine ecosystem varies across the project area. There is a need to reduce tree densities, ladder fuels and crown canopy within forested stands to decrease the risk of fire reaching the overstory canopy and being sustained as a crown fire, resulting in large stand replacement events. Achieving these conditions would reduce competition of light, nutrients and water and restore the diversity, vigor, composition and

structure of the forested stands, while maintaining endemic levels of insect and disease. Additionally, there is a need to reduce total crown canopy in timbered stands, while reducing needle cast coverage in order to release the forage components. The existing condition has resulted in, part from long term suppression of naturally occurring fire. Subsequent development of high tree densities has promoted insect and disease infestations, which have resulted in tree growth reductions, severe physical deformities, and mortality. These factors have reduced the health, vigor, and productivity of the ponderosa pine ecosystem. High tree densities within the ponderosa pine stands has increased tree mortality, natural fuel loading, and the risk of stand replacing wildfires. The lack of disturbance has fostered the development of multi-storied, dense, full-canopied ponderosa pine stands, which causes a decline in the understory shrub, herb, and grass species. This decline, mainly due to shading, is demonstrated in some cases by the absence of the understory grass, forb, and shrub vegetative components in the very dense stands. This decrease in the understory shrub, herb, and grass components has a negative effect on the nutrient cycle. The desired condition is to reduce tree densities, remove the stagnant forested understory, and decrease the risk for epidemic insect infestations and disease infections. This condition would promote a healthy, structurally diverse, productive, and vigorous growing ponderosa pine ecosystem. The reduction of crown canopy in ponderosa pine stands, while reducing needle cast coverage, would promote the release of the forage component. These understory components with a yearly leaf fall and dieback, enable nutrients, and important defense mechanisms against insect and disease attack, to be cycled through the systems.

TABLE 1: DETAILED WHITETAIL HAZARDOUS FUELS REDUCTION PROJECT PROPOSED TREATMENTS

TREATMENT CATEGORY	TREATMENT SUB CATEGORY	ACRES[1]	TREATMENT DESCRIPTION
Mechanical Commercial <30% Canopy Cover Retention	1 – ST	554	**SEED TREE HARVEST (whole tree logging), Slash Understory, Site Preparation, Natural Regeneration, Understory Burning for site preparation as needed to expose 15 to 20% bare soil mosaically across unit (minimizing seed tree mortality), Burn Landing Piles** Stocking reduction to create pattern and structure diversity to alter landscape hazardous fuel conditions. These areas occur predominately on moist aspects. Seed Trees would be a source for future snag replacement trees. • Approximate average conditions of residual stand where available. ➢ Trees per acre greater than 9" diameter: 12 to 14 trees per acre of the largest, best formed, disease/insect free individuals, for purposes of seed production and capturing good genetic traits for growth and yield. ➢ Average spacing between trees would approximate 55 to 60 feet. ➢ Canopy cover range of 5 to 15%, average 10%. • Fuel Loading - Treatment units adjacent to non-FS ownership ➢ Fuels reduced to a range of 3-5 ton/acre, of which 0-3 inch diameter does not exceed 2 tons/acre, and 3-12 inch plus diameter (CWD), with 50% being 12" and larger when available, is a minimum of 3 tons/acre. ➢ Target Fuel Hazard Rating: Low • Site Preparation ➢ Through logging operations or a post logging activity, expose 20 to 30% bare mineral soil (organic material removed or incorporated, not surface soil) uniformly across the treatment unit for seed bed preparation and successful natural regeneration. • Fuel Loading - Treatment units adjacent to FS ownership ➢ Fuels reduced to a range of 3-7 ton/acre, of which 0-3 inch diameter does not exceed 3 tons/acre, and 3-12 inch plus diameter (CWD), with 50% being 12" and larger when available, is a minimum of 4 tons/acre. ➢ Target Fuel Hazard Rating: Low to low end of Moderate

TREATMENT CATEGORY	TREATMENT SUB CATEGORY	ACRES[1]	TREATMENT DESCRIPTION
	2 – SH	199	**SHELTERWOOD SEED TREE HARVEST (whole tree logging), Slash Understory, Site Preparation, Natural Regeneration, Understory Burning for site preparation as needed to expose 15 to 20% bare soil mosaically across unit (minimizing seed tree mortality), Burn Landing Piles** Stocking reduction to create pattern and structure diversity to alter landscape hazardous fuel conditions. These areas occur predominately on dry aspects. Seed Trees would be a source for future snag replacement trees. • Approximate average conditions of residual stand where available. ➢ Trees per acre greater than 9" diameter: 20 to 25 trees per acre of the largest, best formed, disease/insect free individuals, for purposes of seed production, protection of regenerating seedlings, and capturing good genetic traits for growth and yield. ➢ Average spacing between trees would approximate 42 to 47 feet. ➢ Canopy cover range 15 to 25%, average 20%. • Fuel Loading – Fuels reduced to loadings described in the 1-ST Treatments. • Site Preparation – see 1-ST Treatments.

TREATMENT CATEGORY	TREATMENT SUB CATEGORY	ACRES[1]	TREATMENT DESCRIPTION
	3 - CT	116	**COMMERCIAL THINNING (whole tree logging), Release and Weed, NO RX Burning other than Landing Piles.** Thin from below to reduce fuel hazard and promote healthy growing conditions. The best-formed, least disease/insect damaged trees and most vigorous trees will be left. Stand composition will depend on size and age classes present. Thinning from below allows a source for future snag trees. • Approximate average spacing, ages, and diameters classes of residual stand where available. ➢ Young Forests (40 to 80 years); 7 to 14" diameter; range of 125 to 200 trees per acre. Range of spacing between trees: 15 to 19 feet. ➢ Mid Aged to Mature Forest (80 to 150 years); 14" plus in diameter, range of 30 to 60 trees per acre. Range of spacing between trees: 27 to 38 feet. ➢ Canopy cover range 20 to 30%, average 25%. • Fuel Loading – Fuels reduced to loadings described in the 1-ST Treatments. ➢ Target Fuel Hazard Rating: Same as the 1-ST Treatments
	5 – SC	55	**SC - SPECIAL CUT (commercial - whole tree log), Jackpot Burn** • Release of the green ash or aspen by removing the overtopping and competing ponderosa pine trees. ➢ Remove all ponderosa pine trees to an average spacing of 60 feet within two mature tree heights (approximately 120 ft) out from the perimeter of aspens stands to maintain habitat diversity. ➢ Maintain an average spacing of 60 feet between ponderosa pine trees within two mature tree lengths (approximately 120 ft) out from the outer edge of the woody draw. Maintain approximately 10% of the ponderosa pine component where available. • Fuel Loading – Fuels reduced to the levels prescribed in the adjacent treatment units. ➢ Target Fuel Hazard Rating: Low to low end of Moderate.
SUB CATEGORY ACRES		**924**	
Mechanical Commercial	6 – CT1	724	**COMMERCIAL THINNING (whole tree logging), Release and Weed, NO RX Burning other than Landing Piles.**

TREATMENT CATEGORY	TREATMENT SUB CATEGORY	ACRES[1]	TREATMENT DESCRIPTION
>30% Canopy Cover Retention			Thin from below to an average canopy cover range of 40-60% within 10 years of harvest for wildlife habitat and vegetative diversity. Thinning from below allows a source for future snag trees. • Approximate average conditions of residual stand where available. ➢ Trees per acre range greater than 9" diameter 40-150; Trees per acre 5-9": 0-100. ➢ Spacing between trees: Range of 17 feet to 33 feet, average of 26 feet. ➢ Canopy cover range 30 to 40%, average 35%. • Fuel Loading – Fuels reduced to loadings described in the 1-ST treatments. ➢ Target Fuel Hazard Rating: Low to low end of Moderate
SUB CATEGORY ACRES		**724**	
Non Commercial Mechanical and Manual Thinning From Below Treatments	7 – NCBJ	2,219	**HAND THINNING, Lop and Scatter, Jackpot Burn (slopes greater than 30% - XXX acres) MASTICATION/CHIPPING, Jackpot Burn (slopes less than 30% - XXX acres).** Thin from below in the 0 to 7 " diameter range to maintain a canopy cover range of 55-70% within 10 years of thinning to eliminate ladder fuels while maintaining wildlife habitat and vegetative diversity. Jackpot burn to reduce the concentrated activity fuels. Thinning from below and RX fire allows a source for future snag trees. • Trees per acre 1-7": 0-100 (The focus will be elimination of ladder fuels and/or reduction in trees per acre in the understory). ➢ Average canopy cover range 30 to 65+%. • Fuel Loading – Fuels reduced to loadings described for 1-ST Treatment noted above; however loading of 3-7 inch diameter fuels would be somewhat higher. ➢ Target Fuel Hazard Rating: Moderate.

TREATMENT CATEGORY	TREATMENT SUB CATEGORY	ACRES[1]	TREATMENT DESCRIPTION
	8– NCBBB	1,049	**THINNING, Lop and Scatter, Broadcast Burn (slopes greater than 30% - XXX acres) MASTICATION/CHIPPING, Jackpot Burn (slopes less than 30% - XXX acres)** Thin from below in the 0 to 7" diameter to reduce ladder fuels and restore open grown large diameter ponderosa pine. These stands occur on southern, and/or dry aspects that naturally do not support high crown densities. These areas will be opened to resemble more naturally occurring conditions. Broadcast burn to reduce the concentrated activity fuels. Thinning from below and RX fire allows a source for future snag trees. • Approximate average conditions of residual stand where available. ➢ Canopy cover range greater than 7", 10 to 55%. • Fuel Loading – Fuels reduced to loadings described for 1-ST Treatment noted above; however loading of 3-7 inch diameter fuels would be somewhat higher. ➢ Target Fuel Hazard Rating: Low
	4 – FUEL BREAK	300 Foot Road Buffer	**THINNING, Jackpot Burn or THINNING, Handpile, Burn Handpiles or MASTICATION/CHIPPING, Jackpot Burn** On designated roads (4769, 4777, 4427); create up to a 300 foot wide fuel break using treatment reduce hazardous fuels (ladder fuels and crown coverage) to aid in effective containment of wildland fire and create a zone for firefighter safety . • Favor retention of wind firm trees and a mix of size classes. Minimize the effect of slash piling near or on residual leave trees, fences, and drainage ditches alongside roads. ➢ Maintain a minimum canopy spacing of 10 feet. ➢ Maintain a minimum canopy base height of 10 feet (no branches between ground and canopy). • Fuel Loading – ➢ Fuels reduced to an average of 3 tons/acre, of which 0-3 inch diameter does not exceed 2 tons/acre, and 3-12 inch plus diameter (CWD), with 50% being 12" and larger when available, is a minimum of 1 tons/acre. ➢ Target Fuel Hazard Rating: Low

TREATMENT CATEGORY	TREATMENT SUB CATEGORY	ACRES[1]	TREATMENT DESCRIPTION
	5 – SCNC	49	**SCNC - THINNING, Handpile, Burn Handpiles or SLASH, Jackpot Burn** • Release of the green ash or aspen by removing the overtopping and competing ponderosa pine trees. ➢ Remove all ponderosa pine trees to an average spacing of 60 feet within two mature tree heights (approximately 120 ft) out from the perimeter of aspens stands to maintain habitat diversity. ➢ Maintain an average spacing of 60 feet between ponderosa pine trees within two mature tree lengths (approximately 120 ft) out from the outer edge of the woody draw. Maintain approximately 10% of the ponderosa pine component where available. • Fuel Loading – Fuels reduced to the levels prescribed in the adjacent treatment units. ➢ Target Fuel Hazard Rating: Low to low end of Moderate.

TREATMENT CATEGORY	TREATMENT SUB CATEGORY	ACRES[1]	TREATMENT DESCRIPTION
	9 - NCNS	709	**Northern two Nest Stands** **HAND THINNING, Hand Pile, Burn Handpiles** Thin from below without altering the overstory canopy to maintain identified Goshawk nest stands and alternate nest stands. Purpose is to maintain mature high forest crown cover habitat for those wildlife dependent species. ➢ Thin from below by removing trees up to 5" and snow/wind damaged trees between 5.1 and 9.0". ➢ Remove up to 2 ladder fuel layers. ➢ Retain trees in openings where trees are limited, thin to a spacing equal to the distance of the existing tree height. • Fuel Loading – ➢ Fuels reduced to an average of 3 tons/acre, of which 0-3 inch diameter does not exceed 2 tons/acre, and 3-12 inch plus diameter (CWD), with 50% being 12" and larger when available, is a minimum of 1 tons/acre. ➢ Target Fuel Hazard Rating: Moderate to Low end of High **Southern Three Nest Stands (Whitetail Cabin Area)** **HAND THINNING, Lop and Scatter, Jackpot Burn** Thin from below without altering the overstory canopy to maintain identified Goshawk nest stands and alternate nest stands. Purpose is to maintain mature high forest crown cover habitat for those wildlife dependent species. ➢ Thin from below by removing trees up to 5" and snow/wind damaged trees between 5.1 and 9.0". ➢ Remove up to 2 ladder fuel layers. ➢ Retain trees in openings where trees are limited, thin to a spacing equal to the distance of the existing tree height. • Fuel Loading – ➢ Fuels reduced to an average of 3-5 tons/acre, of which 0-3 inch diameter does not exceed 2 tons/acre, and 3-12 inch plus diameter (CWD), with 50% being 12" and larger when available, is a minimum of 1- 3 tons/acre. ➢ Target Fuel Hazard Rating: Moderate to Low end of High

TREATMENT CATEGORY	TREATMENT SUB CATEGORY	ACRES[1]	TREATMENT DESCRIPTION
	10 - PCT	86	**PRECOMMERCIAL THINNING, Lop and Scatter, Jackpot Burn** Thin sapling size class (1-5" diameter) to a density of 125 to 260 trees per acre and pole size class (5-8" diameter) to a density of 125-200 trees per acre, leaving the fastest growing, most disease free and damage-free trees. These are old harvest unit's, residual seed trees will be retained for diversity. Jackpot burn to reduce the concentrated activity fuels. • Fuel Loading – Fuels reduced to loadings described for 1-ST Treatment noted above; however loading of 3-7 inch diameter fuels would be somewhat higher. ➢ Target Fuel Hazard Rating: Moderate.
SUB CATEGORY ACRES		**4,112**	
Commercial /Non Commercial **Seed Tree Removals, Overstory Removals, Intermediate Timber Stand Improvement Treatments**	11 - STR/PCT	66	**SEED TREE REMOVAL (whole tree), Precommercial Thinning, Lop and Scatter, Jackpot Burn or SEED TREE GIRDLE,), Precommercial Thinning, Lop and Scatter, Jackpot Burn (60 acres commercial treatment)** Remove seed trees from past harvest activity or girdle 10-20 percent and leave standing for snag dependent wildlife species. • Thin sapling size stand according to the above 10 – PCT treatment. • Fuel Loading – Fuels reduced to loadings described for 1-ST Treatment noted above; however loading of 3-7 inch diameter fuels would be somewhat higher. ➢ Target Fuel Hazard Rating: Moderate.
	12 - STR1	76	This stand condition has developed from past activity that presents itself for a mixture of small areas of treatment types scattered across the unit: ***Sub Treatment Type 1:*** **SEED TREE REMOVAL** Areas that have 150 to 200 acceptable seedlings/saplings per acre remove overstory trees. • Follow treatment type 11 –STR/PCT above. ***Sub Treatment Type 2:*** **COMMERCIAL/NON COMMERCIAL THINNING** Areas that have a poletimber to sawtimber component that can be thinned apply 3-CT when thinning can result in removal of sawtimber sized material or 7-NCBJ when the majority of the size of material to be thinned is unmerchantable. ***Sub Treatment Type 3:*** **SLASHING, JACKPOT BURN, NATURAL REGENERATION** Areas that have less than 150 acceptable seedlings per acre, maintain the scattered overstory for a seed source, slash the understory, lop and scatter and

TREATMENT CATEGORY	TREATMENT SUB CATEGORY	ACRES[1]	TREATMENT DESCRIPTION
			jackpot burn fuel concentrations to expose 20 to 30 percent bare mineral exposure for site preparation to initiate natural regeneration.
	13 - LIB	22	**OVERSTORY REMOVAL (commercial), Precommercial Thinning, Lop and Scatter, Jackpot Burn.** • Thin sapling size stand according to the above 10 – PCT treatment. • Fuel Loading – Fuels reduced to loadings described for 1-ST Treatment noted above; however loading of 3-7 inch diameter fuels would be somewhat higher. Target Fuel Hazard Rating: Moderate.
SUB CATEGORY ACRES		**164**	
Prescribed Burning Without Manual Pretreatment	14 – RXB	2,332	Prescribe burn to maintain and/or improve nonforest ecosystems and open grown ponderosa pine areas.
SUB CATEGORY ACRES		**2,332**	
No Treatment	15- NT	1,510	No proposed treatment activity.
SUB CATEGORY ACRES		**1,510**	
TOTAL ACRES		**9,766**	

[1]Acres are approximate, individual treatment units and sizes are in the project record and spatially located on the proposed action map in the project record at the District office.

TABLE 2: WHITETAIL HAZARDOUS FUELS PRESCRIBED FIRE PARAMETERS BY TREATMENT TYPE

Treatment Type Sub Category	Prescribed Fire Treatment	Approximate Ratio of Ground Area Burned:Unburned	Management Strategy to Achieve Prescribed fire Goals		
			Percent of Area in Fire Created Canopy Openings	Average Fire Created Canopy Opening Size in Acres	Percent Fire Created Overstory Tree Mortality
1 – ST	Understory Burn[1]	90:10	≤ 3	.5	≤ 10
2 – SH	Understory Burn[1]	90:10	≤ 3	.5	≤ 10
4 – FUEL BREAK	Broadcast Burn	70:30	≤ 3	0.5 to 2.0	≤ 10
5 - SC	Jackpot Burn	30:70	≤ 3	0.5 to 2.0	≤ 10
7 - NCBJ	Jackpot Burn	70:30	5 to 10%	0.5 to 2.0	≤ 15
8 - NCBB	Broadcast Burn	70:30	≤ 5	0.5 to 2.0	≤ 20
9 - NCNS	Jackpot Burn	70:30	≤ 3	0.5 to 1.0	≤ 5
10 - PCT	Jackpot Burn		≤ 3	0.5 to 1.0	≤ 10
11 – STR/PCT	Jackpot Burn	60:40	≤ 3	0.5 to 1.0	≤ 10
12 – STR1	Jackpot Burn	60:40	≤ 3	0.5 to 1.0	≤ 10
13-LIB	Jackpot Burn	60:40	≤ 3	0.5 to 1.0	≤ 10
14 - RXB	Ecosystem Burn	70:30	N/A	N/A	N/A

[1]This burn is for site preparation; see design criteria (Appendix V) for pullback of fuels from seed trees for protection from direct and indirect fire effects.

EXISTING CONDITION

DATA USED FOR ANALYSIS AND HOW IT WAS OBTAINED
The data used for this analysis was compiled from two sources; a compartment inventory done from 1986 to 1990 and field inventories done from 1981 to 2004.

The 1986 to 1990 inventory was based on photo interpretation attributes of crown diameter, dominant species, height and crown closure percent. With ground reconnaissance and the use of these attributes all the stands within the project area were classified into stratums, according to size, stocking, species, forest, nonforest and crown closure percent. An attached copy of the defined stratum classification is in Appendix I. Thirty-nine stands in the project area have had actual ground sample data taken over the past 26 years. Twenty-four percent of the ponderosa pine acres were ground sampled. This data can be found in the FSVEG database for the Custer National Forest.

In 2007, an average stand condition for the ponderosa pine strata was developed using all the field-sampled data to date, across the district. A copy of this average stand attributes is in the project folder at the District office.

STRATUM ACREAGE WITHIN THE PROJECT AREA
Following is a table that depicts acres and percent of project area by stratum, see Appendix I for a definition of stratum codes.

TABLE 3: ACRES BY STRATUM

Stratum	Acres[1]	Percent Project Area	Percent Ponderosa Pine Area
111	56	.57	.83
122	8	.08	.12
123	31	.32	.46
124	108	1.11	1.61
132	17	.17	.25
133	2,456	25.15	36.59
134	1,795	18.38	26.74
142	58	.59	.86
143	442	4.53	6.58
222	146	1.49	2.17
223	77	.79	1.15
231	5	.05	.07
232	1,181	12.09	17.59
233	328	3.36	4.89
234	5	.05	.07
910	279	2.86	
911	325	3.33	

920	1,626	16.65	
921	596	6.10	
930	82	.84	
931	145	1.48	
Total	9,766	100.00%	100.00%

[1]These are approximate acres derived from Forest GIS coverage's.

FOREST PLAN MANAGEMENT ACREAGE

Forest Plan management areas and their percentage of area that fall within the project area are as follows: management area B (.08 percent), management area G (.03 percent), management area D (99.44 percent), management area F (.04 percent), management area P (.41 percent) and management area N, which is currently unmapped, but estimated at less than 2 percent of the area.

TABLE 4: ACRES BY MANAGEMENT AREA

Management Area	Acres[1]	Percent of Project Area
B	8	.08
D	9,712	99.44
P	40	.41
F	4	.04
G	3	.03
M/N	Unmapped	
Total	9,767	100%

[1] These are approximate acres derived from Forest GIS coverage's.

GENERAL FOREST AND INSECT AND DISEASE CONDITIONS

Approximately 69 percent of the project area has forest cover greater than 10% and 31 percent is non forested or has forest cover less than 10%. Of this 69 percent, 98 percent is dominated by ponderosa pine. Juniper is scattered across the project area in the understories of ponderosa pine. Green ash, hawthorn, chokecherry and other woody shrub species are common in many of the moist draws but have been overtopped with ponderosa pine. Approximately 2 percent of the project area can be characterized in this state. Forty nine percent of the total acres occur on slopes greater than 20 percent. Fifty one percent is on slopes less than or equal to 20 percent.

The forested stands of ponderosa pine are predominately multistory. The average overstory ranges from 77 to 323 years old, 11 to 17 inches in diameter at breast height, and 10 to 82 trees per acre. The average midstory ranges form 18 to 161 years old, 6 to 9 inches in diameter at breast height and 24 to 109 trees per acre. The average understory ranges from 0 to 4 inches in diameter at breast height and 760 to 4,571 trees per acre. Board feet per acre ranges from 400 to 7,030. The dryer habitats and non sawtimber strata represent the lower end of the range. Average stand conditions are filed in the project file at the District office. Actual sampled stand data are stored in the national FSVEG (Field Sampled Vegetation) data base.

Rocky Mountain juniper (*Juniperus scopulorum)* historically was confined to the driest, rockiest sites with little fine fuels, when fire played a more significant role in the area. Over the past 90 plus years the juniper has invaded grasslands and has become more established in the ponderosa

pine communities. Juniper competes with the other understory components, resulting in a decline in the desirable grass and shrub species. Because juniper has a compact crown it increases the flammability of ponderosa pine stands. The lack of frequent low intensity fires, which is a major disturbance process, has allowed these vegetative communities to succeed to later successional stages. The introduction of another disturbance process, intensive grazing systems, prior to the turn of the century, has allowed juniper and dense pine stands to develop, by removing the competition of grass species on regeneration establishment.

The forested stands of ponderosa pine have various levels of infestations/infections of the following: tip moth *(Ryacionia* spp.), pine beetles (*dendroctonus ponderosae, Is. spp.*), western gall rust *(Endocronartium harknesii),* and pine needle cast *(Elytroderma deformans).* Porcupine damage and physical damage from snow and wind damage to the doghair stands occurs. The juniper exhibits various levels of cedar apple rust *(Gymnosprangium)* spp.

Without the high frequency, low intensity fire regime, the ponderosa pine communities have moved toward later successional multistory stands, resulting in a high probability of crown fires. With the increased biomass, a decline in stand vigor has resulted in increased insect and disease activity. Insects and diseases have probably affected the stand structures more than if frequent low intensity ground fires still functioned in these systems.

There has been five tip moths identified on the Ashland district, *Ryacionia fumosana, Ryacionia neomexicana, Ryacionia bushnelli, Ryacionia zozana and Ryacionia busckana.* Some of these tip moths can have 2 to 4 plus generations per year. Damage in the project area is seen as heavy to light. Heavy damage is seen in stands where understories are dense and overstories have a basal area greater than 60 square feet per acre. Damage is mainly confined to seedlings and saplings, but can be seen on the lower third of tree crowns in the upper canopy trees. Tip moths mine into terminal leaders and buds creating crooks, forks, multi-tops and reduced height growth. Mortality is uncommon. These deformities and reductions add to the vertical structure to the fuels complex.

Tip moths over winter as pupae in the liter and soil. They emerge in May and June to lay their eggs on pine needles, buds and shoots. The larvae feed during June and July (Furniss and Carolin, 1977). Regular ground fires in these communities might create a negative environment for the tip moth by affecting soil/liter conditions where the tip moth pupates (Bell, 1993). Also, noted by Bell from other studies was that site preparation in the form of burning showed reduced tip moth populations. Bell cited several authors noting that tip moth infestations rates increase as the intensity of vegetation control increases. These studies noted that cattle grazing in young plantations often are associated with extreme tip moth damage, perhaps because cattle reduce grasses and other annuals more drastically than other forms of vegetation control and may cause soil compaction. Vegetation control may result in a lack of habitat for tip moth predators and parasites and/or create a more favorable environment for tip moth by promoting more shoot growth.

Prominent bark beetle species found within the project area are the mountain pine beetle and the pine engraver beetle (*dendroctonus ponderosae, Ipps. spp.*). These species are currently at endemic levels killing incidental individuals or groups within the project area and surrounding watersheds annually. Mountain pine beetle (*dendroctonus ponderosae)* mortality is closely associated with overstocked, continuous stands, drought periods and secondary damaging agents

such as snow or wind damage (Furniss and Carolin 1977; USDA Undated; Shepperd and Battaglia 2002). Stands with conditions at moderate to high risk to mountain pine beetle infestation (USDA Undated; Shepperd and Battaglia 2002) are found on approximately 4,584 acres (68% of the forested lands – strata's 133, 134, 233 and 234) of the National Forest lands within the project area.

Pine engraver beetles are relatively non-aggressive beetles that take advantage of host material available to adults emerging from overwintering sites. Colonizing such material in early spring often produces another generation of beetles that frequently attack and kill trees in mid-summer. Most of the pine engravers locally are *Ips pini*, but other associated species are common.

Most pine engraver (*Ips, spp*) problems are associated with disturbances such as windthrow and snow breakage, drought in spring and early summer, logging, fires, road construction, housing development or other human activities. Pine slash or weakened trees created by these disturbances attract beetles and provide ideal conditions for population buildup and subsequent tree killing.

Because pine engraver beetles overwinter as adults and normally only infest fresh slash when they emerge in the spring, activity slash created from early winter through late spring can be especially hazardous by providing large amounts of breeding material. Slash should not be created during this period unless it can be treated prior to beetle emergence.

Creating slash from about January through July increases the likelihood of subsequent tree killing. When it is not practical to avoid creating slash during high-risk months, several management practices can be used to help minimize potential impacts:

a. Prompt slash disposal. Bulldozer trampling or chipping effectively reduces the amount of breeding material by decreasing the size of logging debris and by removing and drying the bark. Burning slash also destroys potential brood sites. When burning slash, however, avoid scorching standing trees as this makes them more attractive to numerous species of bark and wood-boring insects.

b. Where slash disposal is impractical, lopping into smaller pieces and scattering it into openings is effective. Reducing the size and exposing the slash to direct sunlight dries it faster making it less suitable for beetle colonization and development.

c. When beetle populations in slash constitute a threat, creating a continuous supply of fresh slash during the flight period of emerging adults will generally attract beetles, keeping them out of standing green trees. This technique is known as providing a "green chain." New slash should be produced just as beetles enter the pupal stage. Once started, this technique should be continued for each generation that season.

An alternative to this method is the creation of very large slash piles in the spring before initial beetle flight. If piles are big enough, interior pieces will not dry before beetles from the initial generation emerge. Emerging beetles are attracted deeper into the pile, keeping them out of standing trees. Piles should be at least 20 feet wide and 10 feet deep, and distributed throughout the treated area.

d. During logging, felling trees into openings and using established skid trails to avoid damaging the residual stand are good practices to reduce pine engraver attacks on the remaining

trees. Trees whose roots are exposed or disturbed and those with large patches of bark torn off should be removed.

e. An additional "control" method entails the use of pheromone-baited funnel traps to capture beetles emerging from small, infested slash piles or downed, scattered material. Traps are hung around infested piles or among infested tops, typically during the latter part of May (in Montana and northern Idaho). Emerging beetles will be attracted into traps, keeping them from infesting surrounding trees (Gibson and Weber 2004). While more labor intensive, this method has been used successfully. Still, it should be considered secondary to proper slash treatment.

Western gall rust (*Endocronartium harknessii)* produces galls that infect and girdle tree branches and boles. This disease does not require an alternate host, so it spreads readily from tree to tree. The seedlings, saplings and small pole timber become the most infected as spores rain down from the upper tree canopy. Much of the saplings in the dense stands show stem and bole infection. More frequent ground fire should have reduced stem densities and removed stressed seedlings and saplings, thus lowering the incidence of the rust.

Pine needle cast *(Elytroderma deformans)* is common in all sizes of ponderosa pine across the project area. Elytroderma disease is most damaging in trees of low vigor with poor crown; however, the disease is often more conspicuous in good crowns. If a tree is lightly infected, growth effects are probably negligible. When the infection level is moderately severe in mature trees, the crowns become thin and short and the trees are reduced in vigor. It is assumed moderate and severely infected trees experience some level of growth loss, but these effects have not been adequately quantified. Direct mortality from Elytroderma is uncommon, but moderately infected trees may be susceptible to root disease and bark beetles. The longer a tree is severely infected with Elytroderma, the less attractive it becomes to bark beetles. Mortality and deformation in young trees usually only occurs in crowded or suppressed trees. Young vigorous trees may experience severe defoliation and mortality in the lower crown, but the upper crowns are usually only slightly infected and defoliation is often compensated by new growth at the top. Elytroderma outbreaks are cyclic and a lot of areas across the region are experiencing an outbreak. These areas will eventually recover from the Elytroderma, but trees will die both from the infection and bark beetle attacks. This mortality will add to the vertical structure of the fuel complex.

These pine communities are very fire-dependent ecosystems. Although I have found nothing in the literature on Elytroderma and fire cycles, through a conversation with the regional pathologist, I believe that fire suppression has allowed for periodic buildups of Elytroderma. Dense globose brooms are filled with old casted needles and appear to be very flammable. Ground fires, which would occur prior to the peak of spore dispersal in late summer, would readily burn the lower brooms and, thus, decrease the overall spore load. The regional pathologist suggested that some literature indicates that the casted needles may continue to release viable spores the following spring: ground fires would also burn up these casted needles and any potential for infection from their spores.

Snow damage is prevalent across the forested areas were dense "dog-hair" stands have developed. These dense stands create tremendous competition for light, nutrients and moisture, resulting in individual trees having live crown only in the upper third or less. Late spring snowstorms, which are heavy with moisture, cause these weakened trees to bend to the ground.

This bending damage creates areas of jackstraw, crisscrossed patches and adds to the vertical structure of the fuel complex.

Cedar apple rust *(Gymnosprangium species)* is infecting the juniper as evidenced from stem swellings, knot-like branch galls and witches' brooms. These symptoms can reduce vigor, growth rate, aesthetic value and kill branches above the infected points (Riffle and Peterson, 1986). Juneberry *(Almelanchier alnifolia)* is the alternate host for this rust. The disease cycle starts after spring rains (March to June), telial horns extrude from each lesion, gall, swelling, or broom on junipers. Teliospores in the horns germinate to produce basidiospores, which are carried by wind or insects to nearby rosaceous hosts. After infection of susceptible host tissue by basidiospores, pynia develop in yellow to orange lesions, followed by production of aecia. Aeciospores are wind blown to junipers in the same growing season from late spring to early fall. After infection of the juniper, galls or other structures form. The orange gelatinous telial horns appear on them either the following spring or one year later. The cycle is then repeated.

Witches' brooms and dead branches add to the flammability of the juniper and the fuel complex. High frequency low intensity fires not only kept juniper colonization at low levels in these two fire groups, but also probably had an impact on the amount of infection by controlling the alternate host during the susceptible period of spore dispersal (late spring to early fall).

Across the project area, insects, diseases and weather damage have combined to reduce growth and create deformities in the understory, creating a complex vertical fuel bed. These factors and the dense multistory stands have created a forest structure that is conducive for stand-replacement disturbance regimes.

Most of the discussion has been on the understory. The overstory in these ponderosa pine communities is also affected by tip moth, western gall rust and elytroderma needle cast, but generally with less drastic impacts to the health and fuel complex. The overstory has scattered porcupine damage and many of the large, old ponderosa pines show physical evidence of survival from past fires due to presence of old fire scars and cat faces. Heavy accumulations of needle cast and duff around the bases of the overstory trees is overwhelming evidence that shows lack of fire in these stands for some time period. Even though, ponderosa pine's thick bark adaptation helps to survive ground fires, this buildup of needle cast may hold fire around the bases of the trees. This longer duration fire has an oven effect and could cook the roots and/or girdle the stems at ground line, causing immediate mortality or delayed mortality. Even a less intense ground fire could cause a lot of mortality (Kolb, Agee, Fule, McDowell, Pearson, Sala, Waring, 2007 in press).

Some of the pine stands have colonized and increased in density on the traditional grasslands and shaded out the native grasses. Lack of disturbance has resulted in multistory, dense, full-canopied stands, resulting in a decline in the understory shrub, herb and grass species. This decline, mainly due to shading, is evident in the very dense stands to the degree that the understory nontree vegetative components are absent and the floor is comprised of only needle cast and/or bare soil. This decrease in the understory shrub, herb and grass components have a negative effect on the nutrient cycle. These understory species with a yearly leaf fall and dieback enables nutrients like potassium and boron, important defense mechanisms for insect and disease attack, to be cycled through the system. With and increase in sustained biomass above ground, nutrients are tied up. Competitions for light, minerals and moisture weakens

individuals and with less nutrients being available stands have a lower vigor and are more susceptible to insect and disease attack.

TIMBER SUITABILITY ACREAGE

The forested stands in the project area are found on all aspects. Forested stands being defined as those forested sites where there exists 10 percent stocking or higher (or is capable of supporting). The tentatively suitable forested sites (4,963 acres, 74 percent of the ponderosa pine forested acres); by photo interpretation and ground examination are found predominately on the moist and slightly cooler northerly aspects and the easterly aspects of the larger size draws. The tentatively unsuitable timber sites (1,744 acres, 26 percent of the ponderosa pine forested acres); by photo interpretation and ground examination are most common on the southerly, drier and slightly warmer aspects and represent the driest ponderosa pine habitat types.

TABLE 5: TENTATIVELY UNSUITABLE FORESTED ACRES BY MANAGEMENT AREA

Management Area	Acres[1]	Percent of Ponderosa Pine Area	Percent of Total Project Area
D	1,744	26.01	17.86
Total	1,744	26.01%	17.86%

[1]These are approximate acres derived from Forest GIS coverage's.

TABLE 6: TENTATIVELY SUITABLE FORESTED ACRES BY MANAGEMENT AREA

Management Area	Acres[1]	Percent of Ponderosa Pine Area	Percent of Total Project Area
D	4,938	73.62	50.56
F	4	.06	.04
G	2	.03	.02
P	19	.28	.19
Total	4,963	73.99%	50.81%

[1]These are approximate acres derived from Forest GIS coverage's.

FUEL TYPES AND HABITAT TYPES

The climax ponderosa pine forest types, in the project area, fit Fire Groups Two and Three as described by Fischer and Clayton in 1983. Fire Group Two occurs on the warm, dry ponderosa pine sites. Group Two is characterized as having a light downed and dead fuel loading and can consist of open ponderosa pine stands with predominant grass undergrowth or as stands with dense, multistory understories with scattered to closed overstories. The stands with dense understories often have unusually heavy duff loadings around the bases of the large trees. Fire Group Three occurs on the warm, moist ponderosa pine habitat sites, which are the more productive north slopes, sheltered ravines and coulees. They tend to have more uncharacteristic fuel complexes. Group Three fuel loadings of downed, dead and thick duff layers are very

similar to Group Two. Group Three sites often exist as stagnant, overgrown thickets of ponderosa pine saplings, but can vary from all-aged with scattered regeneration and shrub layers, to stands with only two or three distinct size classes. Group Three fuel complexes of dense "dog-hair" thickets of ponderosa pine regeneration, multi layered stands; shrub layers and increased biomass tend to promote erratic crown fire behavior.

Twenty six percent of the ponderosa pine forested acres represent Fire Group Two and seventy four percent in Fire Group Three. Five general stand structure types currently exist in the ponderosa pine forested acres across the project area and are depicted in the table below.

TABLE 7: PONDEROSA PINE STRUCTURE, CROWN CLOSURE AND ACRES BY FIRE GROUP

	FIRE GROUP TWO			FIRE GROUP THREE		
Structure Type	Average Crown Closure Percent	Percent Ponderosa Pine Area	Acres[6]	Average Crown Closure Percent	Percent Ponderosa Pine Area	Acres[6]
1. Multistory with scattered overstory[1]	10-39	19.84	1,332	10-39	.37	25
2. Two-story with a light overstory[2]				10-39	.86	58
3. Two-story with a light overstory[3]				40-69	6.58	442
4. Multistory with a nearly closed overstory[4]	40-70+	6.11	410	40-70+	65.40	4,390
5. Single story, seedling/sapling[5]				10-39	.83	56
Totals		26%	1,742		74%	4,971

[1]Stratums 122, 132, 222, 231, 232. [2]Strata 142. [3]Strata 143. [4]Stratums 123, 124, 133, 134, 223, 233, 234. [5]Stratums 111. [6]These are approximate acres derived from Forest GIS coverage's.

Fire Group Two also exists as a fire maintained grassland that supports juniper and ponderosa pine individuals. These particular sites are classified as nonforest as they contain less than ten percent pine or juniper stocking. Twenty percent of this nonforest area is identified as scoria/sandstone and shows a component of less than 10 percent ponderosa pine and/or juniper stocking on about 325 acres. Twenty four hundred and forty nine acres is dry and moist grasslands with 30% having ponderosa pine and/or juniper stocking (less than 10%). Sixty seven percent of the non forest acres are on slopes less than 20 percent.

Seven ponderosa pine habitat types may occur across the project area (Pfister and others, 1977). Fire Group Two includes the warm, dry ponderosa pine habitat types *Pinus ponderosa/Andropogon species.* (ponderosa pine/bluestem), *Pinus ponderosa/Agropyron spicatum* (ponderosa pine/bluebunch wheatgrass), Pinus *ponderosa/Festuca idahoensis-Festuca idahoensis* phase (ponderosa pine/Idaho fescue-Idaho fescue phase) and *Pinus ponderosa/Symphoricarpos albus* phase (ponderosa pine/snowberry-snowberry phase). Fire

Group Three occurs on the warm, moist ponderosa pine habitat types *Pinus Ponderosa/Symphoricarpus albus-Berberis repens* phase (ponderosa pine/snowberry-creeping Oregan grape phase), *Pinus Ponderosa/Prunus virginiana Prunus virginiana* phase (ponderosa pine/chokecherry-chokecherry phase and *Pinus ponderosa/Prunus virginiana-Shepherdia canadensis* phase (ponderosa pine/chokecherry-buffaloberry phase.

Fischer and Clayton (1983) indicate that these two fire groups have a high frequency low intensity fire regime, with an interval between 5 and 25 years. The ponderosa pine communities in the project area have not experienced this fire regime for the past 90 plus years. The absence has resulted in (Mutch, 1994):

- Increases in canopy closure,
- Increases in vertical fuel continuity,
- Increases in crown fire potential,
- Declines in tree vigor,
- Declines in shrub production,
- Declines in aesthetic values,
- Decreases in water availability and run off, and
- Decreases in nutrient availability.

LADDER FUELS AND CROWN COVER

Using the forest strata label and the average stand scenario an assessment of ladder fuels for the project area occurred. They were classified into stand conditions having predominately one ladder fuel (One Layer), two ladder fuels (Two Layer) or multiple ladder fuels (Multi Layer).

TABLE 8: ACRES AND PERCENT OF PONDEROSA PINE STRUCTURE ACROSS THE PROJECT AREA

	Acres[4]	% of Ponderosa Pine Project Acres
One Layer[1]	56	.8
Two Layer[2]	0	0
Multi Layer[3]	6,657	99.2
Totals	**6,713**	**100%**

[1]Predominately one layer; may have additional cohorts or layers. In combination the additional layers total generally less than 100 tpa.
[2]Two distinct layers; may have additional cohorts, but there is a distinct break and in combination the additional tpa totals less than about 100 tpa.
[3]More than two layers; has a continual ladder of cohorts in the stand structure. This data is summarized from the forest strata, average stand conditions and inventory data and the analysis is in the project folder. [4] These are approximate acres derived from Forest GIS coverage's.

Over 99 percent of the project area (ponderosa pine acres) has multiple layers. This structure presents a ladder effect for fire to climb into the crowns increasing the risks for large stand replacement fires. Less than 1 percent of the project area is in a single story condition. This single story condition is more conducive to fire being maintained as a surface fire with a lower risk of large stand replacement wildfire events. There is a need to move more of the ponderosa pine stands to a single story condition and lessen the ladder effect of fire moving to the crowns by removal of all or some of the small diameter understory tree components. This would lower the risk of large stand replacement wildfire.

Crown cover was assessed for the project area using the strata label. Each polygon was assessed and classified into No Crown Cover, Very Low Crown Cover, Low Crown Cover, Moderate Crown Cover or High Crown Cover.

TABLE 9: CROWN COVER SUMMARY IN PROJECT AREA

	Project Area		Ponderosa Pine Area within the Project Area	
	Acres	% Project Area	Acres[5]	% of Ponderosa Pine Area
No Crown Cover	1,987	20		
Very Low Crown Cover[1]	1,066	11		
Low Crown Cover[2]	1,471	15	1,471	22
Moderate Crown Cover[3]	3,334	34	3,334	50
High Crown Cover[4]	1,908	20	1,908	28
Totals	**9,766**	**100**	**6,707**	**100**

[1]Very Low Crown Cover: less than 10% crown cover. [2]Low Crown Cover: 10 to 39% crown cover. [3]Moderate Crown Cover: 40 to 59% crown cover. [4]high Crown Cover: 60% plus crown cover. [5] These are approximate acres derived from Forest GIS coverage's.

Twenty eight percent of the ponderosa pine coverage in the project area has been rated with a high crown cover and 50 percent with a moderate crown cover. These crown cover estimates are based on the strata label that was determined about 15 - 20 years ago. The amount of acres currently in the high crown cover classes is believed to be 10 to 20 percent higher. These higher crown cover percents on the landscape increase the risk that once fire has moved into the crowns the fire can continue burning in the upper canopy level. This condition increases the risk for a large scale stand replacement wildfire event.

DESIRED CONDITION

REFERENCES FROM FOREST PLAN AND OTHER PERTINENT DOCUMENTS
Management Area B goal is to provide for the continuation of livestock grazing, implementation of intensive range management systems and the facilitation of minerals and energy development with consideration of other resource needs. In areas not considered key for wildlife, adverse impacts to the wildlife habitat will be mitigated where feasible, but not to the exclusion of range and mineral/energy management and development activities. In key wildlife areas, the habitat may not be adversely impacted from development activities (Custer National Forest and National Grasslands Land and Resources Management Plan, 1987).

Management standards for individual resources in B include:

- Range; intensive grazing systems are preferred with the objective of improving range condition to good or better,
- Wildlife; emphasis will be to maintain existing wildlife habitats. These habitats will be improved where improvement would be consistent with other resource needs,
- Timber; forested areas will be managed to perpetuate or enhance livestock forage and wildlife habitat values. Management activities may include removal of wood products such as sawlogs, posts and fuelwood or transplant materials. Wildlife and range resources will be protected or enhanced. Silvicultural systems may include either even aged or uneven aged systems. Regeneration systems may be appropriately applied to

meet management area goals. The productive forestlands within this area are classified as suitable for timber production.

- Recreation, visual quality objectives will include retention, partial retention and modification and management activities will be designed and implemented to blend with the natural landscape,
- Prescribed fire; planned ignitions may be used for range and wildlife enhancement, fuels and debris reduction.

Management Area N goal is to provide healthy, self-perpetuating plant communities that will have optimum diversity of understory and overstory vegetation (Custer National Forest and National Grasslands Land and Resources Management Plan, 1987).

Management standards for individual resources in the N area include:

- Recreation; the visual quality objectives of retention will be met in this area except where crossed by roads. The natural-appearing landscape will remain dominant and most management activities will not be evident,
- Wildlife; the habitat for old growth/snag cavity dependent species will be maintained. Woody draws will be evaluated to determine existence of T & E species or the value of this area for possible use by these species. Where practical, suitable management techniques will be employed to improve the woody draw areas,
- Prescribed fire; planned ignitions may be used for wildlife habitat enhancement and as a vegetative manipulation tool,
- Timber; harvest timber only if woody draw wildlife habitat values can be improved or protected. Wildlife habitat management objectives will determine the harvest unit size and the amount of material removed. Uneven-aged silvicultural management practices will primarily be used to provide diversity. Timber harvest in areas classified as unsuitable will only be to maintain or perpetuate their special values.

Management Area G goal is to manage these areas for the maintenance and improvement of a healthy diverse forest and as a source of wood products for dependent local markets. Silvicultural systems will consider other resource needs such as wildlife habitat, visual impacts, and livestock management (Custer National Forest and National Grasslands Land and Resources Management Plan, 1987).

Management standards for individual resources in the G area include;

- Recreation; visual quality objectives will not exceed modification. Areas of retention and partial retention will be common,
- Wildlife; management proposals will analyze wildlife and fish values, and potential impacts including but not limited to: forage/cover ratio (pre-and-post), snag densities, road management opportunities, winter range requirements, roost areas, streambank/shoreline vegetation, and siltation potential. Management practices will be assessed particularly as they affect diversity of vegetation. Mitigation measures will be identified and incorporated to the extent possible in that the goal of the Management Area is achieved. Unique wildlife features such as elk wallows and nesting sites for key birds will be protected. Cavity nesting habitat will be maintained by retaining two snags per acre, where they exist,
- Range; domestic livestock grazing may occur in this area and silvicultural systems used are to consider the effects of livestock grazing on regeneration. Forage production

realized through management activities will be treated as transitory range. Livestock use will not be encouraged if regeneration problems occur. On the better growing sites in this area where it is desirable to regenerate the stand as soon as possible it may be necessary to exclude grazing during this critical regeneration period.

- Timber; area analysis will be made that consider harvest levels and location, expected oil and gas development, transportation systems to service management needs and other resource conflicts and possible mitigation measures. Even-aged management is the preferred silvicultural system but uneven-aged management may be used where such methods are more appropriate for meeting ecological requirements and management of the species. Clearcutting may be used where it is the optimum regeneration method and meets the objectives for the area. Old growth will be managed to at least meet the habitat requirements for a minimum viable population of old growth dependent wildlife species. Seasons of management may be adjusted on a case-by-case basis to protect wildlife and soil and water values and reduce conflicts with recreation traffic. Silvicultural systems that favor natural regeneration will be emphasized. The objective will be to regenerate harvested areas within five years. Insect and disease infested timber will be treated with an appropriate silvicultural system in coordination with other resource values. Precommercial thinning will be utilized in a cost-effective manner on areas with high site index. Prescribed fire, as well as other management tools may be used to thin stands. Over stocked stands will be evaluated for wildlife needs prior to treatment. This management area includes lands classified as suitable for timber management.
- Prescribed fire; may be used for timber stand maintenance and thinning, slash disposal, natural fuel reduction, wildlife habitat maintenance and enhancement with an approved prescribed fire plan.

Management Area F goal is to provide for a spectrum of recreation opportunities and settings in and around developed sites. Resource management should favor maintaining or enhancing the recreation opportunities including the visual setting (Custer National Forest and National Grasslands Land and Resources Management Plan, 1987).

Management standards for individual resources in the F area include;

- Recreation; visual quality objectives in the foreground viewing area will be either Retention or Partial Retention.
- Wildlife; Management activities that contribute to the opportunity of wildlife and fish related recreation are encouraged.
- Range; Livestock grazing will not be allowed in developed sites, unless it can be accommodated before or after the recreation use season and is instrumental in the management of the site.
- Timber; Harvest within developed recreation sites will normally be for removal of hazardous trees and protection of improvements. Timber within the recreation corridors is suitable for timber management as long as the goal of the management area can be met. Post, poles, fuelwood, sawlogs, and other wood products may be harvested form within developed sites providing that the recreation setting is maintained or enhanced, and the visual quality objective is achieved. Type of harvest, design of sale unit and slash treatment will be instrumental in meeting these requirements.. Harvest activities will be scheduled to minimize impacts on the recreation experience.

- Prescribed; Planned ignitions may be used for slash and debris disposal, enhancement of visual quality and preventive measures to reduce widlfire intensity. Unplanned ignitions will not be used as a management practice.

Management Area P goal is to provide adequate facilities for the administration of the Custer National Forest (Custer National Forest and National Grasslands Land and Resources Management Plan, 1987).

Management standards for individual resources in the P area include;

- Recreation; visual quality objectives will not exceed modification.
- Range; Livestock grazing may be used to achieve other resource objectives.
- Timber; This area is not part of the suitable timber base. Timber harvest may be used to protect or maintain other values.
- Prescribed; Planned ignitions may be used for debris disposal and maintenance of administrative pastures. Unplanned ignitions will not be used as a management tool.

The forest wide timberland management goal is to manage timber within sustained-yield capability to help maintain timber dependent communities, forest health, vigor, productivity, provide vegetative diversity for wildlife, eliminate tree encroachment on selected livestock grazing areas and provide scenic openings.

Vegetation management activities of timber harvesting, fuels reduction, stocking reduction and prescribed fire are tools and management activities that should be considered for the maintenance and or restoration of the structure, function and composition of ponderosa pine ecosystems. Maintenance objectives include: maintain a diversity of healthy, vigorous stand structures across the landscape to enhance habitat for wildlife and forage for domestic cattle; enhance forage production for cattle and wildlife by maintaining low canopy closures and pine needle build up in mature stands of pine trees; increase the shrub, forb and grass component by opening up the canopies; maintain a mosaic of stand structures and age classes across the landscape for turkey and mule deer habitat enhancement; discourage dense timber stands so livestock utilization patterns in transitory range will contribute to improved primary range; reduce large fire potential by improving access and maintaining stand structures that are not susceptible to large stand replacement fire; improve transitory range throughout the managed rotation; maintain some large woody debris on the site for wildlife habitat and long term soil productivity; break up the continuity of fuels to give fire fighters safety zones and access to prevent uncontrollable wildfires from doing major resource damage and properly loss; and reduce long term susceptibility to effects of uncontrollable wildfires.

Returning high frequency low intensity fires as a disturbance regime should be a goal to restore/maintain the structure, function and composition of the ponderosa pine ecosystems.

According to Clayton and Fischer (1983), fires role during presettlement times was for:

Fire Group Two,

- To maintain grasslands,
- To maintain open pine stands,
- To encourage ponderosa pine regeneration,

Fire Group Three,

- Prepared seedbeds favorable for ponderosa pine regeneration,
- Controlled-stocking levels during the seedling and sapling stage of tree development,
- Thinned out suppressed pole-sized ponderosa pine trees,
- Maintained mature stands in an open, park like condition,
- Provided some browse for wildlife, and
- Destroyed dense, stagnant and multi-storied stands.

Considering the existing conditions, and understanding the presettlement role of fire, there are two long-term objectives for ponderosa pine stands in Fire Group Two:

- Restore and/or maintain open grasslands.
- Restore and/or maintain open pine stands.

And there is four long term objective for ponderosa pine stands in Fire Group Three:

- Restore and/or maintain open pine stands.
- Prepare seedbeds to created development of new stands.
- Control stocking levels.
- Provide browse for wildlife.

There are two objectives for juniper in project area:

- Reduce the frequency of juniper in the ponderosa pine communities and areas of traditional grasslands.
- Maintain the juniper communities where they occur.

The desired conditions for juniper as a landscape component would be less density and coverage in the ponderosa pine stands. Juniper did not historically occur there and increased flammability could replace the forest with grassland. Intensive grazing might have allowed pine and juniper to reestablish grassland conditions. Where juniper is a climax species, little needs to be done to maintain juniper woodlands. Light surface fires might be useful to reduce fine fuels and/or rejuvenate grass and shrub understories in juniper woodlands. Juniper is very susceptible to fire and owes its current distribution to the lack of regular fire and livestock grazing.

NATURAL STRUCTURE AND DISTURBANCE REGIMES

Fire suppression, the lack of prescribed fire and lack of alternative suppression strategies have encouraged pine-colonized grasslands and dense, multistory ponderosa pine stands. Repeat photo points illustrating vegetative trends and patterns from the late 1800's to 1974 supports this contention (Progulske, 1974).

Ponderosa pine seedlings establish readily on bare mineral soil, which is coincident with adequate moisture for germination. Charred logs and stumps and other deadfall provide protection and shade for seedling germination. Ponderosa pine seedlings take about 5 years to overcome grass competition and it takes around 8 years to accumulate sufficient needle litter to carry a surface fire. Ground fire will be a lower intensity in grassy openings as compared to burning needle cast. Such fire would still be effective at killing small, thinner-barked pine seedlings. This regeneration process resulted in even-aged groups of trees that developed in .5 to 2 acre patches. Taller overstories seldom had dense tree regeneration developing beneath them. Regular, passing surface fires killed younger, weaker seedlings and saplings in dense thickets.

Competition for nutrients and water was reduced and stand suppression lessened. The lower branches and the foliage of remaining seedlings and saplings were pruned, thereby increasing fire tolerance in surviving trees.

Repeated fires checked pine encroachment of grasslands and reduced the coverage of less fire-resistant plant species, such as Rocky Mountain Juniper. Burning allowed the development of mature ponderosa pine stands, which developed closed canopies and reduced herbaceous undergrowth. Pine litter accumulated and taller, more isolated overstory dominants were struck by lighting. Such trees repeatedly started surface fires that began the forest renewal process once again. Grasses, herbs, shrubs and pine seedlings would invade the created openings and struggle for dominance, until the next surface fire visited.

The desired condition is to provide enough of each forest structure (grass/forb/shrub, seedling/sapling, young forest, mid aged forest, mature forest and old forest) to fulfill the habitat needs of the species inhabiting the ponderosa pine ecosystem. To obtain the desired condition, management across the landscape, planning management over time, and insuring forest mosaics to reduce ecosystem risk to any single fire or other disturbance that will wipe out any one of the needed forest structures should occur.

Biodiversity

Maintaining a variety of stand structures across a landscape can enhance biological diversity. Each stand can be managed as a system of changing structures. The structures can be changed in a balanced way across the landscape by using planned silvicultural operations to mimic disturbances and other natural processes. Such management for biological diversity can yield high economic and ecological values, a variety of uses, and employment. Efficient management for biodiversity and forest value will entail managing a forest as a portfolio (a multi-product asset), and realizing that maximum forest value is not always achieved by maximizing wood volume.

TARGET STAND CONSIDERATION

Historically, ponderosa pine stands in the project area were more open and less stocked than they are today. In the development of desired conditions there was an emphasis put on restoring the function, composition and structure of the ponderosa pine ecosystems. The structure and composition of the ponderosa pine ecosystems envisioned is a landscape dominated by more single story, even-aged, and open grown, which could be maintained through stocking reductions by either mechanical treatment or prescribed fire or both.

Two desired conditions for the ponderosa pine forestland for the project area were described. Target stand #2 focuses on perpetuating or maintaining goshawk habitat within identified post fledgling areas. Target Stand #1 puts emphasis on creating stand conditions conducive to non-stand replacing wildfires, timber productivity, and forage and browse production out side of the identified post fledgling areas. These desired conditions meet various aspects of issues and the intent of the Forest Plan goals, objectives and management direction. Both of these target stand conditions are described in Appendix IV.

There was a need identified to manage a component of the landscape with higher stocking and crown cover to provide habitat for selected species (goshawk) per guidelines in the Forest Plan. This was captured by the no treatment areas and Target Stand #2. Target Stand #2 was designed

to meet this need and is a deviation from open grown conditions. Target Stand #2 promotes a more closed canopy cover, with an overall stand average greater than 30% and where capable the desired condition is greater than 40 % with some areas 50 to 70%. Target Stand #1 promotes a stand condition that has fewer trees and allows for a lower canopy cover.

Eastern Montana ponderosa pine does not typically grow in continuous uniform patches. A more typical pattern is a clumpy distribution across the landscape of ponderosa pine exhibiting various stand densities and crown cover. It is recognized that managing for a uniform canopy cover across the landscape would create unhealthy conditions for the ponderosa pine system and would be outside of the historic range of conditions for eastern Montana ponderosa pine as modeled by the Vegetation Dynamic Development Tool (FRCC website, 2005). Selection of sites to manage these higher canopy covers should be in areas that are capable to support and can be sustained. These areas commonly termed microsites are typically found in topographic features that are conducive to higher soil moistures (swales, draws, northern aspects).

For Target Stand #1 the basal area and canopy closures were set at levels, to prevent major regeneration, maintain endemic levels of insect and diseases and promote forage and browse species, while still producing timber for the local markets. Target Stand #2 will have a higher risk of epidemic levels of insect and disease outbreaks and less forage and browse production merely from the fact that higher densities create more competition for light, nutrients and water. This creates non-vigorous growing conditions especially during drought, resulting in increased insect and disease activity.

Both Target Stands reduce hazardous fuel conditions on the landscape by promoting single story structures (reduction of multi structures, ladder fuels). However, Target Stand #2 has higher crown canopy that promotes crown-to-crown spread of fire, which increases the risk to large stand replacement fire.

These target stand conditions described are the desired condition. With these target stands, a comparison was made against the existing condition to decide if some form of vegetation manipulation would meet the target stand attributes.

ENVIRONMENTAL EFFECTS

INTRODUCTION

The concept of viewing an ecosystem as a landscape requires a broader scale of reference. Forested ecosystems reflect the physical site (the soils, climate, aspect, etc.) as well as the processes (wind throw, insects and diseases, fire, etc.) that affects and change them. Management practices have interfered with some of the processes (such as wildland fire suppression) shifting forest composition, structure, and function.

A component of landscape ecology involves sustainability. It is presumed that before human intervention, the structure, composition, and function within a forest, and the processes that affected forests, represented a dynamic equilibrium. While there is no definitive point in time or stand conditions that can be described as “the right answer”, there are relationships between forest conditions and processes, which interact and which may be described as sustainable.

Historically, frequent low-intensity fires cleared dry type ponderosa pine forest types of brush and grass but left trees alive and healthy (Graham, et. al, USDA, 2004). Extreme fires were uncommon. By excluding fire from the natural cycle through decades of fire suppression, extended drought and other changes, the result is greater tree densities and a buildup of flammable vegetation across large areas of the forest landscape resulting in large stand replacement fire. The 2000 Stag-Tobin Fire Complex on the Ashland Ranger district that burned over 71,000 acres is an example.

The buildup of vegetation provides "ladders" for wildfire to climb into the tree tops. In areas where trees are densely packed, the fires can spread rapidly from tree-to-tree in a phenomenon known as "crowning." Crown fires are intense, fast moving and nearly impossible for fire fighters to contain. They threaten communities and damage key resources, including timber, fish and wildlife habitat, soils and drinking water quality.

The effect analyzed in this section is vegetative system sustainability, more specifically for the ponderosa pine component of the landscape. This is measured and/or discussed in regards to effects from the implementation of the proposed action on forest stand structure (ladder fuels and crown cover) and risk to large stand replacement wildfire. A discussion of forest health in regards to understory vegetation and large woody debris as it relates to the proposed action and no action is included.

FOREST SUSTAINABILITY

Effects on Ladder Fuels, Crown Cover and Risk to Large Stand Replacement Wildland Fire

Prior to Euro-Americans settlement, dry ponderosa pine forests were burned by frequent low or mixed severity fires (Hessburg, Agee, Franklin, 2005). These mostly surface fires maintained low and variable tree densities, light and patchy ground fuels, simplified forest structure, and favored a patchy cover of associated fire-tolerant shrubs and herbs (Hessburg, Agee, Franklin, 2005). Low severity fires maintained fire-resilient structures by elevating tree crown bases and scorching or consuming many seedlings, saplings, and pole-sized trees. They cycled nutrients from branches and foliage to the soil, where they could be used by other plants, and promoted the growth and development of low and patchy understory shrub and herb vegetation. Finally, surface fires reduced the long-term threat of running crown fires by reducing the fuel bed and metering out individual tree and group torching, and they reduced competition for site resources among surviving trees, shrubs and herbs. Rarely, dry forest landscapes were affected by more severe climate-driven events (Hessburg, Agee, Franklin, 2005).

Dry forests no longer appear or function as they once did. Large landscapes are homogeneous in their compositions and structure, and the landscape is set up for severe, large fire and insect disturbance events.

Small fires, if they had been allowed to burn in the early 20th century, or were intentionally lit, would have broken up the dry forest thereby reducing the size of the area influenced by uncontrolled wildfires that we are experiencing today. Changes that have occurred and the effects of those changes form wildfire suppression (management) have been discussed in the literature (Hessburg, Agee and Franklin, 2005). Table 10 compares key changes and their effect on the landscape.

TABLE 10: KEY CHANGES IN DRY FOREST LANDSCAPES	
Change	**Effect**
Reduced grassland and shrubland area in forest potential vegetation settings and expanded forest area.	*Increased homogeneity of the landscape vegetation and fuels mosaic.*
Reduced old and new forest area.	*Increased homogeneity of the landscape vegetation and fuels mosaic, reduced spatial isolation of areas prone to high-severity fires.*
*Loss of grass and shrub understories.**	*Reduced likelihood of low-severity fires with increasing flame length, fierline intensity, rate of spread, increased fuel ladders and likelihood of crown fire.*
*Increased tree canopy cover, and canopy layers.**	*Increased fuel ladders, potential flame lengths, fireline intensity, rate of spread, and likelihood of crown fires.*
*Increased young multi-story forest area.**	*Increased landscape homogeneity, reduced fire tolerance, increased fuel ladders, potential flame lengths, fireline intensity, rate of spread, and likelihood of crown fires.*

**Indicates a strong correlation with current severe fire behavior.*

Changes in disturbances process have also been noted in the literature and include (Hessburg, Agge, Franklin, 2005):

1) elevated fuel loadings and increased connectivity of high fuel loading;
2) increased potential for running crowning fires;
3) increased vulnerability to many insect and disease disturbances;
4) increased likelihood of severe fire behavior in forest stands or patches with respect to flame length, rate of spread, and fireline intensity;
5) increased contagion or spatial aggregation of vulnerability to severe fire and insect and disease disturbances.

There is little evidence that current patterns are sustainable and this has important ecological consequences. The project area is increasing in homogeneity in its composition and structure, and the landscape is set up for severe, large fire and/or insect disturbance events. To date, wildland fires alone have not created ecological outcomes that are desired by society or that are consistent with natural ecosystem functioning.

Fire resilience and sustainability of dry forest landscapes can be improved by thinning from below or applying regeneration harvest systems (emphasizing opening up the canopy to relatively wide spacing, reducing canopy layering and removal of the smaller size classes), coupled with prescribed burning or mechanical fuel treatment of the surface fires. Many examples have been documented in the literature to support this.

Studies for evaluating effectiveness of pre-fire fuel treatments were done on the 2002, 2003 and 2004 large wildfires fires in the western United States (Omi, Martinson, Chong, 2006). In this study fuel treatment effectiveness was found to be dependent on the type of treatment. Treatments that included reduction of surface fuels were generally effective, with or without

prior treatment of canopy fuels. Thinning followed by slash treatment produced the most impressive results. Thin-only treatments were generally ineffective and in some cases produced greater fire severity than adjacent untreated areas.

In 2005, Storm also noted in her study that the combination of cutting and prescribed fire had the greatest effect in reducing wildfire burn severity. She noted that prescribed fire alone reduced burn severity, but only if it took place within 10 years of the wildfire.

Skinner, Ritchie, Hamilton, and Symons evaluated effects of thinning and prescribed fire on wildfire severity that they summarized for a 2002 wildfire. They reported there was a higher percent of mortality in untreated stands vs. treated stands. They noted that where ladder fuels had been treated but then those surface fuels were not treated, resulted in ineffective reduction in wildfire severity. However, when ladder and surface fuels had been sufficiently reduced crown fire was reduced and severity of wildfire.

Cram, Baker and Boren studied 2002 and 2003 wildfires in New Mexico and Arizona and reviewed fire effects in silviculturally treated vs. untreated stands. They concluded similar results: the more aggressive the treatment the less susceptible forest stands were to crown fire and mechanical treatment followed by prescribed fire had the greatest impact toward mitigating fire severity (i.e., aerial and surface fuels were reduced).

Graham, Harvey, Jain, and Jonalea in 1999 indicated that the best general approach for managing wildfire damage seems to be managing tree density that includes a mix of thinning, surface fuel treatments, and prescribed fire.

This too has been demonstrated on the Sioux Ranger District of the Custer National Forest. There are sale units in the Ward timber sale (1986-1988) and Pot Hole timber sale (late 1970's) in the Long Pines land unit that had harvest systems implemented similar to those in the proposed action. As an example, one can clearly see in the pot hole sale that the a large stand replacement fire in 1988 (Brewer) and then again in 2002 (Kraft Springs) that the overstory and the dense unthinned understory has remained intact (Sandbak, Clark, 2005 unpublished). The wildfire was a crown fire and when it came to the treated stand it became a surface fire and burned in a mosaic pattern within the treated area. Once thru the treated stand the fire became a crown fire in the nearby untreated area. This fire behavior was also demonstrated in the Ward Timber Sale with the 2002 fire.

Current research clearly indicates the potential of fuel treatments in reducing fire severity and thereby making treated stands more ecologically and functionally resilient than untreated stands.

No Action

All wildland fires would be actively and aggressively suppressed. No vegetation treatments would occur. Continued fire suppression, is expected to increase stand density, canopy cover, vertical fuel continuity (ladder fuels) and crown fire potential; and decrease tree vigor, shrub production, water availability, run off, and nutrient availability. Tree seedlings would continue to regenerate with resulting increases in crown densities. As these seedlings grow in size, ladder fuels would continue to increase. This will result in more competition between trees for increasingly limited nutrients and moisture, resulting in a further decline in forest health. These conditions predispose the forest to large stand replacement fire or other large disturbance events.

The long-term sustainability of the ponderosa pine forest ecosystem would be less likely under this alternative.

Overall landscape ladder fuel conditions under a no action scenario are expected to remain the same. Crown cover across the landscape is expected to move towards a continuous high crown cover category. Overtime stand conditions will increasingly become denser, and function with a high risk for large disturbances (i.e. large stand replacement wildland fire, epidemic insect, and disease). Currently over 99 percent (6,657 acres) of the existing ponderosa pine coverage has multiple canopy layers resulting in a continual ladder of fuels to the crown. Seventy eight percent of the landscape has a canopy cover greater than 40 percent, which once the fire reaches the crown can sustain a crown fire. These conditions increase the risk of large stand replacement wildfire.

Proposed Action

The proposed action uses various commercial (ST, SH, CT, CT1, SC, LIB, STR, STR1), non commercial (NCBB, NCBJ, NCNS, PCT, SCNS, STR1) and prescribed fire treatments (NCBB, NCBJ, NCNS, PCT, RXB, SC, SCNC, STR, STR1) on the landscape to target reduction of ladder fuels, crown cover and surface fuels. Ponderosa pine would be managed to promote various densities, single and multi story (no treatments areas) stand structures across the landscape (TABLE 1). All of these treatments will promote and manage for predominately single story stand conditions. The no treatment areas will maintain multi story stand conditions. Ponderosa pine crown cover post implementation will vary from 10 to 70 percent plus.

The ST and SH will have the greatest reduction in canopy cover with a post treatment canopy cover of 10 to 20 percent (low risk for sustaining a crown fire). The CT will have a post canopy cover averaging 25 percent (low risk for sustaining a crown fire). The SC, LIB, STR, STR1, NCBB, and PCT will have post canopy cover ranges from 20 to less than 60 percent (low risk to high moderate risk for sustaining a crown fire). The NCBJ and CT1 will have areas post treatment averaging 30 to 65 percent plus (moderate to high risk for sustaining a crown fire). The NCNS treatments will carry the highest crown cover of the treated areas exceeding 70 percent in some areas (high to very high risk for sustaining a crown fire).

Implementation of the proposed action would result in a landscape that would have a much lower risk of large stand replacement wildland fire effects. This in large part due to post treatment conditions of 87 percent of the ponderosa pine landscape having stand conditions with limited ladder fuels that are less conducive to fire moving into the overstory canopy and 57 percent of the landscape having low, very low or no crown cover. These low canopy cover scattered and intermingled across the landscape reduce the risk for a wild fire to be sustained as a crown fire. About 13 percent of the landscape would still retain ladder fuels with a high risk of large stand replacement wildland fire effects. The net change would be an 87 percent reduction in ponderosa pine stand conditions exhibiting ladder fuels or multi layer canopies (Table 11) and a 16 percent reduction in high crown cover (Table 12). These reductions reduce the overall risk of large stand replacement wildfire in the project area.

TABLE 11: PRE AND POST TREATMENT LADDER FUEL ACRES AND PERCENT OF CHANGE ACROSS THE PROJECT AREA			
	Acres[1]	**% of Ponderosa Pine Project Acres**	**Percent Change**

	Pre Treat	Post Treat	Pre Treat	Post Treat	
One Layer	56	5,867	.8	87.4	*+86.6*
Two Layer	0	0	0		
Multi Layer	6,657	846	99.2	12.6	*-86.6*
Totals	6,713	6,713	100%	100%	

[1] These are approximate acres derived from Forest GIS coverage's.

TABLE 12: PRE AND POST TREATMENT ACRES OF CROWN COVER AND PERCENT CHANGE IN PROJECT AREA

	Project Area					Ponderosa Pine Area within the Project Area				
	Acres[1]		% Project Area			Acres[1]		% of Ponderosa Pine Area		
	Pre Treat	Post Treat	Pre Treat	Post Treat	Percent Change	Pre Treat	Post Treat	Pre Treat	Post Treat	Percent Change
No Crown Cover	1,987	**1,987**	20	**20**	*0*					
Very Low Crown Cover	1,066	**1,066**	11	**11**	*0*					
Low Crown Cover	1,471	**2,488**	15	**26**	*+11*	1,471	**2,488**	22	**37**	*+15*
Moderate Crown Cover	3,334	**3,444**	35	**35**	*0*	3,334	**3,444**	50	**51**	*+1*
High Crown Cover	1,908	**781**	19	**8**	*-11*	1,908	**781**	28	**12**	*-16*
Totals	**9,766**	**9,766**	**100**	**100**		**6,713**	**6,713**	**100**	**100**	

[1] These are approximate acres derived from Forest GIS coverage's.

EFFECTS ON UNDERSTORY VEGETATION

Understory vegetation with its yearly leaf fall and dieback is added to the nutrient cycle that promotes a healthy forest. Understory plants (grasses, shrubs, and forbs) are generally sparse where ponderosa pine trees canopy coverage is high (Arno, Harington, 1999). Limited growth is a result of shading, competition for soil moisture and nutrients, and casted needles that form a thick mat under dense forest conditions. In an open mature to old-growth ponderosa pine forest, a variety of grasses, shrubs, and forbs would be expected, and would be maintained over time by periodic low intensity fire.

Studies in the ponderosa pine have indicated the highest understory production (forbs, brush, graminoids) occurs with canopy cover of 0 to 20 percent (Shepperd, Battaglis, 2002). Thirty to sixty percent crown cover had a 56 to 64 percent reduction in production, while the heavier crown cover exhibits an 83 to 86 percent reduction.

No Action
With continued fire suppression, the ponderosa pine needle cast and high crown canopy would progressively suppress understory vegetation. The root systems of many species of grasses, forbs and shrubs are alive under this needle mat and would sprout if the needles were removed. However, these root systems cannot survive indefinitely and would decline in vigor over time. This would result in reduced resiliency of the ecosystem to regain its historical composition, structure, and function when a disturbance occurs. This also reduces the amount of available nutrients in the nutrient cycle, and leads to forest stands that are unhealthy and prone to insects and disease epidemics.

Proposed Treatment
The proposed treatments of commercial harvest, non commercial treatment and prescribed fire would result in increased sunlight, increased soil moisture, and decreased needle mat. All of these effects would stimulate understory plans. Overall, the effects of the proposed treatments would rejuvenate understory species (shrubs, grasses, and forbs).

Summary of Effects
The greatest reduction in crown canopy will occur on the commercial treatments of ST, SH, CT, STR, STR1 and LIB. Overtime these stands will be managed with less than a 60 percent canopy cover which would be a positive effect on the understory components. Reductions of canopy on the non commercial treatments of CT1, NCBB, SCNS, and PCT will also have positive effects. The non commercial treatment of NCBJ will have a positive effect on those areas where the crown canopy exists or is reduced to less than 60 %; however some of this treatment area and the NCNS treatment areas will maintain a canopy cover in excess of 60 percent, which would have limited to no gains in understory production. Prescribed fire treatment in combination with the commercial/non commercial treatments will have the greatest benefit.

EFFECTS ON FOREST HEALTH AND LARGE WOODY DEBRIS
Fire is a process that maintains the balance between organic matter buildup and decomposition for forested sites. Continued suppression of fires results in accumulation of dead fuels as well as living plant materials. In a situation where fuels have accumulated, wildland fires may result in increased volatilization of nutrients due to the intense burning conditions. A decrease in available nutrients would decrease site productivity, and health and vigor of the forest components.

Trees and other vegetation take water from the soil and transpire it in the process of respiration. In the absence of fire or other disturbances, the increased tree density results in a reduced amount of available soil water. When nutrients and water decline, plants experience stress and are more vulnerable to the impacts of drought, insects, and diseases. Trees killed or injured by fire attract a variety of insects, including bark beetles and woodborers. Some of these insects can cause tree mortality and introduce organisms that accelerate wood deterioration and recycling.

Large woody debris performs many physical, chemical, and biological functions in the forest ecosystems (ranging from soil protection to wildlife and microbial habitat). Large woody debris is defined by Graham (et. al. 1994), as coarse woody debris (CWD) greater than 3 inches in diameter. The management of large woody debris helps maintain ecosystem function. Snag retention is a management tool that benefits this function. CWD protects the forest floor and

mineral soil from erosion and mechanical disturbances and protects new seedlings from livestock damage. This resource is a key habitat component (especially large logs) for wildlife, and is important to stream ecology. Large woody debris alters airflow and provides shade, insulation, and protection for new forest growth. Ponderosa pine studies have recommended that between 5 and 13 tons per acre should be maintained (Graham, et. al, 1994). When large woody debris decays it retains water, making moisture available to vegetation during dry periods. When buried in the forest floor, large woody debris is an excellent host for ectomycorrhizal root tips. Even though this debris is a small portion of the forest soil, it contains the majority of the ectomycorrhizae. Ectomycorrhizae help woody plants take up water and nutrients, and their fruiting bodies play important roles in the food chains of many small rodents and larger predators. Retaining large woody debris on the landscape is important for forest health. The sizes amounts and continuity should be balanced with other needs such as reducing the threat of wildfire burning off NFS lands and onto private lands. Strategic locations of fuel loads on the landscape to aid in fire suppression operations and fire fighter safety should also be a consideration.

No Action

Without a change in the current structure of the forests in the project area forest health would decline over time creating conditions which would further increase fire behavior and intensity during wildland fires. These conditions would result in an increased probability of a large stand replacement event and the loss of the existing forest.

Although historically, insects played a role in the ponderosa pine stands, fire appears to have been the dominant disturbance agent. By maintaining the current stand conditions and suppressing wildland fire, insects and disease may become the major disturbance agent in the project area. A long-term effect of the No Action Alternative would be to perpetuate a trend toward a “boom and bust” cycle of larger scale disturbances between insects and disease and wildland fire in the ponderosa pine forest. This kind of disturbance regime, and the resulting landscape pattern (large patch size), would be much different from that occurring historically. Stand replacement fire in ponderosa pine types under a historical fire regime is estimated at about 10 to 15 percent (Northern Region Overview, 1998) and Wright (1978) has indicated that vegetation patterns created from the historical fire regime most likely occurred in a smaller even-aged patch size.

Currently surface fuels average 5 to 8 tons per acre across the landscape with small scattered areas having 15 to 20 tons per acre. With a no action scenario fuels are expected to increase. If a large wildfire were to occur a boom of surface fuels would be expected 10 to 13 years post fire after the fire killed trees have fallen. This would result in a high hazard fuels load and risk for another fire.

In 2002, that is what happened as an indirect effect of the 1988 sixty two thousand acre large stand replacement wildfire on the Sioux Ranger District of the Custer National Forest. Up to 40 tons per acre of down dead fuels intermixed with flashy light fuels (grass, brush and tree regeneration) dominated the post 1988/pre 2002 burn area. In 2002 this fuel complex is what carried the Kraft Springs fire. As indicated by the fire behavior specialist the continuous large woody debris component was a major carrier of the fire and made suppression operations very difficult (Sandbak, Clark 2005). The end result of this reburn was a loss of the large woody debris component across much of the fire area.

Proposed Action
Treatments would reduce the competition for nutrients, light and water, increase the availability of nutrients, initialize understory growth, and result in a forest structure that would be more sustainable. Vigorous and healthy stands would be more resistant to endemic levels of insects and diseases, and tolerant to drought cycles. Following treatments ST, SH, CT, CT1, SC, and SCNC that are not adjacent to private ownership large woody debris would have a minimum of 4 tons per acre (low to low end of moderate hazard) where available. Those same treatments that occur adjacent to private ownership would carry a minimum of 3 tons per acre (low hazard rating) where available. Post treatment NCBB, NCBJ, PCT, STR, and STR1 would have higher levels in the 3 to 7 inch class (moderate hazard). Following the FUEL BREAKS treatment large woody debris will be a minimum of 1 ton per acre (low hazard). The purpose is to aid in effective containment of wildland fire and create a zone for firefighter safety. The NCNS treatments will result in a minimum or 1 to 3 tons, however because of the remaining live fuel loading and structure they have been given a moderate to low end of high hazard rating.

Following prescribed fire in the NCBJ and NCBB treatments, large woody debris could exceed 20 tons per acre and upwards of 40 tons within 7 to 10 years when fire killed trees deteriorate and fall down. This would occur on 5 to 10 percent of the treated acres and in areas up to 2 acres in size across these treatment units.

Summary of Effects
For the no action alternative, tree density would continue to increase, increasing competition for limited water, nutrients, and light in the absence of disturbance (wildland fie, insect, disease, windthrow). This would result in decreased health and vigor of the trees with a negative trend in forest health. The proposed action will decrease tree densities, reduce tree competition, and promote healthy, vigorous trees and overall forest health. All of these treatments will have green trees remaining and through natural processes large woody debris will be added to the forest floor overtime (Sandbak, 2004). The proposed action overtime would meet or exceed the recommended large woody debris to maintain long-term soil productivity except in those areas with a purpose to aid in effective containment of wildland fire.

CUMULATIVE EFFECTS
The cumulative effects analysis area is the project area. Past, present, and reasonably foreseeable activities that were considered include:

Past Activities
Past activities in the project area have included intensive grazing management systems for domestic cattle, aggressive wildland fire suppression, incidental personal use fire wood cutting, recreational hunting for big game and upland game birds (primarily turkeys), past logging, fuels treatment and post sale and timber stand improvement activities.

Areas and acres that have been documented with past management or wildfire activities in the Forest Service Activity Tracking System (FACTS) include:

TABLE 15: PAST MANAGEMENT ACTIVITIES AND WILDFIRE

ACTIVITY[1]	YEAR BY ACRES					
	1984 - 1987	1988 - 1989	1990 - 1993	1999 - 2002	2003 - 2004	Total
Regeneration Harvest	103	63	34			**200**
Intermediate Harvest	25	44				**69**
Wildfire – Low Intensity				28	22	**50**
Wildfire – Mixed Intensity					7	**7**
Invasive Treatment					.9	**.9**
Permanent Growth Plot Instal[2]	1		1			**2**
Mechanical Site Preparation for Natural Regeneration		77				**77**
Timber Stand Improvement	43	101	87			**231**
Burning of Activity Fuels		82	35	5	13	**135**
Fuels Treatment – Activity and Natural - Mechanical	82	30	2			**114**
Fuels Treatment – Activity and Natural - Hand	37	81		5	26	**149**
TOTALS	**291**	**478**	**159**	**38**	**68.9**	**1034.9**

[1]These are all past activities stored in the Forest Service Activity Tracking System (FACTS).
[2]These consist of control and treatment plots. Per regional office the minimum would be to protect the control plot from proposed treatment.

These activities have been grouped together by category, individual FACTS Id's by year of treatment and acres can be found in the project record.

Present Activities
Present activities in the project area are similar to past activities, with the exception of no logging and include intensive grazing management systems for domestic cattle, aggressive wildland fire suppression, limited personal use firewood cutting and seasonal recreational hunting for big game and upland game birds (primarily turkey).

Reasonably Foreseeable Future Activities
No activities except those described above under present activities, are planned to occur in this project area unless the proposed action derived in this analysis are implemented.

Summary of Cumulative Effects
Past, present and reasonably future activities have contributed to an increased homogeneity of the landscape vegetation and fuels mosaic. These homogeneous conditions (dense stands, continuous ladder fuels and full canopied stands) put landscapes at a higher risk for large stand replacement disturbances and downward trends in forest health and sustainability.

The biggest cumulative effect from these treatments will be on the potential to alter fire behavior during a wild fire event. Fire behavior is strongly influenced by stand and fuel structure (tree density, ladder fuels, surface fuels and crown canopy). Crown fires are dependent on the sequence of available fuels starting from the ground surface to the canopy. Limiting crown fire in the project area can be accomplished by the proposed individual treatments cumulatively through treatments of surface, ladder and crown fuels across this landscape. The proposed action can help produce diverse forest structures and fuels characteristics across the landscape

that then reduce the likelihood that wildfires will cause large, rapid changes in biophysical conditions. The proposed treatments can modify fire behavior sufficiently so that some wildfires can be suppressed more easily. However, it will take subsequent, sustained fuel treatments (ones that do not increase ladder fuels, crown canopies or surface fuels) to maintain favorable stand and fuel conditions on the landscape. Cumulative effects are therefore focused on changes to these conditions and whether there would be a cumulative increased or decreased ability to sustain the ponderosa pine systems in the whitetail landscape.

The no action alternative has no activities that will alter the project area landscape from existing to desired stand and fuel structures. The cumulative effect from past, present, and reasonably foreseeable future actions has created a downward trend in sustainability. Tree densities, ladder fuels, and crown canopies are expected to increase with continued fire suppression. This increases the risk for large stand replacement disturbances (wild fires, insects, diseases) reducing the ability to sustain the ponderosa pine forest. Conversely, the proposed action decreases tree densities, ladder fuels, and crown canopy which decrease the risk for large stand replacement wild fire, thus increasing the ability to sustain the ponderosa pine forest.

The objective of fuel reduction within the project area cannot be to "fireproof" the environment, but rather to reduce the likelihood of stand-replacement crown fire, i.e., change fire behavior. Fires will still continue but the cumulative effects of regeneration harvest, thinning from below (commercially and non commercially), prescribed fire and woody draw enhancement combined with treating the resultant activity fuels can reduce future fire effects.

CURRENT GUIDENCE, IMPORTANT TO THE RESOURCE (FSM, FSH, OTHER LAWS AND REGULATIONS)

There are nine acts and a Code of Federal Regulations (CFR's) that give basic authority for silvicultural practices on National Forest System lands.

- Organic Administration Act of 1897 (30 Stat. 34, as supplemented and amended; 16 U.S.C. 473-478).
- Knutson-Vandenberg Act of 1930 (46 Stat. 527, as amended; 16 U.S.C. 576-576b).
- Bankhead-Jones Farm Tenant Act of 1937 (50 Stat. 525, as amended; 7 U.S.C. 1010-1012).
- Anderson-Mansfield Reforestation and Revegetation Act of 1949 (63 Stat. 762; 16 U.S.C. 581j-581k).
- Granger-Thye Act of 1950 (64 Stat. 82, as amended; 16 U.S.C. 490).
- Multiple-Use Sustained-Yield Act of 1960 (P.L. 86-517, 74 Stat. 215; 16 U.S.C. 528-531).
- Supplemental National Forest Reforestation Fund Act of 1972 (87 Stat. 242, 245, as amended; 16 U.S.C. 576C-576e).
- Forest and Rangeland Renewable Resources Planning Act of 1974 (88 Stat. 476, as amended; 16 U.S.C. 1601-1610).
- National Forest Management Act of 1976 (90 Stat. 2949; 16 U.S.C. 1600 (note)).
- Reforestation Trust Fund, Title III - Reforestation, Recreation Boating Safety and Facilities Improvement Act of 1980 (16 U.S.C. 1606a, as amended).
- Title 36 Code of Federal Regulations, Part 219 - Planning. CFR's 219.15, 219.27(b), and 219.27 (c).

All of these acts and CFR's direct the way the agency will carry out silvicultural practices. These mandate to us the harvesting systems in accordance with regeneration requirements and timelines, a continuous supply of timber for the use and necessities for citizens of the United States, allowable collections from purchasers to carry out post sale work, land conservation, land utilization, timber suitability determination, and multiple use and sustained yield of our National Forest resources.

Forest Service Handbook Policy for Silvicultural Practices

Silvicultural practices in Region 1 are those activities that control the establishment, composition, structure and function of forested ecosystems. Correct silvicultural practices must be used whenever management activities such as cutting or burning will modify forest vegetation. Silvicultural practices are employed in the management of all forest resources including timber, water, forage, wildlife and recreation. They are based upon application of scientific knowledge and experience and are specified through silvicultural prescriptions prepared or approved by a certified silviculturist.

Silvicultural practices must be implemented with the involvement and consultation of a certified silviculturist.

Silvicultural practices will be monitored and evaluated for biological and ecological soundness and for effectiveness in meeting resource needs. The effectiveness of silvicultural practice will be judged primarily on the basis of average stand attributes, and the ability of these attributes to sustain the ecological composition, structure and function of the larger ecosystem.

Reforestation is a silvicultural practice critical to the successful management of all forest resources. The laws and regulations allowing timber harvest on National Forest lands include both expressed and implied mandates to reforest.

The focus of silvicultural practice is the forest stand and the relationship the stand has with the landscape it is located within. A stand represents a relatively uniform forest plant community that occupies a specific area of land.

Stand management is carried out by manipulating species composition, stand density and stand structure to provide conditions that best satisfy resource management objectives while sustaining the function of the ecosystem.

Species Composition. Seral species adaptable to the site will usually be favored where they have historically maintained a role in the composition of the ecosystem. These are generally least affected by insects, disease, fire and wind damage.

Stand Density. The objective of stand management is to provide stocking rates over time that sustain ecosystem function, capture as much potential productivity as possible and still meet all other management requirements.

Stand Structure. The form of the forest produced by silvicultural practice should generally maintain the ecosystem composition and structure within the natural range of variation to sustain ecosystem function, benefit forest resources and at the same time provide protection from

unnatural levels of damaging agents. This often requires some compromise with resource objectives that, in the long run, should favor stand and ecosystem health. Multiple storied stands will normally not be developed where insects and diseases that can be transmitted vertically between canopy levels are likely to occur, unless that structure is required to sustain a historically important ecosystem function.

Ecosystem management is the context in which silviculture must be practiced. In recognizing the importance of ecosystem hierarchy, treatments will be undertaken to support ecosystem functions at scales broader than the stand level.

Additional Policy and Regulation for Reforestation and Silvicultural Prescriptions

The National Forest Management Act of 1976, Forest and Rangeland Renewable Resources Planning Act or 1974, 36 CFR 219.14, 36 CFR 219.27 (c) 6, 36 CFR 219.27 (c) 3, Custer National Forest and National Grasslands Land and Resources Management Plan, Forest Service Manuals and Handbooks are very specific on timeframes and monitoring requirements following management and natural disturbances. The policy is that all forested lands in the NFS be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans. This is policy for both suitable and unsuitable lands.

Time frames for adequate restocking within 5 years of final harvest are specific to lands to be managed for timber production as stated in Forest Service Handbook 2409.17, 2.2. When seed or shelter trees will be carried through the rotation the initial seed cut is considered final cut.

Forest Service Handbook 2409.17, 2.2 states reforestation needs arising from disturbances such as fire, weather, insect, and disease shall have an analysis done to determine long-term objectives of the land based on the forest plan. Developing site-specific reforestation requirements is part of this analysis. The silvicultural prescriptions shall explicitly state time frames. Where reforestation is required, design treatments to achieve satisfactory stocking promptly.

Direction from Forest Service Handbook 2409.17, 2.2 allows for time frames for reforestation to be decided by silvicultural prescription on unsuitable lands. Regenerate in a manner consistent with the land management objectives and the NEPA decision; document time frames as well as species in the silvicultural prescription. When regeneration is required, regenerate promptly to avoid further site preparation costs and regeneration delays. These Acts, Handbooks and Manual excerpts can be found at the District office.

Forest Service Manual 2472.33 directs to include adequate protection measures in the reforestation prescription and that if there is known problems and protection measures cannot be implemented, harvesting or reforestation treatments should be deferred. It is more specific on the control of livestock grazing to achieve successful reforestation. Policy is to not permit livestock on a reforestation area until seedlings are capable of withstanding the type of grazing use intended.

Forest Service Manual 2478.03 states that the preparation of silvicultural prescriptions detailing the methods, techniques, and timing of the silvicultural activities necessary to achieve established objectives are required prior to initiating any silvicultural treatment on National Forest lands. Forest Service Manual 2470.3 further directs to use only those silvicultural practices that are best suited to the land management objectives for the area, while considering all resources, as directed in the forest plan. Treatments should be prescribed that are practical in terms of the cost of preparation, administration, transportation systems, and logging methods. These practices should be monitored using procedures specified in Forest Plan to ensure that the objectives are met.

Integrating Management Tools, Ecological Knowledge, and Silviculture

Forest management has become highly technical over the years and more so in the last few years with ecosystem and restoration management concepts. Natural forests are in a constant state of disturbance and regrowth, rather than in a stable, steady state as previously thought. The contemporary social attitude is to reduce the extremes of natural and man caused "boom and bust" cycles that affect animal and plant populations. We need to apply specific measurable criteria at the landscape, stand structure, and operational levels to reduce the extremes and achieve desired social goals. Active management is needed to maintain the targeted array of stand structures and landscape patterns by doing specific silvicultural operations at specific times. Several discrete steps are involved: (1) identify the measurable criteria to be targeted. (2) Determine existing stand structures and landscape patterns. (3) Develop alternative silvicultural systems suitable for each stand. (4) Project the changing stand structures and landscape patterns resulting from the alternative systems. (5) Analyze the alternative systems and select the best one for each stand. (6) Implement the operations. (7) Monitor the results to ensure that objectives are achieved. Each step can be performed with varying degrees of detail, technical sophistication, and precision. The process may begin with incomplete knowledge, but adaptive management techniques can be used to make improvements along the way.

APPENDIX I

TSMRS STRATUM DEFINITIONS

CUSTER NATIONAL FOREST STRATA CODES

ASHLAND AND SIOUX RANGER DISTRICT DEFINITIONS

Non-forested	Non-productive Species
Code	Code
900 - water	300 - aspen
910 - scoria/sandstone	310 - juniper
920 - dry grasslands	320 - cottonwood
930 - wet grasslands	330 - mixed/other
940 - sagebrush/sumac	
950 - special use	
960 - baresoil	

Tentatively Suitable >10% Crown Cover			1/Tentatively Unsuitable >10% Crown Cover		
	Code	Crown Cover		Code	Crown Cover
Seedling/Sapling -	101	nonstocked	Seedling/Sapling –	201	nonstocked
	111	<10%		211	<10%
	112	10 - 39%		212	10 - 39%
	113	40 - 69%		213	40 - 69%
	114	70%+		214	70%+
Poletimber	- 121	<10%	Poletimber	- 221	<10%
	- 122	10 - 39%		- 222	10 - 39%
	- 123	40 - 69%		- 223	40 - 69%
	- 124	70%+		- 224	70%+
Sawtimber	- 131	<10%	Sawtimber	- 231	<10%
	- 132	10 - 39%		- 232	10 - 39%
	- 133	40 - 69%		- 233	40 - 69%

	- 134	70%+		- 234	70%+
2/Two-storied	- 141	<10%	2/Two-Storied	- 241	<10%
	- 142	10 - 39%		- 242	10 - 39%
	- 143	40 - 69%		- 243	40 - 69%
	- 144	70%+		- 244	70%+

1/Tentatively unsuitable - sites that are usually slower to regenerate, not capable of producing forest products and they take longer than 5 years to restock.

2/Two-storied - 10% to 30% sawtimber overstory, code for crown cover on understory.

APPENDIX II

TARGET STAND #1

(FOREST CONDITION THAT WILL MAINTAIN A SINGLE STORY OF OPEN GROWN PONDEROSA PINE, SITE INDEX 35-45)

Based on the objectives and site data, the following target stand was used, as a comparison for treatment needs. This target stand will meet the objectives set forth in the Custer Forest Plan.

The desired future condition is a diversity of healthy, vigorous stand structures across the landscape to enhance habitat for wildlife and forage for domestic cattle, provide for wood products, and reduce the risk for large stand replacement wild fire. The target stand structure was developed to restore the function, composition, and structure of the ponderosa pine ecosystem. By targeting canopy coverage less than 60%, this target stand will be considered transitory range with forage being a component through the rotation of the stand.

Following treatment, future stand development over time would approximate these stand structures and density goals to meet the long-term target stand description at rotation age.

TARGET STAND ATTRIBUTES

COVER TYPE	AGE	TREATMENT ATTRIBUTES
Seedling 0-1”	0-15	Initiation of an even aged, single story, healthy, vigorous growing stand of 200-400 seedlings per acre, with minimum for certification at 200 seedlings/acre at age 5. Grasses, forbs, and shrubs should begin to occupy the site as valuable forage for livestock and wildlife, but not deter pine reestablishment. Fuel loading should be 5-8 tons/acre of 3 inches and larger woody debris and 1-2 tons/acre if less than 3 inches, spread evenly across the stand to ensure nutrient recycling for long term site productivity and serve as micro site protection of the seedlings. With implementation of proper soil protection measures, soil disturbance and erosion will be minimal and vegetation recovery will be rapid. The stand serves as a fuel break to slowdown and control wildfire.
Seedling/Sapling 1-5”	15-40	A healthy, vigorous growing, stand of saplings 10 to 30 feet tall. Desired stocking is 125 to 260 stems/acre. Precommercial thin, if needed. Promote best growth potential by selection of crop trees that are fast growing and free of damage and defect to improve stand health and vigor. To increase lumber values at rotation age. Slash will approximate 8-20 tons/acre (post treatment) and will be lopped and scattered to within 18 inches of the grand line, jackpot burning activity fuels to reduce total fuels to 4 to 7 tons/acre. The stand will contain desirable brush, forbs, and grasses that provide forage and habitat for white-tailed deer, turkeys, grouse, and cattle.
Young Forest	40-80	A healthy, vigorous (relatively free of insect and disease) growing, stand of 30-

COVER TYPE	AGE	TREATMENT ATTRIBUTES
5”-8”		45 feet tall pine pole sized stems. At age 40 to 80 the stand should carry 125 to 200 stems/acre, with 50 to 180 square feet of basal area/acre. Volume will approximate between 1 and 9 MBF per acre. The stand will contain a grass, forb and pine component for diversity to maintain the structure, function and composition of the pine ecosystem. This will provide foraging for wildlife and cattle and hiding/thermal cover for wildlife. With periodic under burning, fuels will be kept at 4 to 7 tons/acre, with small patches of seedlings, and saplings scattered across the stand. Stand structure and condition will favor low intensity, ground fires.
Mid Aged Forest 8”-12”	80-120	A healthy, vigorous growing, mature pole to saw timber sized stand. If needed, precommercial/commercial thin to approximately 45 to 70 trees/acre at age 80. Selection will favor best growing trees and those free of defect and damage to improve stand health and vigor. At age 80 to 120 the stand should carry about 70 to 120 square feet of basal area and 7 to 10 MBF per acre. The average height will be 40 to 55 feet averaging 14 to 19 inches. Soil protection measures should be a major objective during and after the harvest operation. Periodic under burning at intervals of 20 years, and after activities, should keep 3 inches and larger fuels at 5-7 tons/acre, 1-2 tons/acre at less than 3 inches. The stand will provide for wildlife and domestic cattle needs by having a diverse vegetation component and patches of ¼ to 2 acres of seedling and sapling patches.
Mature Forest 12”-16”	120-150	The target stand will exhibit an even-aged, single story stand showing limited insect and disease activity and mortality. The stand will have approximately 40 to 65 trees/acre with the average height of 50 to 60 feet and average diameter of 19 to 22 inches. Volume per acre will be 5.5 to 11.5 MBF per acre and have approximately 90 to 140 square feet of basal area/acre. Stand structure will favor non-replacing stand fires. The stand will provide a variety of values and habitats, including snags, down woody material, thermal, hiding, and intercept cover and forage where canopy openings occur.
Old Forest 16”-20”	>150	The target stand will exhibit a over mature, single story, open grown, park-like stand of ponderosa pine, having insect and disease activity at endemic levels. Small-scattered patches of seedlings to pole timber will occur but not dominate the understory. Canopy coverage will be such that a grass, forb shrub and pine component are present. Stand structure will favor non-replacing stand fires, and with to periodic underburning, fuel loadings will be 6 to 11 tons/acre with limited ladder fuels. The stand will have 35 to 60 trees/acre carrying 110 to 160 basal area/acre. Volume will approximate 8 to 19 MBF per acre.

MANAGEMENT AREA: B, D, G, F	**HABITAT TYPES: GROUP A** – PIPO/ANDR, PIPO/SPIC, PIPO/FEID, PIPO/SYAL, PIPO/PRVI

PRIMARY RESOURCES BENEFITS: Fuels, Forage, Wildlife, and Timber

DEVELOPMENT STAGE	AGE	TREES PER ACRE	BASAL AREA Sq. Ft/Ac.	QM DIA. Inch	STRUCTURE	HEIGHT Feet	VOLUME MBF	GROWTH Cu Ft	I&D	FORAGE LBS/AC.	FUELS TONS/ACRE
GRASS/FORB/ SHRUB	1-15	200-400 10'-15'	-	0-1	Single Layer	0-10	-	0-5	Some Tip Moth	BROWSE 0-150, GRASS 600-1000, FORBS 50-150	1-2 T/A <3IN 5-8 T/A >3IN
SEEDLING/ SAPLING	15-40	125-260 13'-19'	2-70	2-8	Single Story	10-30	0-1.5	0-10	Tip Moth And Gall Rust Minor	BROWSE 50-100, GRASS 300-700, FORBS 50-150	1-2 T/A <3IN 3-5 T/A >3IN
YOUNG FOREST	40-80	125-200 15'-19'	50-180	7-14	Single Story	30-40	1.5-9.0	10-30	Tip Moth And Gall Rust Minor	BROWSE 20-50, GRASS 150-400, FORBS 20-50	1-2 T/A <3IN 3-5 T/A >3IN
MID AGED FOREST	80-120	45-70 25'-31'	70-120	14-19	Single Story	40-55	6.5-10.0	25-35	Gall Rust Minor, Pine Beetle at Endemic Levels	BROWSE 20-50, GRASS 150-400, FORBS 20-50	1-2 T/A <3IN 5-7 T/A >3IN
MATURE FOREST	120-150	40-65 26'-33'	90-140	19-22	Single Story	50-60	5.5-11.5	25-35	Gall Rust Minor, Pine Beetle at Endemic Levels	BROWSE 20-50 GRASS 150-400, FORBS 20-50	1-2 T/A <3IN 5-7 T/A >3IN
OLD FOREST	150-200	35-60 27'-35'	110-160	21-25	Single Story	51-70	8.0-19.0	22-27	Pine Beetle at Endemic Levels	BROWSE 20-50, GRASS 150-400, FORBS 20-50	1-2 T/A <3IN 5-8 T/A >3IN

TARGET STAND #1 - FOREST CONDITION TO MAINTAIN SINGLE-STORIED PONDEROSA PINE STAND

Rotation age envisioned is from 150-200 years, in which a single-storied, even-aged, open grown stand would be maintained through thinning and/or prescribed burning. The basal areas are set in such ranges, because if they drop below these ranges, major regeneration would initiate. Live, ladder fuels are minimal due to understory burning at intervals from 5-20 years. Canopy coverage should not exceed 60 percent; otherwise forage coverage and production would drop rapidly in the understory. Some pine regeneration will occur in patches ranging from ¼ to 2 acres, which will create a mosaic in places on the landscape. The stand objective is to maintain open pine stands through thinning and/or periodic fires that reduce seedlings and remove dense understory patches of sapling and pole sized trees. As modeled by the Vegetation Dynamic Development Tool (FRCC website, 2005) the Vegetation Type and Structure on the landscape should resemble the following:

Class	Percent of Landscape	Description
A: Post Replacement	10	Grass and forb dominated community following fire and grazing effects
B: Mid Development Closed	15	Dense mid-development forest; pole to large pole size trees susceptible to stagnation. Marginal understory associated with limited site resources
C: Mid- Open	25	Open mid-development forest with diverse herbaceous understory. Maintained by frequent burning.
D: Late- Open	40	Open late-development forest; widely spaced trees, diverse understory, and limited surface fuels due to frequent burning.
E: Late- Closed	10	Dense late-development forest with significant within-stand mortality. Poorly developed understory and substantial surface fuel accumulation.
Total	100	

2 snags/acre > 11 inches D.B.H. and > or = 15 feet tall should be strived for. Three large logs/acre > 8 feet in length, > or = 10 inches in diameter at mid-length. Forage lbs/acre were obtained from the range specialist.

Tip moth damage should be minimal with frequent underburning and thinning. Western gall rust should be reduced to low levels through more selective mechanical thinning and stand improvement practices, but periodic fire will also keep gall rust out of the understory. Keeping basal areas below 150-160 square feet/acre in older forest patches should keep the mountain pine beetle at endemic levels.

TARGET STAND #2

(FOREST CONDITION THAT WILL MAINTAIN SINGLE STORY PONDEROSA PINE WHILE MAINTAINING GOSHAWK HABITAT, SITE INDEX 35-45)

Based on the objectives and site data, the following target stand was used, as a comparison for treatment needs within the identified post fledgling areas. This target stand will meet overall objectives set forth in the Custer Forest Plan, however specific Management Area Goals may be met at different levels than in Target Stand #1. Rotation age is envisioned shorter due to higher densities and the capability to maintain healthily, vigorous conditions. This target stand carries more stems per acre, thus smaller diameters, resulting in lower timber productivity. With the discouragement of ladder fuels hazardous fuel risk will be reduced but the risk of large stand replacement fire will not be as low as in Target Stand #1. This is due to higher crown canopies that increase the risk of fire spread from crown to crown during a fire event.

The overall Forest Plan desired future condition is a diversity of healthy, vigorous stand structures across the landscape to promote habitat for wildlife. This target stand structure was developed to enhance or maintain goshawk habitat. By targeting average canopy coverage greater than 40%, and in some areas 50 to 70+ canopy cover.

Following treatment, future stand development over time would approximate these stand structures and density goals to meet the long-term target stand description at rotation age.

TARGET STAND ATTRIBUTES

COVER TYPE	MEAN AGE	TREATMENT ATTRIBUTES
Seedling 0-1”	0-15	Initiation of an even aged, single story, healthy, vigorous growing stand of 400-800 seedlings per acre, with minimum for certification at 200 seedlings/acre at age 5. Grasses, forbs, and shrubs should begin to occupy the site as valuable forage for livestock and wildlife, but not deter pine reestablishment. Fuel loading should be 5-8 tons/acre of 3 inches and larger woody debris and 1-2 tons/acre of less than 3 inches, spread evenly across the stand to ensure nutrient recycling for long term site productivity and serve as micro site protection of the seedlings. With implementation of proper soil protection measures, soil disturbance and erosion will be minimal and vegetation recovery will be rapid. The stand serves as a fuel break to slowdown and control wildfire.
Seedling/Sapling 1-2.5”	20	A healthy, vigorous growing, stand of saplings 10 to 30 feet tall. Desired stocking is 350 to 400 stems/acre. Precommercial thin, if needed. Promote best growth potential by selection of crop trees that are fast growing and free of damage and defect to improve stand health and vigor to increase lumber values at rotation age. Slash will approximate 8-20 tons/acre (post treatment) and will be lopped and scattered to within 18 inches of the grand line, jackpot burning activity fuels to reduce total fuels to 4 to 7 tons/acre. The stand will contain desirable brush, forbs, and grasses that provide forage and habitat for white-tailed deer, turkeys, grouse, and cattle.
Young Forest 3”-6”	40	A healthy, vigorous (relatively free of insect and disease) growing, stand of 30-45 feet tall pine pole sized stems. At age 40 the stand should carry 250 to 300 stems/acre, with 30 to 45 square feet of basal area/acre. The stand will contain a grass, forb and pine component for diversity where stand openings occur. This will provide foraging for wildlife and cattle and hiding/thermal cover for wildlife in the denser areas of pine. With periodic under burning, fuels will be kept at 4 to 7 tons/acre, with small patches of seedlings, and saplings scattered across the stand. Stand structure and condition will favor low intensity, ground fires.

COVER TYPE	MEAN AGE	TREATMENT ATTRIBUTES
Mid Aged Forest 6”-10”	60	A healthy, vigorous growing, mature pole to saw timber sized stand. If needed, precommercial/commercial thin to approximately 120 to 150 trees/acre by age 80. Selection will favor best growing trees and those free of defect and damage to improve stand health and vigor. At age 80 to 120 the stand should carry about 70 to 145 square feet of basal area and 4 to 10 MBF per acre. The average height will be 40 to 55 feet averaging 6 to 10 inches in diameter. Soil protection measures should be a major objective during and after the harvest operation. Periodic under burning at intervals of 20 years, and after activities, should keep 3 inches and larger fuels at 5-7 tons/acre, 1-2 tons/acre at less than 3 inches. The stand will provide for wildlife and domestic cattle needs by having a diverse vegetation component.
Mature Forest 9”-13”	80	The target condition will exhibit an even-aged, single story stand showing limited insect and disease activity and mortality, while providing for goshawk habitat. The stand will have approximately 120 to 150 trees/acre with the average height of 50 to 60 feet and average diameter of 9 to 13 inches. Volume per acre will be 4 to 10 MBF per acre and have approximately 70 to 130 square feet of basal area/acre. Stand structure will favor non-replacing stand fires, however due to stocking crown-to-crown torching during wild fires has an increased risk from occurring. The stand will provide a variety of values and habitats, including snags, down woody material, thermal, hiding, and intercept cover and forage where canopy openings occur.
Old Forest 12”-16”	120+	The target stand will exhibit an over mature, single story, stand of ponderosa pine, that will provide for goshawk habitat, having endemic levels of insect and disease activity. Small-scattered patches of seedlings to pole timber will occur but not dominate the understory. Canopy coverage will be such that a grass, forb, and shrub are present but not at potential. Stand structure will favor non-replacing stand fires, and with to periodic underburning. However risk for crown fires will be moderate. Fuel loadings will be 6 to 11 tons/acre with limited ladder fuels. The stand will have 100 to 120 trees/acre carrying 105 to 145 basal area/acre. Volume will approximate 10 to 15 MBF per acre.

MANAGEMENT AREA: B, D, G, F					**HABITAT TYPES: GROUP A** – PIPO/ANDR, PIPO/SPIC, PIPO/FEID, PIPO/SYAL, PIPO/PRVI						
PRIMARY RESOURCES BENEFIT: WILDLIFE											
SIZE CLASS	MEAN AGE	TREES PER ACRE	BASAL AREA Sq. Ft/Ac.	QM DIA. Inch	STRUCTURE	HEIGHT Feet	VOLUME MBF	GROWTH Cu Ft	I&D	FORAGE LBS/AC.	FUELS TONS/ACRE
GRASS/FORB/ SHRUB	1-15	400-800 11’ - 7	-	0-1	Single Layer	0-10	-	Less than Target Stand #1	Some Tip Moth	Less than Target Stand #1	1-2 T/A <3IN 5-8 T/A >3IN
SEEDLING/ SAPLING	20	350-400 10’ – 11’	3-6	1-2.5	Single Story	10-30	0	Less than Target Stand #1	Tip Moth And Gall Rust Minor	Less than Target Stand #1	1-2 T/A <3IN 3-5 T/A >3IN
YOUNG FOREST	40	250-300 12’ - 13’	30-45	3-6	Single Story	30-40	0	Less than Target Stand #1	Tip Moth And Gall Rust Minor	Less than Target Stand #1	1-2 T/A <3IN 3-5 T/A >3IN
MID AGED FOREST	60	170-200 15’-16’	50-110	6-10	Single Story	40-55	1-5	Less than Target Stand #1	Gall Rust Minor, Pine Beetle at Endemic Levels	Less than Target Stand #1	1-2 T/A <3IN 5-7 T/A >3IN
MATURE FOREST	80	120-150 17’-20’	70-130	9-13	Single Story	50-60	4-10	Less than Target Stand #1	Gall Rust Minor, Pine Beetle at Endemic Levels	Less than Target Stand #1	1-2 T/A <3IN 5-7 T/A >3IN
OLD FOREST	120	100-120 20’-21’	105-145	12-16	Single Story	51-70	10-15	Less than Target Stand #1	Pine Beetle at Endemic Levels	Less than Target Stand #1	1-2 T/A <3IN 5-8 T/A >3IN

TARGET STAND #2 - FOREST CONDITION TO MAINTAIN SINGLE-STORIED PONDEROSA PINE STAND WHILE PROVIDING FOR GOSHAWK HABITAT

Rotation age envisioned is from 120-150 years, in which a single-storied, even-aged stand could be maintained through thinning and prescribed understory burning. Densities are set at levels to provide for high canopy levels to provide for goshawk habitat. Live, ladder fuels will be minimal provided understory burning or mechanical treatment at an interval from 5-20 years. When canopy coverage exceeds 60 percent; forage coverage and production will drop rapidly in the understory. Some pine regeneration will occur in patches ranging from ¼ to 2 acres, which will create a mosaic in places on the landscape. The stand objective is to maintain single story pine stands through thinning and/or periodic burning that reduce seedlings and remove dense understory patches of sapling and pole sized trees. As modeled by the Vegetation Dynamic Development Tool (FRCC website, 2005) the Vegetation Type and Structure on the landscape should resemble the following:

Class	Percent of Landscape	Description
A: Post Replacement	10	Grass and forb dominated community following fire and grazing effects
B: Mid Development Closed	15	Dense mid-development forest; pole to large pole size trees susceptible to stagnation. Marginal understory associated with limited site resources
C: Mid- Open	25	Open mid-development forest with diverse herbaceous understory. Maintained by frequent burning.
D: Late- Open	40	Open late-development forest; widely spaced trees, diverse understory, and limited surface fuels due to frequent burning.
E: Late- Closed	10	Dense late-development forest with significant within-stand mortality. Poorly developed understory and substantial surface fuel accumulation.
Total	100	

2 snags/acre > 11 inches D.B.H. and > or = 15 feet tall should be strived for. Three large logs/acre > 8 feet in length, > or = 10 inches in diameter at mid-length.

Tip moth damage should be minimal with frequent underburning and thinning. Western gall rust should be reduced to low levels through more selective mechanical thinning and stand improvement practices, but periodic fire will also keep gall rust out of the understory. Keeping basal areas below 150-160 square feet/acre in older forest patches should keep the mountain pine beetle at endemic levels.

APPENDIX III

GLOSARY

Biomass: The total mass of living matter within a given volume of environment.

Blowout: A hole made in the canopy by prescribed fire that results in nearly one hundred percent mortality of all conifers.

Board Feet (BF): A unit of measurement equal to an unfinished board one foot square by one inch thick.

Canopy: More or less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

Catface: An opening at the base of trees due to the burning of the bark, cambium and sapwood.

Climax Vegetation: The culminating stage in plant succession for a given site where the composition of the vegetation has reached a highly stable condition over time and perpetuates itself unless disturbed by outside forces.

Commercial Thin: An intermediate (mid-rotation) stand tending treatment which harvests commercial sized lower crown classes with the objective of improving growth, vigor and/or value until at the end of the rotation. A commercial thin is not a regeneration treatment.

Cover: Vegetation used by wildlife for protection from predators, or to adverse weather conditions, or in which to reproduce. The different types are identified as hiding cover, thermal cover, and security areas.

Cumulative Effect: The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can also result from individually minor but collectively significant actions taking place over a period of time.

Diameter at Breast Height (dbh): A diameter measurement of a tree made at a point 4.5 feet above the ground surface.

Direct Effects: effects, which are caused by the action and occur at the same time and place.

Disturbance: A discrete event, either natural or human induced, that causes a change in the existing condition of an ecological system.

Doghair: A stand structure condition that typically has many trees per acre (generally greater than 600) of the larger sapling (>3 inches dbh) and immature pole (5-6 inches dbh) sized trees.

Duff Layer: A layer of dead plant material that has fallen to the soil (ground) surface and has accumulated over several growing seasons. This fallen plant material is in the different stages of decay that ultimately results in the return of nutrients and minerals to the soil and living plants.

Ecosystem Burn: Treatment of fire dependent ecosystems to meet multi resource objectives identified in the Custer National Forest and National Grasslands Land and Resource Management Plan.

Ecosystem: Living organisms interacting with each other and with their physical environment, usually described as an area for which it is meaningful to address these interrelationships.

Effects (or impacts: Environmental consequences (the scientific and analytical basis for comparison of alternatives) as a result of a proposed action. Effects may be either direct, which are caused by the action and occur at the same time and place, indirect, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable, or cumulative.

Endemic: The population of potentially injurious plants, animals, or diseases that are at their normal, balanced level, in contrast to epidemic.

Epidemic: The population of potentially injurious plants, animals, or diseases that are widely prevalent, and exceed their normal, balanced level, in contrast to endemic levels.

Even-aged: A stand of trees of essentially the same age, growing together.

Forage: Vegetation used for food by wildlife, particularly big game wildlife and domestic livestock.

Fuels: Combustible materials present in the forest, which potentially contribute a significant fire hazard.

Habitat Type: (Vegetative). An aggregation of all land areas potentially capable of producing similar plant communities at climax.

High Risk: Individual or groups of trees that are live (green) but have the physical characteristics favorable to insect or disease caused mortality. Trees in this category are subject to mortality and loss of economic value in the short term.
Indirect Effects: Secondary effects which occur in locations other than the initial action or significantly later in time.

Intensive Grazing Management: Grazing management that controls distribution of cattle and duration of use on the range, usually by fences, so parts of the range are rested during the growing season.

Ladder Fuels: Fuels that provide vertical continuity and enable surface fires to reach upper forest canopy levels.

Landscape: A heterogeneous land area composed of a cluster of interacting ecosystems that are repeated in similar form throughout. Landscapes vary in size from many thousands of acres to only a few acres.

Lopping: Methods of modifying fuels to allow for primary fuel treatment accomplishment and/or to speed natural abatement. Maybe a primary fuel treatment when no other treatments are planned.

Management Area (MA): Geographic areas, not necessarily contiguous, which have common management direction, consistent with the Forest Plan allocations.

Management Direction: A statement of multiple use and other goals and objectives, along with the associated management prescriptions and standards and guidelines to direct resource management.

Mature Timber: On lands allocated for timber harvest, and for the purpose of this project, mature is defined as trees or stands in which average annual stand growth has culminated, generally 80 to 100 years. In the context of wildlife - Mature forest habitat with characteristics needed to provide habitat for certain wildlife species such as the Goshawk.

Merchantable: Timber that meets minimum size and quality standards.

Mineral Soil: Soil that is exposed; that there is no living or dead plant material covering the ground surface.

Mitigation: Actions to avoid, minimize, reduce, eliminate, replace, or rectify the impact of a management practice.

Monitoring and Evaluation: The evaluation, on a sample basis, of Forest Plan management practices to determine how well objectives are being met, as well as the effects of those management practices on the land and environment.

Mortality: Trees of commercial species, standing or down, that have died during a specific period, and were not cull trees at the time of death.

National Forest Management Act (NFMA): Law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring preparation of Regional Guides and Forest Plans, and the preparation of regulations to guide that development.

Natural Regeneration: Renewal of a tree crop by natural means using natural seed fall.

Natural Slash: Accumulations of material in a stand due to the lack of fire, natural dying, overstocking, etc.

No-Action Alternative: The No-Action Alternative is required by regulations implementing the National Environmental Policy Act (NEPA) (40 CFR 1502.14). The No-Action Alternative provides a baseline for estimating the effects of other alternatives. Where a project activity is being evaluated, the No-Action Alternative is defined as one where current management direction would continue unchanged.

Overmature Timber: For the purpose of this project, overmature stands are considered to be approximately 120 years of age or greater, average annual stand growth has culminated, or in which mortality often exceeds growth.

Overstory: The portion of trees in a forest, which forms the uppermost layer of foliage.

Multistory: A stand of trees that has more than two canopy heights.

Precommercial Thin (PCT): The select felling, deadening or removal of trees in a sound stand primarily to accelerate height and diameter growth on the remaining stems, maintain specific species, stocking and/or stand density and improve vigor and quality of the trees that remain.

Preferred Alternative: That alternative which, after assessment of the environmental effects of an action, or actions, is chosen by the Forest Service as the environmentally preferred course of action.

Prescribed Burning: The intentional application of fire to wildland fuels in either the natural or modified state under such conditions as to allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to further certain planned objectives (i.e., silviculture, wildlife management, reduction of fuel hazard, etc.).

Prescribed Fire: A wildland fire burning under preplanned specified conditions to accomplish specific planned objectives. It may result from either a planned or unplanned ignition.

Prescription: Management practices selected and scheduled for application on a designated area to attain specific goals and objectives.

Proposed Action: A proposal by the Forest Service to authorize, recommend, or implement an action.

Purpose and Need: A statement, which briefly specifies the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action. (40 CFR 1502.13)

Reforestation: The natural or artificial restocking of an area with forest trees; including measures to obtain natural regeneration, as well as tree planting and seeding. The work is done on National Forests to produce timber and other forest products, protect watershed functioning, prevent erosion, and improve other social and economic values of the forests, such as wildlife, recreation, and natural beauty.

Regeneration: The renewal of a tree crop, whether by natural or artificial means. This term may also refer to the crop (seedlings, saplings) itself.

Regeneration Harvest: Used in reference to clear-cut, seed tree and shelterwood harvest methods, which remove an existing, stand to prepare a site for regeneration.

Uneven-aged: Stands of trees of many age and sizes, growing together.

Sawtimber: Trees containing at least one 12-foot sawlog or two noncontiguous 8-foot logs, and meeting regional specifications for freedom from defect. Ponderosa pine trees must be at least 7 inches in diameter at breast height.

Scoping: The procedures by which the Forest Service determines the extent of analysis necessary for a proposed action, i.e. , the range of actions, alternatives, and impacts to be addressed, identification of significant issues related to a proposed action, and establishing the depth of environmental analysis, data, and task assignments needed.

Seedlings and Saplings: Non-commercial size young trees, generally occurring in plantations. Seedlings and saplings are from zero to five inches diameter at breast height. Seedlings are generally considered less than 1.0 inches diameter at breast height.

Seral Stage: A transitory or developmental stage of a biotic community in an ecological succession (does not include climax successional stage or pioneer stage).

Silviculturist: A person that uses theory and experience to direct forest establishment, composition, and growth for the production of forest resources to meet specific management objectives.

Silvicultural System: A management process whereby forests are tended, harvested, and replaced, resulting in a forest of distinctive form. Systems are

classified according to the method of carrying out the cuttings that remove the mature crop and provide for regeneration, and according to the type of forest thereby produced.

Site Preparation: A general term for a variety of activities that allow site establishment of regeneration such as removal or treatment of competing vegetation, slash, and other debris that may inhibit the establishment of regeneration.

Slash: The residue left on the ground after felling and other silvicultural operations and/or accumulating there as a result of storm, fire, girdling, or poisoning of trees.

Snag: A standing dead tree usually without merchantable value for timber products, but may have characteristics of benefit to some cavity nesting wildlife species.

Stand: A community of trees or other vegetation uniform in composition, constitution, spatial arrangement, or condition to be distinguishable from adjacent communities.

Stocking: The degree to which trees occupy the land, measured by basal area and/or number of trees by size and spacing, compared with a stocking standard; that is, the basal area and/or number of trees required to fully utilize the land's growth potential.

Successional Stage: A stage or recognizable condition of a plant community which occurs during its development from bare ground to climax.

Suitable Forest Land: Forest land (as defined in CFR 219.3, 219.14) for which technology is available that will ensure timber production without irreversible resource damage to soils, productivity, or watershed conditions; for which there is reasonable assurance that such lands can be adequately restocked (as provided in CFR 219.4); and for which there is management direction that indicates that timber production is an appropriate use of that area.

Tentatively Suitable Forest Sites: Those ponderosa forested lands that were tentatively classified; through a combination of photo interpretation and ground inventory, as suitable lands that were predominately on moist, cool aspects and where stocking could be reasonably reassured within 5 years after treatment.

Tentatively Unsuitable Forests Sites**:** Those ponderosa forested lands that were tentatively classified; through a combination of photo interpretation and ground inventory, as suitable lands that were predominately on hot, dry southern aspects and where stocking could be reasonably reassured within 5 years after treatment.

Thinning: Cutting to redistribute growth potential or benefit the quality of the residual stand.

Understory: Vegetation (trees or shrubs) growing under the canopy formed by taller trees.

Uneven-age Management: The application of a combination of actions needed to simultaneously maintain continuous high-forest cover. Cutting methods that develop and maintain uneven-aged stands are individual-tree and group selection.

Unsuitable Forest Land: Lands not selected for timber production suitability during the development of the Forest Plan due to: (1) the multiple-use objectives for the alternative preclude timber production; (2) other management objectives for the alternative limit timber production activities to the point where management requirements set forth in 36 CFR 219.27 cannot be met; and (3) the lands are not cost-efficient over planning horizon in meeting forest objectives that include timber production shall be designated as unsuitable in the Forest Plan.

Wildfire or Wildland Fire: Any wildfire not designated and managed as a prescribed fire with an approved prescription.

Woody Draw: A classification of areas, particularly in grassland settings, where an overstory of woody vegetation in small drainages creates habitat for many wildlife species and shade/wind protection and forage for livestock. The vegetation is a result of higher moisture conditions that in the surrounding area but surface water if any, running through the area is generally short term.

APPENDIX IV

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APPENDIX V

Design Criteria

Project design criteria and the units to which project design features apply		
Project Design Criteria Item	**Description of Project Design Criteria**	**Units to which Project Design Criteria Apply**
Silviculture		
30	Permanent Growth Plot Protection: During implementation of project activities protect control cluster with a 50 foot untreated buffer. Forest Silviculturist will be notified prior to implementation to locate plots. Purpose: Maintain long term monitoring integrity on management effects.	FACTS Id's A110200037 (PCT, STR), A140200003 (CT Unit 60), A140400003 (CT Unit 60).
31	Reforestation: Ensure every treatment unit receiving a regeneration harvest on suitable lands will meet or surpass stocking guidelines and certification standards within 5 years. Large openings created by prescribed burning on suitable lands will be monitored to ensure restocking. Purpose: Meet National Forest Management Act and Forest Plan Monitoring requirements.	All proposed action activities
32	Seed Tree Protection: Pullback of fuel accumulation (woody debris and duff) will be required as needed from designated seed trees prior to prescribed burning. Purpose: Limit seed tree mortality from prescribed fire.	All ST and SH units.

APPENDIX VI

Sale Area Improvement Opportunities and Hazard Reduction Activities By Order of Priority

The following is a list of proposed activities by priority that would have potential to be funded with Knutson Vandenberg (KV) funds from any commercial sale receipts. Funding could be a combination of KV, BD, Partnerships and appropriated funds to meet the multiple objectives.

Required KV

- Site preparation (slashing and mechanical scarification) activities for natural regeneration on forestlands.
- Monitoring for natural regeneration on forestlands.

Appropriate KV

- Rehabilitation of landings.
- Monitoring for new noxious weed infestations on sale area treatments.
- Timber stand improvement activities and associated fuel treatments (release and weed - noncommercial) ***within*** commercial harvested units.
- Mechanical timber stand improvement activities and associated fuel treatments (thin from below/ Prescribe Burn – noncommercial) ***outside*** commercial harvest units.
- Manual timber stand improvement activities and associated fuel treatments (thin from below/ Prescribe Burn – noncommercial) ***outside*** commercial harvest units.
- Treatments of existing noxious weed infestations.
- Wildlife habitat improvement in Woody/Aspen stands
- Prescribe burning to enhance wildlife habitat and rangeland ecosystems.
- Wildlife habitat improvement in Goshawk Nest Stands.

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