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ENVIRONMENTAL ASSESSMENT

BOLOGNA BASIN SALVAGE

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- **CHAPTER III – ENVIRONMENTAL CONSEQUENCES**

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CHAPTER III - ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social, and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives discussed in Chapter II. It also presents the scientific and analytical basis for the comparison of alternatives presented.

Effects are described in terms of increases or decreases, intensity, duration, and timing. Cumulative effects are the effects of the project when added to other past, present, and reasonably foreseeable actions, both on the National Forest and other adjacent federal, state, or private lands. Appendix B of this Environmental Assessment lists past, present, and reasonably foreseeable future activities to be analyzed in the consideration of cumulative effects.

FOREST VEGETATION

This Environmental Assessment hereby incorporates by reference the *Forest Vegetation Specialist Report* in the Project Record (40 CFR §1502.21). The *Forest Vegetation Specialist Report* is located in the *Project Analysis* section of the Project Record and contains the detailed data, methodologies, analyses, conclusions, maps, references, and technical documentation that the Forest Vegetation specialist relied upon to reach the conclusions in this Environmental Assessment. The analysis area for the Forest Vegetation section includes only the 9,184 acres of National Forest land within the Bologna Basin subwatershed.

EXISTING CONDITIONS

STAND HEALTH

There is broad agreement among entomologists that tussock moth outbreaks develop in place from local populations, due to the limited buoyancy of larvae to travel downwind, and the fact that female tussock moths are incapable of flight (Mason 1974, 1981; Mitchell 1979; Shepherd 1977). These findings suggest that tussock moths are probably present at some low level in most stands containing host tree species most of the time (Scott 2002).

However, the fact that not all sites develop outbreaks suggests that certain sites or site characteristics are more conducive to development of outbreak levels of tussock moth than others. For example, defoliation of host trees has consistently been concentrated on relatively warm and dry sites, usually on upper slopes and ridges (Sugden 1957, Wickman 1963). Mason (1981) found that typical outbreak

sites had a lower site index[1] and higher plant moisture stress than typical non-outbreak sites. This latter finding explains the development of the Heppner District's tussock moth outbreak in the lower productive areas and poorer growing sites of the southernmost portion of the District (including Bologna Basin).

The host trees in certain portions of the outbreak were defoliated so quickly that little food was created by the needles for the 2001 growth season. This imposed a substantial drain on each tree's reserve energy (Webb 1980). Webb found that tussock moth defoliation accelerated the normal seasonal loss of starch – a measure of reserve energy – and starch in all vegetative parts of host trees was reduced as defoliation intensified. In the heaviest defoliated areas of Bologna Basin, crown regrowth appears to be minimal. Reports from District personnel have indicated that a few trees were sprouting new foliage in late spring of 2002.

An insect damage map of Bologna Basin and field surveys were used to update the vegetation database to reflect changes caused by the tussock moth outbreak (Figure 5, page 29). The updated vegetation database was then used to characterize existing vegetation conditions in terms of species composition, forest density, and forest structure. These are the parameters that were used to analyze impacts to vegetation in this analysis.

In addition, many portions of the project area have moderate to high levels of Douglas-fir dwarf mistletoe and low to moderate levels of western dwarf mistletoe affecting ponderosa pine. This infestation in Douglas-fir slows growth, deforms trees, eventually kills trees, and increases fire danger when dead. Ponderosa pine mistletoe slows growth and deforms trees. The proximity of trees to each other (due to high densities) along with low tree vigor resulting from the high density, contribute to these dwarf mistletoe problems (Scott 2002).

SPECIES COMPOSITION

- **A higher than normal proportion of Douglas-fir forest exists on dry-forest sites. Ponderosa pine forest exists at a lower proportion than would have occurred historically.**
- **The area contains a large number of dead trees resulting from Douglas-fir tussock moth defoliation. This includes mortality to a number of intermingled ponderosa pines that were also heavily defoliated by tussock moth.**

Tree species occur in either pure or mixed stands called forest cover types. Table 12 summarizes the existing cover types for the Bologna Basin analysis area. It shows that the predominant forest cover type is ponderosa pine (36 percent of the analysis area). Approximately 19 percent of the analysis area supports non-forest vegetation.

[1] Site Index: A quantitative estimate of the productive potential of a given site to grow a given species of tree to a given size within a specified number of years.

Table 12. Existing Cover Types of the Bologna Basin Analysis Area

Cover Type[1]	Acres	%
Grand Fir & Mixed Grand Fir	312	3.4
Ponderosa Pine & Mixed Ponderosa Pine	3,298	35.8
Douglas-fir & Mixed Douglas-fir	2,839	31.0
Western Juniper & Mixed Western Juniper	940	10.3
Forb	1,044	11.4
Grass	132	1.4
Shrub	610	6.7

[1]Summarized from the vegetation database (see Powell 2001c).

Potential vegetation indicates the environmental factors that determine the vegetation on a site, site, such as soils, temperature, elevation, solar radiation, slope, aspect, and rainfall. Rather than state these factors directly, potential vegetation uses plant types to express them. The plant type (ponderosa pine forest, bluebunch wheatgrass grassland, etc.) produced by a particular combination of environmental factors is called a potential vegetation type – deep ash soils on a north-facing aspect at 5400 feet elevation and with a slope gradient of 30 percent produces a grand fir/big huckleberry potential vegetation type; moderately deep residual soils on a west-facing slope at 4600 feet elevation and with a slope gradient of 45 percent produces a Douglas-fir/ninebark potential vegetation type. Within the Bologna Basin analysis area there are six potential vegetation groups (Table 13).

Table 13. Potential Vegetation Groups (PVG) of the Bologna Basin Analysis Area

PVG Description[1]	Acres	%	% of Total Forested
Dry Upland Forest	6,506	70.9	97.0
Dry Upland Herbland	424	4.6	
Dry Upland Shrubland	610	6.7	
Moist Upland Forest	203	2.2	3.0
Moist Upland Herbland	752	8.2	
Moist Upland Woodland	679	7.4	
Total	**9,174**		
Total Forested	**6,709**	**73.1**	

[1] Powell (1998) describes how potential vegetation groups were identified.

Maps from two historical vegetation studies detail past conditions in the Bologna Basin analysis area. F.B. Kellogg prepared a land classification map for the Umatilla National Forest in 1916 (Kellogg 1916), and the Pacific Northwest Forest Experiment Station prepared a forest type map for the northeast quarter of

Oregon in 1937 (Andrews and Cowlin 1937). Both studies show that the dominant historical vegetation type in the Bologna Basin area was ponderosa pine forest.

Recent bioregional assessments concluded that dry forest areas have vegetation conditions that are out of balance when compared with the historical (presettlement) situation (Caraher et al. 1992, Hessburg et al. 1999, Lehmkuhl et al. 1994, Quigley and Arbelbide 1997). Because management has suppressed fires over several return intervals (fire cycles), dry forests that were historically dominated by ponderosa pine have changed more than other vegetation types over the past 90 years.

Table 14. Historical Range of Variability (HRV) Analysis for Vegetation Composition on Dry Upland Forest Sites

Cover Type	Historical Range (%)[1]	Current (%)[2]	Interpretation
Ponderosa Pine	72-90	49	Well below HRV
Interior Douglas-fir	8-14	42	Well above HRV
Grand Fir	1-5	4	Within HRV
Grass/Forb	0-2	0	At low end of HRV
Shrub	0-3	0	At low end of HRV
Juniper	1-5	4	Within HRV

[1]Historical ranges are approximate and were inferred from Morgan and Parsons (2000). Note that this information pertains to the "dry upland forest" potential vegetation group only; historical ranges and the current percentage values would vary for other potential vegetation groups.

[2]Current percentages were derived from the vegetation database (see Powell 2001c).

Seventy-three percent of National Forest System lands in the Bologna Basin analysis area are forested; 97 percent of the forested acreage is "dry upland forest" when classified using potential vegetation. A historical range of variability analysis for vegetation composition on the dry upland forest potential vegetation group suggests that the analysis area currently supports too much of the Douglas-fir cover type (Table 14)[2].

[2] The temporal scale of the Historic Range of Variability analysis was based on Umatilla National Forest direction (Blackwood 1998) tiered to the Eastside Screens (USDA Forest Service 1995). According to the Screens, "*the HRV should be based on conditions in the presettlement era; however, 1900s photography may be acceptable*." Blackwood's letter provides historic ranges for use with all historic range of variability analyses involving forest structural classes. These historic ranges were developed among the three Blue Mountain forests based on the expertise of over 40 experienced Forest Service natural resource specialists. This information was applied at the subwatershed scale to the Bologna Basin analysis area. The presettlement estimates were compared with historical maps (circa 1916 and 1937) and aerial photos (1939) which confirmed the historical range of variability results, particularly with respect to changes in forest composition.

FOREST DENSITY

- **A large proportion of upland forests (83 percent) are densely stocked and susceptible to insect and disease outbreaks, crown fire, and other disturbance processes affecting dense tree stands.**

Recently developed stocking guidelines (Cochran et al. 1994, Powell 1999) were used to analyze forest density levels to infer whether they are ecologically sustainable. Forests stocked above these stocking guidelines have density levels in the "self thinning" zone where trees aggressively compete with each other for moisture, sunlight, and nutrients. Forests in the self-thinning zone experience mortality as crowded trees die from competition or from insects or diseases that attack trees under stress (Powell 1999). By using the stocking guidelines in conjunction with potential vegetation, the areas that would be considered "overstocked" were determined. Table 15 shows that a very high percentage of forestland in the Bologna Basin analysis area is "overstocked" (83 percent).

Table 15. Forest Density Analysis for the Bologna Basin Analysis Area

Potential Vegetation Group	Not Overstocked (Acres)	Overstocked[1] (Acres)	Overstocked (%)
Dry Upland Forest	1,036	5,470	84.1
Moist Upland Forest	100	103	50.6
Total (Upland Forest)	**1,136**	**5,573**	**83.1**

[1] Summarized from the vegetation database (see Powell 2001c). Criteria used for determination of stocking status ("overstocked" or "not overstocked") are described in Powell (2001b).

The upper stand density for the Bologna Basin project area currently averages approximately 140 square feet of basal area per acre, although some areas have tree density in excess of 180 square feet of basal area per acre. This means that much of the project area has forest density levels that exceed recommended stocking by a factor of two or three times (Powell 1999).

FOREST STRUCTURE

- **A large amount of multi-layer old forest exists in the analysis area. Single-layer old forest is at the low end of its historical range of variability.**

Table 16 summarizes the forest structural classes for Bologna Basin, using a seven-class system described by O'Hara et al. (1996). It shows that the predominant structural stage is old forest with multiple canopy layers, followed by two stem-exclusion structural classes[3] and old forest with a single canopy layer.

[3] Stem exclusion structural classes: A stage in the development of a forest stand in which "growing space is occupied by vigouous, fast-growing trees that compete strongly for available

Understory reinitiation[4], stand initiation[5] and young forest with multiple canopy layers are relatively uncommon structural classes – each of them occupies five percent or less of the Bologna Basin analysis area.

Table 16. Existing Forest Structural Classes of the Bologna Basin Analysis Area

Forest Structural Class Description	Acres[1]	%
Old Forest Multi-layer structural class	1,889	20.6
Old Forest Single-layer structural class	902	9.8
Stem Exclusion Closed Canopy structural class	1,689	18.4
Stem Exclusion Open Canopy structural class	1,490	16.2
Stand Initiation structural class	494	5.4
Understory Reinitiation structural class	99	1.1
Young Forest Multi-layer structural class	148	1.6
Forbland, grassland, and shrubland cover types	1,787	19.5
Woodland (western juniper) structural classes	679	7.4

[1] Acreage figures include National Forest System lands only. Forest structural classes are described in O'Hara et al. (1996) and in Powell (2000; see Table 2, page 16).

To understand the implications of current conditions, it is often helpful to put them in a historical context. A historical range of variability analysis was used to evaluate structural classes for the Bologna Basin analysis area. Results are provided in Table 17. It summarizes the current percentage of each structural class by potential vegetation group. The historical ranges for each of the structural classes are also shown.

The historical range of variability results in Table 17 show that one dry-forest structural class is below the historical range (young forest multi-layer), and that two structural classes are above the historical range (old forest multi-layer and stem exclusion closed canopy).

light and moisture. Because trees are tall and reduce light, understory plants (including smaller trees) are shaded and grow more slowly. Species that need sunlight usually die; shrubs and herbs may become dormant" (Powell, 2000, p. 16).

[4]Understory reinitiation structural class: A stage in the development of a forest stand in which "a new age class of trees (cohort) eventually gets established [in the understory] after overstory trees begin to die or because they can no longer fully occupy their growing space. . . [T]rees begin to develop in vertical layers" (Ibid).

[5] Stand initiation structural class: A stage in the development of a forest stand that follows "a high severity disturbance such as wildfire or timber harvest [in which] growing space is occupied rapidly by vegetation that either survives the disturbance or colonizes the area. . . A single canopy stratum of tree seedlings is present in this class"(Ibid).

Table 17. Historical Range of Variability (HRV) Analysis for Dry Upland Forest Structural Classes

Forest Structural Classes[1, 2]	Historical (%)	Current (%)	Interpretation
Stand Initiation	5-15	8	Within HRV
Stem Exclusion Open Canopy	5-20	22	[3]
Stem Exclusion Closed Canopy	1-10	26	Above the HRV for this structural class.
Understory Reinitiation	1-10	2	Within HRV
Young Forest Multi-layer	5-25	2	Below the HRV for this structural class.
Old Forest Multi-layer	5-20	29	Above the HRV for this structural class.
Old Forest Single-layer	15-55	13	[3]

[1] Note that deviations from the historical range (either above or below) were not evaluated for the Moist UF potential vegetation group due to its limited acreage in the analysis area.

[2] Summarized from the vegetation database (see Powell 2001c). Upland forest potential vegetation groups (PVG) are described in Powell (1998). Historical percentages (H%) were derived from Hall (1993), Johnson (1993), and USDA Forest Service (1995), and are summarized in Blackwood (1998). Current percentages (C%) were based on National Forest System lands.

[3] Because a historical range of variability analysis is somewhat imprecise, deviations (whether above or below the H% range) were only noted when the current percentage differed from the historical range by more than 2 percent.

ENVIRONMENTAL EFFECTS

In general, the information provided in Tables 18 to 22 shows that implementing either of the action alternatives would initiate favorable trends in vegetation composition, structure, forest (tree) density, and crown fire risk for the Bologna Basin analysis area. Post-treatment effects include:

- A higher proportion of ponderosa pine forest
- A reduced proportion of Douglas-fir and grand fir forests
- A lower proportion of densely stocked forest
- A lower proportion of forest with high crown-fire potential
- A lower proportion of multi-strata old forest
- A higher proportion of single-stratum old forest

Table 18 summarizes the effects of each alternative on vegetation parameters of species composition, forest density, and forest structure.

Table 18. Summary of Effects of Alternatives on Vegetation Parameters

Parameter	Alternative 1	Alternative 2	Alternative 3
Species Composition	• Trend toward late seral species • Continued susceptibility to fire, drought, insects and disease	• Trend toward early seral species • Less susceptibility to fire, drought, insects and disease	Same as Alternative 2
Forest Density	• Higher density • Lower stand vigor • Continued forest health problems • Currently 83%[1] "overstocked"	• Lower density • Higher stand vigor • Fewer forest health problems • 68% "overstocked"	Same as Alternative 2
Forest Structure	• Multi-layered structure • Increased ladder fuels	• Decreased ladder fuels • Lower intensity surface fire	Same as Alternative 2

[1] Percentages are the proportion of land classified as "overstocked" on the National Forest within the analysis area.

ALTERNATIVE 1: *NO ACTION*

STAND HEALTH

This alternative would allow disturbance and successional processes to continue without human intervention. Wickman (1979) studied defoliation by tussock moth and related tree mortality in the Blue Mountains of Oregon during the 1970s outbreak. He found that the percentage of individual trees dying as a direct result of tussock moth defoliation alone did not increase beyond 10 percent until reaching defoliation levels of 90 percent, in which green needles remained on only the lowest 10 percent of the crown. Wickman also observed that trees defoliated 90 percent or more and concentrated in patches have the highest probability of dying from defoliation. Trees defoliated 50 percent or less rarely died from the effects of defoliation. However, when defoliation rates increase to 75 percent or more, and drought, either before or during the outbreak accompanied defoliation, resident bark beetle populations would respond and attack, often killing some of the defoliated overstory trees. This is due in part to the trees' weakened condition that limits their ability to manufacture defensive chemicals, as these are costly expenditures to the trees' energy during such periods of severe stress (Waring and Schlesinger 1985). As these bark beetle populations increase, they would attack and kill many of the re-foliating trees that might otherwise have survived the tussock moth defoliation. The indirect mortality from bark beetles usually occurs within 3 years of primary insect

infestation (Mason and Wickman 1984). Small trees generally suffer more mortality from direct effects of defoliation, and large trees suffer more mortality as a result of secondary insect attack (Wickman 1963, 1978a). Hence, with the recent drought and the level of defoliation in Bologna Basin, the tree mortality witnessed on the south end of the Heppner Ranger District in 2002 would likely continue for another two years.

Based on outbreaks studied in the past (see Mason and Wickman 1984), over half the total mortality (due to tussock moth and secondary insects) would occur in patches that make up a relatively small portion – usually 10 to 14 percent – of an outbreak area. Although the visible defoliation – especially areas of 100 percent host tree defoliation – is widespread on the Heppner outbreak, total tree mortality is expected to be within the range cited by Mason and Wickman (1984).

Although tussock moth outbreaks can be dramatic in occurrence, intensity, and appearance, not all ecological effects are necessarily negative. Recovery after an outbreak can be almost as dramatic as the outbreak. Growth on partially defoliated trees that survive usually returns to pre-outbreak levels within five years, and after only 10 years may surpass pre-outbreak growth rates (Mason and Wickman 1984, Wickman 1978b). Enhanced growth, including that of the resident ponderosa pine component, is believed to be the result of nutrient cycling brought about by defoliation (fallen needles and insect frass -- a mixture of excrement and partly digested needles) that provides a boost in available nitrogen to the stand components (Mason and Wickman 1984). The removal of trees by insect-caused mortality also constitutes a natural thinning in densely stocked stands, allowing residual trees to benefit from the increased nutrient, moisture, and sunlight levels within the stand. This ability of the tussock moth to alter to some extent stand conditions is viewed as a long-term beneficial role as a regulator of forest primary production and is essential for forest stability (Klock and Wickman 1978, Mason and Wickman 1984, Mattson and Addy 1975, and Turnbull 1969). These benefits, however, must be viewed along with the opposing concern of increased fuel loads and potential fire hazards accompanying the buildup of fine fuels (in the form of needles), and heavy woody fuels that result from tree mortality. The benefits stated have very little value to the management of this resource if it burns in a stand replacement fire.

The currently severe Douglas-fir dwarf mistletoe infestations would also continue to worsen under this alternative due to increasing stand densities as trees grow. Western dwarf mistletoe in ponderosa pine would also proliferate. Often smaller understory trees affected by dwarf mistletoe never reach maturity, eventually succumbing to the parasite itself or to secondary agents that attack stressed trees.

SPECIES COMPOSITION

Continuation of existing management direction, including fire suppression, would allow forest stands to become dominated by late-successional Douglas-fir and grand fir; many of the proposed treatment areas are already exhibiting these conditions. This would move stands even further away from their historical range

of variability. This successional progression is undesirable for the following reasons:

- Douglas-fir and grand fir are primary hosts (habitat) for two important defoliating insects – western spruce budworm and Douglas-fir tussock moth. Ponderosa pine and western larch are either immune (non-hosts) or a secondary host species for these insects. Allowing Douglas-fir and grand fir to increase on these dry sites would contribute to future forest health problems from broad-scale defoliator outbreaks and root disease (Scott 2002).
- Although large-diameter Douglas-fir has moderate fire tolerance, ponderosa pine and western larch have higher fire tolerance than any of the other tree species occurring in the Blue Mountains (Agee 1993). Allowing Douglas-fir and grand fir to replace ponderosa pine and western larch would contribute to future fire susceptibility.
- Perpetuation of these pest-susceptible, fire-intolerant species would compromise our ability to meet future objectives with respect to ecological sustainability and forest health.

FOREST DENSITY

A very high proportion of the analysis area has forests with high tree density. Competition between trees for sunlight, moisture, and nutrients would increase as trees grow larger, further decreasing tree vigor and increasing susceptibility to insects and pathogens that seek out stressed trees. Tree mortality from bark-beetle insects (mountain pine beetle, western pine beetle, Douglas-fir beetle, fir engraver, and pine engraver) would increase under these conditions. Stands would eventually become less dense as diseases, insects, and weather combine to reduce the number of living trees. This would occur in a 2 to 3 year period within 5 to 10 years of infestation. Once the canopy opens, forbs, shrubs, and tree regeneration would increase in abundance, exhibit high vigor, and eventually grow up through the accumulating down, dead wood. Fire intolerant and shade tolerant species such as Douglas-fir and grand fir would dominate because conditions would be unfavorable for establishment and growth of early-seral tree species such as ponderosa pine and western larch.

In addition, the increased stand densities would eliminate or severely restrict opportunities to reestablish an important ecosystem process – short-interval, low-intensity fire – because fire in such dense stands or with so much downed wood would be difficult to keep under control.

FOREST STRUCTURE

Continuation of existing management direction, including fire suppression, would allow a multi-layered structure to increase at the expense of the historically predominant single-layer structure on dry sites in the Blue Mountains (Munger 1917). These multi-layered structures serve as ladder fuel, allowing a low-intensity fire to climb into the upper canopy and kill the trees, including the fire-

resistant species. If multi-layered structures are allowed to persist in the analysis area, we can expect more high severity wildfire in the future.

ALTERNATIVE 2: *PROPOSED ACTION*

STAND HEALTH

Harvest of dwarf mistletoe infested trees, coupled with noncommercial thinning of existing regeneration (host species saplings being a priority for removal), would reduce dwarf mistletoe infestation to a more acceptable level. Bark beetle infestations would be less damaging because thinning would open stands and expose tree bark to sunlight, an environment not suited to bark beetles. Reduced stand densities would eliminate the continuity of trees attacked by tussock moth. Food sources would be farther apart and the trees would be more able to resist tussock moth and secondary insect infestation. Competition between trees would be reduced, resulting in more nutrients, water, and sunlight available to each tree. As a result, stand health would be improved.

SPECIES COMPOSITION

Proposed thinnings would discriminate against shade tolerant, late-seral species such as Douglas-fir and grand fir, while favoring early-seral species. This would restore a more appropriate species composition on 1,003 acres within the Bologna Basin Analysis area. Forest composition would shift toward the historical proportions of more ponderosa pine and less Douglas-fir and juniper (Table 19). Thinnings would also favor retention of disease-resistant tree species, particularly within areas experiencing on-going forest health problems such as dwarf mistletoe and other parasites or diseases.

Although the historical range of variability analysis (Table 20) shows juniper to be within its historical range overall, its historical distribution was limited to areas in which it was the main cover type. Currently, juniper is distributed in heavily wooded stands of ponderosa pine and Douglas-fir cover types that have not previously contained juniper due to historic fire cycles. The current distribution is causing stress to other vegetation by competing for soil moisture. Juniper removal would not occur in areas where it is the dominant cover type. Instead, it would be removed from within ponderosa pine and Douglas-fir cover types to improve vigor of remaining trees by reducing competition for water, sunlight, and nutrients. It would also increase the water availability to other plants, increase forage for big game and livestock, and decrease fire hazard by eliminating ladder fuels.

Table 19. Pre-Treatment and Post Treatment Comparison of Vegetation Composition (cover types) for the Bologna Basin Analysis Area

Cover Type Description[1]	Pre -Treatment		Post Treatment	
	Acres	%	Acres	%
Grand fir	312	3.4	140	1.5
Ponderosa pine	3,298	35.9	3,580	39.0
Interior Douglas-fir	2,839	31.0	2,728	29.8
Western juniper	940	10.3	940	10.3
Nonforest cover types dominated by forb communities	1,044	11.4	1,044	11.4
Nonforest cover types dominated by grass communities	132	1.4	132	1.4
Nonforest cover types dominated by shrub communities	610	6.7	610	6.7

[1] Summarized from the vegetation database (see Powell 2001c).

Plantings in salvaged areas would be more in conformity with the historical range of variability and potential vegetation. Eighty percent of the species mix in the planting would be ponderosa pine, and 20 percent would be Douglas-fir.

Table 20. Comparison of Pre-Treatment and Post Treatment Historical Range of Variability (HRV) Analysis for Vegetation Composition on Dry Upland Forest Sites

Cover Type	Historical Range (%)[1]	Current Composition (%)[2]	Post-Treatment Composition %
Ponderosa Pine	72-90	49	54
Interior Douglas-fir	8-14	42	41
Grand Fir	1-5	4	1
Grass/Forb	0-2	0	0
Shrub	0-3	0	0
Juniper	1-5	4	4

[1]Historical ranges are approximate and were inferred from Morgan and Parsons (2000). Note that this information pertains to the "dry upland forest" potential vegetation group only; historical ranges and the current percentage values would vary for other potential vegetation groups.

[2]Current percentages were derived from the vegetation database (see Powell 2001c).

FOREST DENSITY

Thinning on 475 acres and salvage on 528 acres would reduce forest stocking

density to levels that are below the zone of imminent susceptibility to bark beetle attack. The proportion of the analysis area classified as "overstocked" (83 percent) would be reduced to 68 percent (Table 21). The reduced stocking levels would leave stands in a more vigorous condition, improve insect and disease resistance, and create sustainable stand structure.

Table 21. Comparison of Pre-Treatment and Post-Treatment Forest Density Analysis for the Bologna Basin Analysis Area

Potential Vegetation Group	Pre-Treatment "Overstocked"[1] (%)	Post-Treatment "Overstocked" (%)
Dry Upland Forest	84.1	68.3
Moist Upland Forest	50.6	47.3
Total (Upland Forest)	**83.1**	**67.7**

[1] Summarized from the vegetation database (see Powell 2001c). Criteria used for determination of stocking status ("overstocked" or "not overstocked") are described in Powell (2001b).

FOREST STRUCTURE

The proposed harvest and thinning would increase the amount of area in the stem exclusion open canopy structural class. However, Table 22 shows that the these stands were converted from stands in the stem exclusion closed canopy

Table 22. Comparison of Pre-Treatment and Post-Treatment Forest Structural Classes of the Bologna Basin Analysis Area

Forest Structural Class Description	Pre-Treatment		Post-Treatment	
	Acres[1]	%	Acres	%
Old Forest Multi-layer	1,889	20.6	1,614	17.6
Old Forest Single-layer	902	9.8	1,177	12.8
Stem Exclusion Closed Canopy	1,689	18.4	987	10.8
Stem Exclusion Open Canopy	1,490	16.2	2,151	23.4
Stand Initiation	494	5.4	561	6.1
Understory Reinitiation	99	1.1	79	0.9
Young Forest Multi-layer	148	1.6	141	1.5
Forbland, grassland, and shrubland cover types	1,787	19.5	1787	19.5
Woodland (western juniper)	679	7.4	679	7.4

[1] Acreage figures include National Forest System lands only. Forest structural classes are described in O'Hara et al. (1996) and in Powell (2000; see Table 2, page 16).

structural class, a structural class which is currently far above its historic upper limit. Although shifting stands from the stem exclusion closed canopy structural

class to the stem exclusion open canopy structural class would push the stem exclusion open canopy class above its historic range of variability, distribution of these two structural classes would become more balanced.

Table 23. Historical Range of Variability (HRV) Analysis for Dry Upland Forest Structural Classes

Structural Class[1]	HRV (%)	Current (%)	Post-Treatm't (%)	Interpretation[2]
Stand Initiation	5-15	8	9	Remains within HRV
Stem Exclusion Open Canopy	5-20	22	32	Percent of area in this structural class would increase above the historical levels
Stem Exclusion Closed Canopy	1-10	26	15	Percentage above HRV would be reduced, but would still remain above historical levels
Stem Exclusion Closed Canopy	1-10	26	15	Percentage above HRV would be reduced, but would still remain above historical levels
Understory Reinitiation	1-10	2	1	Remains within HRV
Young Forest Multi-layer	5-25	2	2	Stands would continue to remain below HRV until stands in the lower structural classes mature/develop to this level
Old Forest Multi-layer	5-20	29	25	Percentage above HRV would be reduced, but would still remain above historical levels
Old Forest Single-layer	15-55	13	17	Percent of area in this structural class would increase, remaining within HRV

[1] Summarized from the vegetation database (see Powell 2001c). Upland forest potential vegetation groups (PVG) are described in Powell (1998). Historical percentages (H%) were derived from Hall (1993), Johnson (1993), and USDA Forest Service (1995), and are summarized in Blackwood (1998). Current percentages (C%) were based on NFS lands.

[2] Note that deviations from the historical range (either above or below) were not evaluated for the Moist UF potential vegetation group due to its limited acreage in the analysis area.

By definition, stands in the stem exclusion structural classes are at a stage of development where trees initially grow fast and quickly occupy all of the growing space, competing strongly for sunlight and moisture (O'Hara and others 1996, as cited in the forest vegetation specialist report.). With a closed canopy, tree crowns touch or overlap. Together, stem exclusion with a closed canopy creates conditions that promote insect and disease attacks and provide continuous vertical and horizontal aerial fuels that easily spread crown fire and make control of prescribed fire difficult. Couple this with post-grazing, post-fire suppression intrusion of tree species that are not as well suited to drought and fire occurrences, and an unsustainable forest condition is created. These were exactly the conditions identified as needing treatment in the purpose and need

for these projects: fuels, forest structure, composition, and density.

Historic Range of Variability did not direct the development of the proposed activities; however, it does display the effects of those activities very well. Thinning treatments in stem exclusion closed canopy stands will initially and temporarily create stem exclusion open canopy stands, but thinned stands grow faster than unthinned stands and the ultimate result of this accelerated growth rate will be future increases in the young forest multi strata and old forest structural classes, which are currently very deficient when compared to their historic occurrence.

Thinning around large-diameter trees would improve their health and vigor and contribute to their increased longevity. Stands would progress toward a forest structure that is compatible with the historical situation – higher proportions of single-layer structure (Table 23). Thinning would also permit the reintroduction of low-intensity surface fire with its many associated ecosystem benefits.

ALTERNATIVE 3

The effects of this alternative on the vegetation resource would be the same as Alternative 2 with the exception that they would occur on 8 fewer acres. This alternative would reduce the proportion of the analysis area classified as "overstocked" (currently 83 percent) to 68 percent. Untreated areas would continue to have elevated stocking levels, leaving them with high risk for attack by insects and pathogens, and high susceptibility to stand replacement wildfire. These areas would continue to trend away from the historical species composition and structure.

CUMULATIVE EFFECTS OF ALTERNATIVES 2 AND 3

The thinning and salvage treatments, together with projected future prescribed fire implemented at regular intervals, would do much to reverse the departure from historical composition and structure. The result would be park-like stands of ponderosa pine with scattered, larger diameter, fire-tolerant Douglas-fir. Ground cover would be grass with scattered shrubs, and more sunlight would reach the forest floor increasing forage for domestic livestock and big game. Regular interval fires would prevent the reproduction of shade-tolerant Douglas-fir and grand fir, and prevent the reoccurrence of the overcrowded condition that presently exists. This combination of activities would also help reverse the following broad-scale trends identified in a scientific assessment for the interior Columbia River Basin (Quigley et al. 1996):

- Substantial declines in single-layer old forest structure
- Increased structural complexity in the absence of native disturbance regimes
- Increased stand density and forest stocking
- Increased homogeneity in both forest composition and structure
- Substantial increases in the amount of lethal fires

These activities would also be consistent with several of the 11 points contained in former Oregon Governor Kitzhaber's strategy for restoring eastern Oregon forests, watersheds, and communities (Kitzhaber et al. 2001).

A total of 4,090 acres of timber harvest occurred in Bologna Basin between the years of 1966 and 1988. These harvests appeared to be light, overstory removals instead of the commonly perceived clearcuts. Putnam 1987 (879 acres) and Putnam 1988 (65 acres) were the most recent sales. The largest sale in the analysis area was West Bologna in 1976 (2,829 acres). Even so, residual effects of past activities in Bologna Basin are not evident and the cumulative effects of this alternative in combination with these past actions cannot be identified.

The juniper reduction, non-commercial thinning and commercial thinnings should have positive effects in water source developments planned for the future. All would increase the amount of available water for these developments.

FIRE/FUELS

This Environmental Assessment hereby incorporates by reference the *Fire and Fuels Specialist Report* in the Project Record (40 CFR §1502.21). The *Fire and Fuels Specialist Report* is located in the *Project Analysis* section of the Project Record and contains the detailed data, methodologies, analyses, conclusions, maps, references, and technical documentation that the Fire and Fuels specialist relied upon to reach the conclusions in this Environmental Assessment. The analysis area for the Fire/Fuels section includes only the 9,184 acres of National Forest land within the Bologna Basin subwatershed.

EXISTING CONDITIONS

Several fuels concerns in the Bologna Basin analysis area need to be addressed. The major concern is the effect of the Douglas-fir tussock moth defoliation on the mixed conifer forest, which has killed standing trees and created a fuel buildup. Affected trees are standing, but over time will fall, contributing to ground fuels.

Until the last century, fires that started could easily spread in the available fuels with only natural breaks and weather to restrict their sizes. There was little time for dead and down fuels to accumulate in the areas that burned frequently.

A review of more recent fire activity shows that no large fires (greater than 10 acres) have occurred within the analysis area boundary during the last 40 years. The most recent large fire in the analysis area occurred in 1961 (Thorn Springs Fire) and was 785 acres in size. Data for small fires (less than 10 acres) is limited. Geographical Information Systems coverage shows areas where small fires occurred, but contains no data for the size and dates of these fires.

The Bologna Basin analysis area shows signs of past treatment, primarily timber sale activities, prescribed fire, and fire suppression. In 2000, The Forest Service

conducted a prescribed underburn fire to open the understory in the eastern part of the analysis area within the Forest boundary – specifically in Township 8 South, Range 26 East, parts of sections 14, 15, 21-24, 26-28, 33-35. The objective of this underburn was to (1) reduce natural fuels levels to within the historical range of variability, and (2) improve wildlife habitat. This prescribed underburn was 3,120 acres in size and was reported to be only partly successful in reducing fuel loads and continuity.

The stand conditions that exist because of past activities and natural circumstances are described in terms of fire regimes, condition classes, and fuel models.

FIRE REGIME

Fire regimes are based on historic fire frequency, climate, topography, and vegetation types. The three dominant fire regimes found within the analysis area are described below (Table 24) and shown in Figure 10.

Table 24. Fire Regimes in Bologna Basin

Fire Regime	Fire Return Interval	Severity	Area (Acres)
I	0-35 Years	Low	7,678
II	0-35 Years	Stand Replacement	610
III	35-100+ Years	Mixed	887
Total			**9,175**

DRY FOREST (FIRE REGIME I)

This fire regime occurs where low-intensity fires with short return intervals dominate dry forests. Fire sustains early seral species, such as ponderosa pine, and thins a large proportion of the seedlings and saplings that become established between fires. The result is a relatively open, single-canopy stand with low levels of accumulated fuels.

Figure 10 illustrates that Fire Regime I covers most of the analysis area and a majority of the tussock moth defoliation. This corresponds to the warm-dry species types historically found on southern exposures. Field reconnaissance has shown the area to be a forest of mixed conifers.

MOIST FOREST (FIRE REGIME II)

This fire regime occurs where low-intensity surface fires with short return intervals tend to remove all of the dead vegetation and kill most of the live vegetation. Under drought conditions or on very dry sites, ground fires may consume the underground parts of the plants. The removal of dead debris generally allows more dense growth to develop. Frequent fires tend to promote grasses at the expense of shrubs and trees. In the absence of fire, shrubs and trees (particularly juniper) will invade the site.

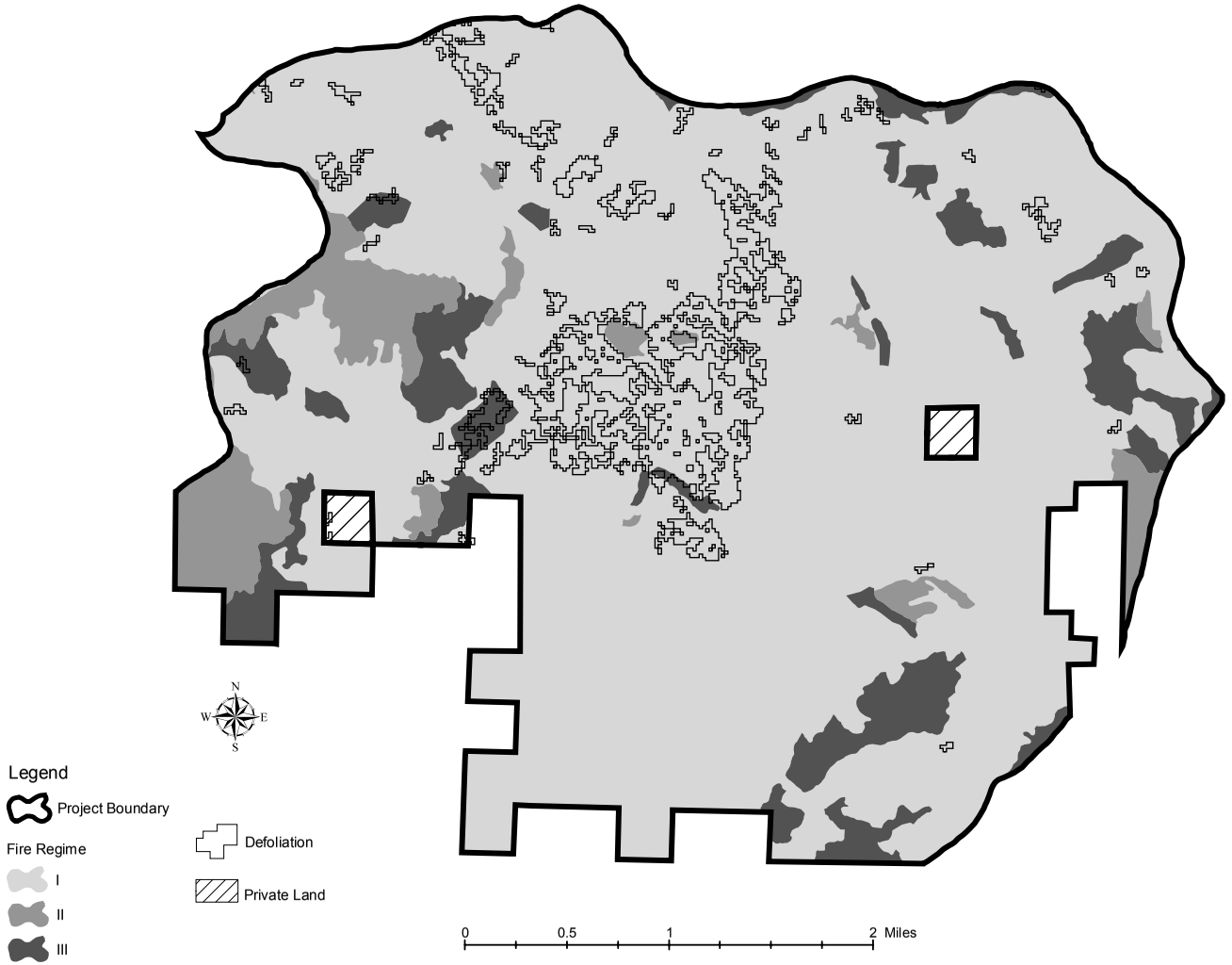

Figure 10. Defoliation with Respect to Fire Regime

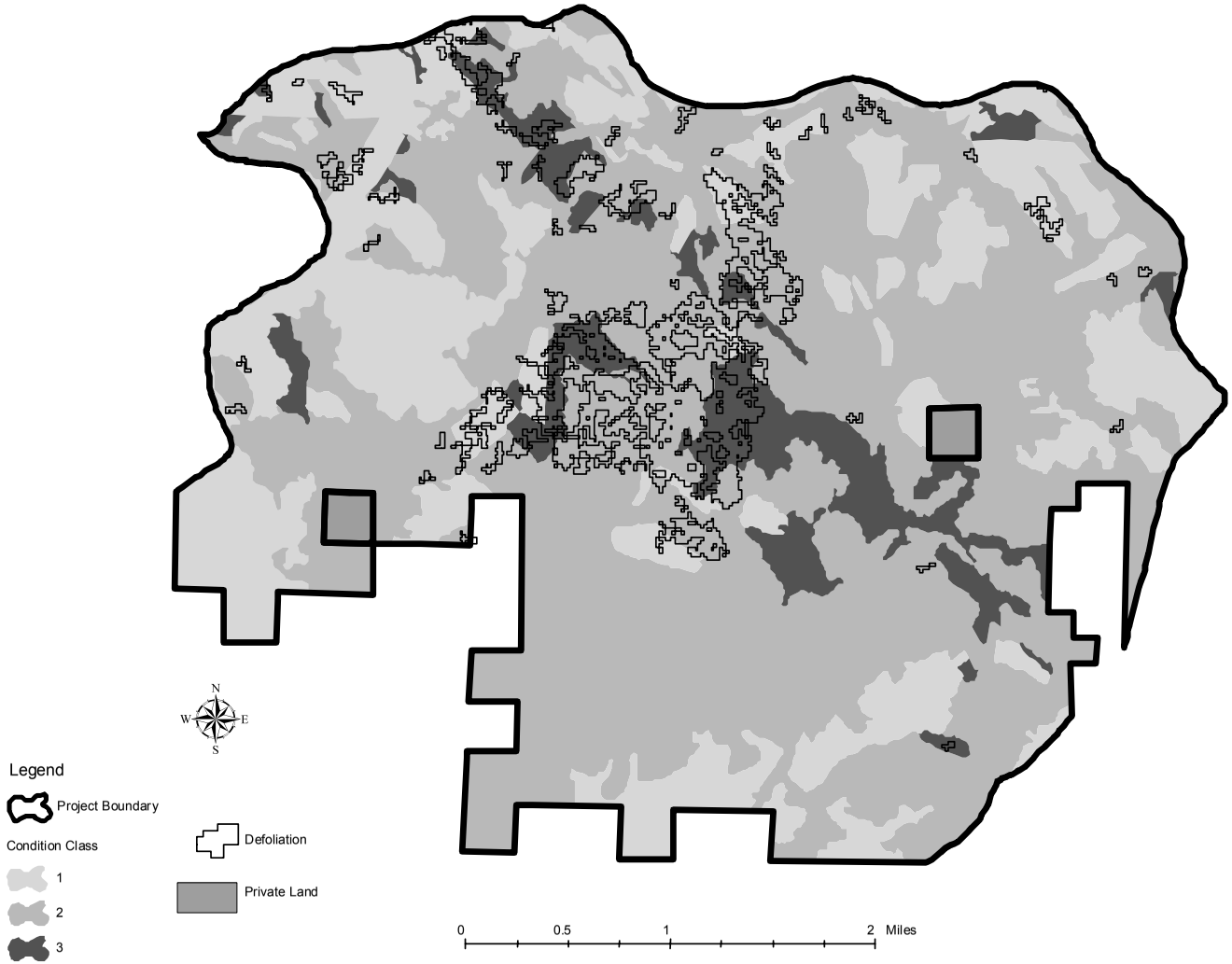

Figure 11. Bologna Basin Condition Classes

COLD FOREST (FIRE REGIME III)

Fire regimes are complex in these forests, and are often referred to as a mixed fire regime, indicating that fires often burn with a combination of low to moderate intensity surface fire, and patches of high intensity fire. Patches of high intensity, high severity fire occur when changes in surface fuels, stand density, and/or topography come together to increase fire intensity. Because of the variation in these factors, patch sizes resulting from this type of fire regime are likely to be highly variable.

CONDITION CLASS

Condition classes (Table 25) are a measurement of how much an area deviates from historical fire regimes. These deviations are determined by comparing the number of missed fire return intervals in recent history with the long-term historic fire return interval. The greater the deviation – that is, the longer the area "waits" past the historic interval for the return of a natural fire – the greater the alteration to key ecosystem components such as species composition, structural stage, stand age, and canopy closure than if historic fire return intervals had taken place. One or more of the following activities may have caused this departure:

- Fire exclusion
- Timber harvesting
- Regeneration activities following harvest
- Livestock grazing
- Introduction and establishment of exotic plant species
- Insects and disease (introduced or native)

Other past management activities

To describe this condition, three condition classes have been developed to categorize the current condition with respect to current fire regime.

Table 25. Bologna Basin Condition Classes

Condition Class	Description	Area (Acres)
1	Areas are within their historical range of variability.	2,589
2	Areas are beginning to, or are moving away from their historic norm, primarily through increased stocking levels and in-growth of mid and late seral species.	5,782
3	Areas that have moved further away from what would be expected historically.	805
Total		**9,176**

Therefore, a fire regime in normal condition would be in Condition Class 1. A fire regime that has completely deviated from its historically normal condition would

be in Condition Class 3. As Figure 11 shows, most of the analysis area outside the private property is in Condition Class 2. Areas in Condition Class 1 are moving toward Condition Class 2 and a limited portion of the area is in Condition Class 3.

Figure 11 also shows that much of the defoliation is concentrated in condition classes 2 and 3. This fact, along with the concentration of these condition classes within Fire Regime I, supports the concern that areas historically dominated by a low-intensity fire regime are lacking the single-canopied stand structure and early seral species composition that would exist under natural disturbances. The concentration of defoliation in condition classes 2 and 3 is likely due to stress on trees resulting from fire exclusion and drought.

FUEL LOADS AND MODELS

Fuel loading among defoliated units can be best described by using Ottmar's Photo Series for Quantifying Natural Fuels for Mixed-Conifer with Mortality in the Interior Pacific Northwest. In the photo series, model MC 12 best describes the overstory stand condition estimating a fuel loading of 36.73 tons per acre. This model best displays the condition of tree stands with mortality from defoliation. Ground fuels can be described by using photo series MC 01 estimating down woody material loading of 7.6 tons per acre.

This analysis uses the Northern Forest Fire Laboratory system to describe fuel models present in Bologna Basin. The Northern Forest Fire Laboratory fuel models are nationally recognized and are used by the BEHAVE computer program for output of fire calculations. Four categories of fuels are used: grass, shrub, timber, and slash[6]. Six fuel models exist within Bologna Basin, ranging from areas devoid of fuel, to grass, to timber (Table 26). Figure 12 shows the distribution of these fuel models within the analysis area.

Table 26. Bologna Basin Fuel Models

Fuel Model	Vegetation Category	Area (Acres)
1	Grass	543
2	Grass	1570
5	Shrub	2867
8	Timber	1922
9	Timber	1480
10	Timber	802
Total		**9,184**

The conditions under which crown fires are likely to occur require hot and dry weather conditions with strong winds and steep slopes. It also requires an overstory that is conductive to carrying or sustaining a crown fire. (Rothermel 1983)

[6] Slash: Debris that remains after harvest.

At present, the risk of crown fire to adjacent landowners is moderate due to three reasons:

1. Most of the timber stands are located in the northern portion the analysis area. It is in this area where the Douglas fir tussock moth has affected timber stands. Farther south, and closer to the National Forest boundary, timbered stands become sparse and unable to support an active or independent crown fire.
2. Historical data shows that a large portion of the timbered area has been treated in the past either by thinning, logging, or by prescribed fire that has reduced or maintained a low loading of ground fuels.
3. Standing dead and dying trees are part of the "aerial" fuels that could contribute to a crown fire. They are not part of the ground fuels where a surface fire's activity and behavior occurs. In 5 to 15 years these standing trees would fall and then contribute to the ground fuel loading.

Aerial fuels are dense and contain a dead and dying crown component. Ground fuels would support a surface fire but fuel loading is low enough that firefighting resources could easily suppress and control a ground fire. The threat of a crown fire exists as long as there is a dense crown closure with a high ground fuel loading component. It is the high ground fuel loading that would support a fire, allowing it to have high flame lengths that would reach tree canopies and initiate a crown fire.

The continued, periodical use of prescribed fire would reduce and maintain a low fuel loading that would minimize the chances for a ground fire to have large flame lengths and high intensities. Thinning areas that have a high dead and dying canopy component would open up canopies and minimize the chances for an active or independent crown fire to occur. The long-term results would be a much healthier forested area that would not be as susceptible to insect infestations or disease.

NORTHERN FOREST FIRE LABORATORY FUEL MODEL 1

Fire spread is governed by fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fire occurs as surface fires that move rapidly through the cured grass and associated material. Very little shrub or timber is present—generally less than one-third of the area. This fuel type best represents grasslands and savanna. Annual and perennial grasses are included in this model.

NORTHERN FOREST FIRE LABORATORY FUEL MODEL 2

Fire spreads primarily through fine herbaceous fuels, either curing or dead. These are surface fires where herbaceous material, dead leaves/needles, and dead, down stemwood from the open shrub or timber overstory contribute to the fire intensity. Open shrub lands and pine stands that cover about one-third of the area generally fit this model. Such stands may include clumps of fuels that

generate higher intensities and may produce firebrands.

NORTHERN FOREST FIRE LABORATORY FUEL MODEL 5

Fire in this fuel model is generally carried in the surface fuels that are made up of dead leaves from shrubs, and the grasses or forbs in the understory. The fires are generally not very intense because surface fuel loads are light, the shrubs are young with little dead material, and foliage contains little volatile material. Usually shrubs are short and almost totally cover the area. Young, green stands with no dead would qualify: laurel, vine maple, alder, chaparral, manzanita, chamise and, ceonothus.

NORTHERN FOREST FIRE LABORATORY FUEL MODEL 8

Slow-burning ground fires with low flame lengths are generally the case in this model, although the fire may encounter an occasional heavy fuel concentration that can flare up. Fuels pose fire hazards only under severe weather conditions involving high temperatures, low humidity, and high winds. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Representative conifer types are white pine, lodgepole pine, spruce, fir, and larch.

NORTHERN FOREST FIRE LABORATORY FUEL MODEL 9

Fires in this model run through the surface litter faster than Model 8 and have longer flame height. Both long-needle conifer stands and hardwood stands (especially the oak-hickory types) are typical. Closed stands of long-needled pine (like ponderosa, Jeffrey, and red pines) are grouped in this model. Concentrations of dead, down woody material will contribute to possible torching of trees, spotting, and crowning. Fire spread is mainly within the surface litter and the understories of these stands.

NORTHERN FOREST FIRE LABORATORY FUEL MODEL 10

Fires in this model burn in the surface and ground fuels with greater fire intensity than other timber litter models. Dead, down fuels include greater quantities of 3-inch or larger limbwood resulting from age or natural disturbances that create a large load of dead material on the forest floor. Crowning, spotting, and torching of the fire lead to potential fire control difficulties. Any forest type may be considered under this model if heavy down material is present; examples are insect- or disease-ridden stands, wind thrown stands, old stands with deadfall, and dry debris from light thinning or partial harvest.

Figure 12. Bologna Basin Fuel Models

Figure 12 indicates that fuel conditions, topography, and the expected fire behavior vary across the Bologna Basin analysis area. This is the case for not only the surface (horizontal) fuel profiles, but also for vertical components of fuel profiles (ladder fuels). Generally, the areas with lighter fuel loadings would experience short duration/low to high intensity fires (grass models burn intensely but burn out quickly), which could be expected to spread very slowly in the case of the short needle timber areas (Fuel Model 8) or very rapidly in the case of the grass fuels (fuel models 1 and 2). Areas with heavy fuel accumulation would be expected to burn with higher intensities for longer periods of time with moderate rates of spread (Fuel Model 10). Most of the defoliated areas occur within fuel models 8, 9, and 10.

FIRE/FUEL EFFECTS

The analysis of effects for fire and fuels was done at the subwatershed scale and included only National Forest System land within Bologna Basin. Fire occurrence and fuels information on the private property within the analysis area is not available. An ecosystem analysis at the subwatershed scale has not been done for Bologna Basin. However, the Wall Ecosystem Analysis (USDA Forest Service 1995) area is directly adjacent to the Bologna Basin project area, shares similar topography and environmental conditions, and will be referred to in this analysis.

Using BEHAVE and Northern Forest Fire Laboratory Fuel Models, a series of fire scenarios were modeled for this area. Unfortunately, this model does not include the ability to determine vertical fire movement and will not provide an estimation of the potential for crown fire development and spread (a major concern, particularly in Fire Regime III). Crown fire potential was analyzed instead using criteria described in Powell (2001a) and based on work by Agee (1996). Fire behavior predictions were run for fuel models 1, 2, 5, 8, 9, and 10 using identical weather conditions, slope values, and fuel moistures. The weather conditions used represent conditions usually seen in mid- to late-August.

Figure 13 shows the predicted flame lengths of the fuel models under these weather assumptions. As displayed in the graph, firefighting crews using hand tools would only be expected to control a wildfire under conditions found in fuel models 8 and 9. These two models comprise about 3,400 acres (37 percent) of the analysis area within the Forest Boundary.

Table 27 displays analysis of existing potentials for crown fire based on vegetation type and condition and the projected potential for crown fire under the alternatives. Table 28 summarizes how condition classes and fuel loads would be affected by each alternative.

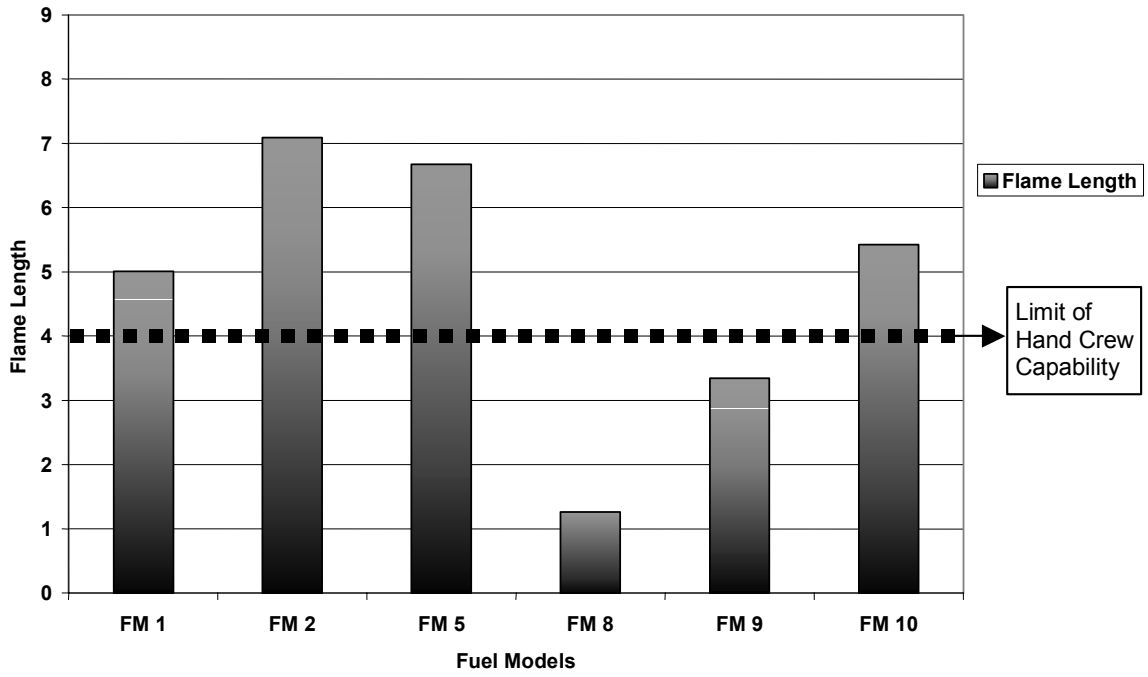

Figure 13. Predicted Flame Lengths by Fuel Model (Feet)

Table 27. Crown Fire Potential Analysis for the Bologna Basin Analysis Area

Potential Vegetation Group	Existing Condition		Projected High Crown Fire Potential[1]	
	Low-Moderate Crown Fire Potential (Acres)	High Crown Fire Potential (Acres)	Alternative 1 (%)	Alts 2 & 3 (%)
Dry Upland Forest	4,818	1,688	26.0	12.2
Moist Upland Forest	168	35	17.2	13.9
Total	**4,986**	**1,723**	**25.7**	**12.2**

[1] Criteria used to determine crown fire potential ("no crown fire potential" or "crown fire potential") are described in Powell (2001a) and based on work by Agee (1996).

Table 28. Summary of Fire/Fuel Effects within Treatment Units

	Alternative		
	1	2	3
Area in Condition Class 1 (acres)	215	574	561
Area in Condition Class 2 (acres)	558	354	358
Area in Condition Class 3 (acres)	235	80	84
Final Fuel Loads (tons/acre)	38	9	9

DIRECT AND INDIRECT EFFECTS COMMON TO ACTION ALTERNATIVES

Thinning and salvaging treatments would thin and open dense timbered stands affected by the Douglas-fir tussock moth. The direct effect of these treatments would be a reduction in the hazardous fuels that currently exist from dead and dying trees affected by the Douglas-fir tussock moth. Treatments would thin and open close canopy tree stands, breaking up the aerial fuel continuity that can support an active or independent crown fire. The proposed treatments would help reduce the chances of an active or independent crown fire occurring, reducing the chances for a passive crown fire. Following the salvage and thinning treatments, prescribed burning would be used to remove residual slash. This would further reduce the hazardous fuels condition by reducing the available fuels to support a wildfire with flame lengths needed to reach tree canopies to initiate a crown fire.

Reductions in ground fuels would reduce the impacts of wildfires by reducing fire intensity, reducing the chance of exposing soil, reducing the opportunity for erosion, and encourage new growth and vigor. In addition, a reduction in fuels would allow firefighting resources a better opportunity to suppress and manage wildfires, increasing personnel safety and minimizing risk to adjacent landowners.

ALTERNATIVE 1: *NO ACTION*

CONDITION CLASS

Current management activities would continue, including fire suppression. Due to past timber harvest and ongoing fire exclusion, understory vegetation would continue to increase in all fire regimes. Much of this vegetation is composed of mid-seral species that are not tolerant of fire. Stands affected by disease and insect infestations would continue in their present condition. Fuels and understory stocking of mixed conifer and ponderosa pine would continue to accumulate. Susceptibility to damage from uncontrolled fire would continue to increase and future use of prescribed fire to control fuels would become increasingly difficult. As stands trend further away from Condition Class 1, it would become more difficult to manage these areas back to their historic, natural condition.

FUEL LOADS AND MODELS

As stands continue to deteriorate, tree boles and woody debris would accumulate on the forest floor. Fuel continuity would extend over a much larger area. Grand fir would continue to invade previously open stands and contribute to an increase in ladder fuels. This increase in understory vegetation would greatly increase the fuel loading and aerial fuel continuity.

Experience from the last spruce budworm outbreak (1980 to 1993) suggests that the dead, smaller diameter pole and sawlog-size trees would begin to rot at the roots and fall over within a relatively short time. Widespread mortality would

contribute to horizontal fuel loads in 20 to 30 years, and would deviate from the condition class due to dense ingrowth of fire intolerant species. Fuels would eventually be suspended above the forest floor, allowing them to thoroughly dry, become more flammable, and persist for a longer period (because lack of soil-wood contact inhibits decomposition).

FIRE BEHAVIOR AND ASSOCIATED RISKS

While the area is currently at a low to moderate risk for a high-severity wildfire, over time these stands would develop the types of fuel profiles that increase the potential for such an event. The ability to control wildfire using direct suppression tactics would be low because of heavy fuel accumulations and due to the risk of moderate- to long-range spotting[7] by a fire.

Also, areas with densely stocked forests are vulnerable to destructive crown fire (Powell et al. 2001a). Research has shown that high tree density causes forest stands to be more vulnerable to crown fire initiation at any age, and that it also extends the duration of a stand's exposure (by 20 to 30 years) to crown fire hazard (Keyes and O'Hara 2002). Table 27 shows that almost 26 percent of upland forests in the Bologna Watershed currently have the potential to express crown fire behavior during a fire event, ranging from a low of 17 percent for moist-forest sites to a high of 26 percent for dry-forest sites. Crown fires move extremely fast and are often not deterred by barriers, creating high risks for firefighters, the public, and property.

SMOKE

Smoke impacts under this alternative would be infrequent. Smoke would be generally limited to minor amounts from small wildfires and controlled burns. However, on occasions when large wildfires occur the smoke impact would be much more severe. The towns of Monument, Spray and Kimberly are down valley from the analysis area and would experience high levels of smoke for extended periods if a large fire occurred. The possibility of this occurring would increase with time as fuel loads build. See the *Clean Air Act* section on page 179 for a list of the State air quality standards.

ALTERNATIVE 2: *PROPOSED ACTION*

CONDITION CLASS

The proposed harvest, thinning, juniper removal, and prescribed burning on 1,003 acres would return 204 acres in Condition Class 2 and 155 acres in Condition Class 3 to Condition Class 1.

[7] Spotting: Wildfire that occurs when fire brands are carried ahead of the main fire by winds or by the force of the fire itself. The fire brands start new fires ahead of the main fire, which makes control difficult and can quickly trap firefighters.

FUEL LOADS AND MODELS

Commercial thinning would result in a reduction of both canopy continuity and ladder fuels. Non-commercial thinning and juniper removal would also reduce ladder fuels. Salvage would reduce future surface fuels.

Whole tree yarding (424 acres) would result in concentrating a majority of the fuels in skid trails, with additional, large debris piles located at landing sites. Because of the concentrated arrangement of these fuels, necessary drying and safe prescribed burn conditions would not occur until the fall and winter months following harvest.

Full tree suspension yarding (579 acres) would leave residual fuels in a more uniform arrangement across the proposed unit. This would allow nutrients to recycle into the ground in a much more uniform pattern after prescribed burns than whole tree yarding. Fuels would dry at a faster rate and be available for burning throughout the year.

Non-commercial thinning would result in debris either lopped and scattered, or piled to be burned at a later date (within a year)[8]. Thinning debris would increase short-term fire risk for up to a year. Treatment of this debris through underburning would mitigate the increased risk and provide a large, continuous area of treated fuels.

Post treatment fuel loading of defoliated units can be described using *Maxwell's Photo Series for Quantifying Residues Fuels*. Salvage should yield a fuel loading of 13.4 tons per acre, possibly greater in some areas, while commercial thinning would yield a fuel loading of 29.3 tons per acre. Non-commercial thinning and juniper removal would leave about 3 to 5 tons per acre. The increased fuel loading of ground fuels from commercial thinning is expected to exist for no longer than one year. Fuels on 448 acres would be treated through a combination of underburning (199 acres of commercial thinned units) and pile burning (249 acres of salvage units). Once treated with the proposed prescribed fire, fuel loading levels would decrease to below the Forest Plan target of 9 tons per acre.

FIRE BEHAVIOR AND ASSOCIATED RISKS

Mechanically removing standing fuels prior to burning would enhance the ability to determine which trees, both understory and overstory, would be either be removed or remain in forest stands. Mechanical treatments would protect large overstory trees and healthy young trees that reside in forest stands. Mechanically removing selected trees would remove the risk associated with fire behavior and increase safety margin for firefighters and adjacent landowners.

Commercial thinning would result in a reduction of both canopy continuity and ladder fuels, which would reduce the potential for crown fire spread within treated

[8] Debris that exceeds 9 tons per acre would be grapple piled and burned when weather permits.

stands. Non-commercial thinning would reduce the understory stocking (future canopy continuity) as well as ladder fuels. Both types of thinning would create more open stands, resulting in more sunlight reaching surface fuels. This would decrease ground fuel moistures, leading to an increased intensity of surface fire.

However, after all activities (including burning) are completed, fuel loading would be reduced, decreasing the future threat of high-intensity wildfire that would otherwise kill most, if not all, of the live trees. Susceptibility to severe wildfires would eventually decline due to limited amounts of fuel available for combustion. Areas where fuels are concentrated would be isolated and readily contained within the treated area. Direct fire suppression could occur with relative safety; fire spread from torching would be limited. Future prescribed fires would burn with a low to moderate intensity and be much more controllable, permitting a wider season of use.

SMOKE

Analysis of probable smoke emissions from this project estimates that 18 tons of PM 10 particulates[9] and 16 tons of PM 2.5 particulates[10] would be created through the prescribed burning proposed under this alternative. Smoke emissions would have little to no effect on public health or use of National Forest or private lands within the analysis area because of the small amount to be burned.

ALTERNATIVE 3

With this alternative, the resulting amount of fuel loading and the effects to canopy continuity, ladder fuels, and condition class would be identical to Alternative 2, but on 8 fewer acres. Fuel treatment through pile burning would occur on 8 fewer acres. Once treated with the proposed prescribed fire, fuel loading levels would decrease to below the Forest Plan target of 9 tons per acre.

However, ground fuel continuity would be different because this alternative would harvest the entire 995 acres scheduled for treatment under this alternative using full tree suspension yarding. This system would leave residual fuels in more a uniform arrangement, would burn with a low to moderate intensity, and would be available for burning throughout the year.

Estimates show 17 tons of PM 10 particulates and 15 tons of PM 2.5 particulates would be created through the prescribed burning proposed under this alternative. Smoke emissions would have little to no effect on public health or use of National Forest or private lands within the analysis area because of the small amount to be burned.

[9] PM 10 Particulates: Coarse particulate matter larger than 2.5 micrometers in size.

[10] PM 2.5 Particulates: Fine particulate matter smaller than 2.5 micrometers in size.

CUMULATIVE EFFECTS OF ACTION ALTERNATIVES

The cumulative effects of the activities on the fuels resource would be the same under both action alternatives. The profile of the analysis area is that of an ecosystem dependent on the frequent return of low-intensity surface fires to maintain low fuel loading levels and to encourage new vegetation growth by removing the old.

The implementation of either action alternative would convert 440 acres (Alternative 3 would include 8 fewer acres) to a condition class 1, where wildfires and prescribed fires would burn with a low-intensity, minimizing impacts to ecosystem components and promoting new growth and vigor.

Past activities in the area include 8 timber harvests on 4,090 acres (45 percent of the analysis area) over the last 38 years. The two largest harvests were the West Bologna Harvest in 1972 (2,829 acres) and the Putnam Harvest (944 acres) in 1987-88. Over a period of 10 to 20 years, these areas would accumulate enough ground fuel to support a moderate to high intensity wildfire.

Present activities are grazing on 8,862 acres (96 percent) of the area. Grazing has effectively helped reduce the fuel loading of fine fuels. Over time, larger fuels (greater than 1 inch) not consumed by cattle, accumulate on the ground. During landscape prescribed fires, these fine fuels are an important component in conducting large-scale burns. Fine fuels easily ignite, carrying fire across the landscape and help in the ignition of larger fuels. To help conduct landscape burns, grazing activities would need to be coordinated with prescribed fire activities to manage for the availability of fine fuels. Though grazing offers fine fuel reduction without the risks from fire, it does not provide the fire component needed by fire-adapted flora and fauna found in the area.

The residual effects of the proposed treatments that might combine with the predicted direct and indirect effects of reasonably foreseeable future prescribed burns would maintain low fuel loading levels on 5,440 acres (60 percent) of the area managed by the Forest Service in the Bologna Basin.

The current fire management policy is suppression of all wildland fires in the analysis area. The maintenance of roads in alternatives 2 and 3 would reduce the response time by initial attack forces by allowing access to remote areas and breaking up large tracts of continuous vegetation.

TERRESTRIAL WILDLIFE

This Environmental Assessment hereby incorporates by reference the *Terrestrial Wildlife Specialist Report,* the *Terrestrial Wildlife Report – Supplement,* and the *Neotropical Migratory Birds Specialist Report* in the Project Record (40 CFR §1502.21). These reports are located in the *Project Analysis* section of the Project Record and contain the detailed data, methodologies, analyses, conclusions, maps, references, and technical documentation that the Wildlife specialist relied upon to reach the conclusions in this Environmental Assessment.

EXISTING CONDITIONS

LATE AND OLD STRUCTURE

OLD-GROWTH HABITAT

Old Growth units are identified in the Forest Plan as C1 – Dedicated Old Growth or C2 – Managed Old Growth. Old growth units were initially classified as suitable and/or capable habitat for a selected Forest indicator species. Units are to be maintained as old growth tree habitat for appropriate wildlife species (Forest Plan).

The analysis area does not contain any C2 – Managed Old Growth areas. However, there are two C1 – Dedicated Old Growth units on the south and east portion of the analysis area. These two units total 374 acres and are about one-half mile apart. Other C1 and old growth area occur several miles outside of the Bologna Analysis area and would not be affected by the proposed action.

Both C1 units are classified as "Pileated woodpecker Capable." However, these units would not be considered capable pileated woodpecker habitat because the vegetative composition is a dry forest type and pileated woodpeckers prefer moist forest types. In addition, the units do not meet the Forest-wide old growth standards for pileated woodpecker because the distance between the two units is greater than the recommended maximum 0.25 mile identified in the Forest Plan.

The C1-Dedicated old growth units within the analysis area would not be affected by the proposed action because the C1 units are outside the affected area (greater than 0.5 mile from the nearest harvest unit); and because of the distance from the proposed action, the current composition, structure, or function of the C1 units would not be altered. Therefore, no further analysis of the environmental effects will occur for the C1 management areas in the analysis area.

LATE AND OLD STRUCTURAL STAGES

The wildlife standards in the Regional Forester's Forest Plan Amendment #2 (1995) require the evaluation of late and old structural stages relative to the quantity of late and old structural stages within or outside the historical range of variability. For the purpose of this standard, late and old structural stages include old forest multi-strata and old forest single-stratum.

Late and old forest conditions consisting of old forest multi-strata and old forest single-stratum occupy about 42 percent the analysis area. As stated in the previous *Forest Vegetation* section, multi-strata old forest in the analysis area is about 9 percent above the historical range of variability (Table 17) and single-layer old forest is 2 percent below the historical range of variability (Table 17). Approximately eight stands covering about 275 acres of late and old structure would be affected by the proposed action. Other late and old structural stands in the analysis area would remain unaffected by proposed activities.

CONNECTIVITY

Other wildlife standards in the Regional Forester's Forest Plan Amendment #2 (1995) require late and old structural stands and Forest Plan old growth areas to be connected to each other in the watershed. For this standard, connective habitat does not necessarily need to meet the same description of suitable habitat, but provide "free movement" between late and old structural stands and old growth areas for a wildlife species associated with a late and old structural condition.

For the majority of the watershed, late and old structural stands and old growth areas are connected to each other with medium (9 to 14.9 inches diameter breast height) to large trees (greater than 14.9 inches diameter breast height), stands with variable widths greater than 400 feet and attached with 2 or more different connections. The least connected areas would include stands where the tussock moth infestation occurred, reducing stand density. Late and old structural habitat remains connected around the infested area. The proposed action would affect connectivity through the area.

DEAD WOOD HABITAT

DEAD STANDING TREES

As a result of the tussock moth infestation in the analysis area, dead standing trees (snags) occur as scattered singles, clumps, and/or patches in the affected area. Snag densities would be affected in stands proposed for treatment. Dead standing trees outside treated areas would remain unaffected by the proposed action.

The Umatilla Forest Plan established standards and guidelines for dead standing and downwood for various levels of biological potential in each management area. The plan was amended in 1995 by the Regional Forester's Forest Plan Amendment #2, also known as the "Eastside Screens." This amendment requires the retention of snags and green replacement trees greater than or equal to 21 inches diameter breast height (or the representative diameter of the overstory layer trees if they are less than 21 inches diameter breast height), at 100 percent potential population levels of primary cavity excavators (Thomas 1979). Based on the amended direction, "new" snag requirements and replacement tree objectives were developed for the five vegetative working groups on the Forest and documented in the memo, "*Interim Snag Guidance for Salvage Operation*" (Umatilla National Forest 1993). Only one of these working groups is applicable to this project – South Association. Table 29 compares the snag standard to the existing condition of the equivalent dry upland forest, based on vegetation plot data.

Based on recent stand exams in the affected area of the Bologna Basin analysis area, snag densities exceed Forest Plan standards in all diameter classes for the dry forest potential vegetation group/working group. In general, snag densities in the affected area are about six times higher than required in the Forest Plan

standard.

Table 29. Forest Plan Standards for Average Dead Standing Tree Density Compared with the Existing Condition in the Bologna Basin Affected Area.

Umatilla Forest Plan, Amended (1995)			**Bologna Basin Plot Data**		
Working Group	**Diameter Class Groups (Inches DBH)**	**Snag Density (#/acre)**	**Potential Vegetation Group**	**Diameter Class Groups (Inches DBH)**	**Snag Density (#/acre)**
South Association	≥ 10	2.25	Dry Upland Forest	≥ 10	12.6
	≥ 12	1.50		≥ 12	6.0
	≥ 20	0.14		≥ 20	0.7

More recently, the Decayed Wood Advisor (DecAid) by Mellen et al. (2003) has become available. This information source provides guidance to land managers evaluating effects of forest conditions and existing or proposed management activities on organisms that use snags, downwood, and other wood decay elements. DecAid is a statistical summary of empirical data from published research on wildlife and deadwood. Data provided in DecAid allows the user to relate the abundance of deadwood habitat for both snags and logs to the frequency of occurrence of selected wildlife species that require dead wood habitat for some part of their life cycle. This data is displayed at 30 percent, 50 percent, and 80 percent "tolerance level." Tolerance levels are estimates of all individuals in the population that value a particular parameter (e.g. snag density, snag diameter, downwood density, etc. (Mellen et al. 2003)). DecAid evaluations are best performed at the landscape, watershed, or larger scale. In this analysis, DecAid will be used to compare the current condition with each alternative for snag density.

For the DecAid evaluation, relative to Lower John Day River/Kahler Creek watershed, the ponderosa pine/Douglas-fir forest wildlife habitat type (Mellen et al. 2003) was selected because it is the dominant forest type in the project area and watershed. The small/medium/large structural condition class (Mellen et al. 2003) was selected because it represents the variety of structural stages affected in the proposed action. In addition, there is no difference in the cumulative species curves for snag density between the three structural stages. The pileated woodpecker and the white-headed woodpecker are the only two species identified on the cumulative species curve for snag density for this habitat type and structural condition. The white-headed woodpecker will be used for the comparison because it is a better representative of the dry forest type in the project area than the pileated woodpecker.

Snag densities were derived from current vegetation survey data for the dry upland forest potential vegetation group and compared to the white-headed

woodpecker cumulative species curves for snag density in DecAid in the Lower John Day River/ Kahler Creek watershed. Estimates for snag densities exceeded the 80 percent tolerance level for the white-headed woodpecker in the greater than or equal to 10-inch (9.85 inch) diameter group when compared with the DecAid cumulative species curves for snag density. For the greater than or equal to 20-inch (19.7 inch) diameter group, the snag density occurred between the 30 percent and 50 percent tolerance levels for the white-headed woodpecker (Table 30).

Table 30. DecAid Tolerance Levels for the White-headed Woodpecker in the Ponderosa pine/Douglas-fir Forest

	Snag Density (#/acre)[1]			
Diameter Group	**DecAid Tolerance Levels**			**CVS Data**
(Inches DBH)	**30%**	**50%**	**80%**	**Lower John Day River/Kahler Creek**
≥ 10	0.3	1.7	3.7	10.3
≥ 20	0.5	1.8	3.8	1.0

[1] For the small/medium/large trees structural condition class and snag density data from current vegetation survey inventories in the Lower John Day River/Kahler Creek watershed

SNAG REPLACEMENT TREES

As a result of the tussock moth outbreak in the analysis area, green/live trees do occur throughout the analysis area, but are more scattered and form dense patches in the affected area. Based on recent stand exams within the affected area of the Bologna Basin analysis area, replacement trees (green/live) exceed Forest Plan (Amended 1995) objectives in all diameter classes for the dry forest potential vegetation group/working group (Table 31). Overall, snag replacement trees in the affected area are about three-times higher than required in the Forest Plan. Live/green replacement trees would be affected in stands proposed for treatment. Snag replacement trees outside treatment area would remain unaffected by the proposed action.

Table 31. Average Snag Replacement (green/live) Tree Density for the Affected Area in the Bologna Basin Analysis Area.

Umatilla Forest Plan (Amended 1995)			Bologna Basin Affected Area		
Working Group	Diameter Groups (Inches DBH)	Snag Density (#/acre)	Potential Vegetation Group	Diameter Groups (Inches DBH)	Snag Density (#/acre)
South Association	≥ 10	22.8	Dry Upland Forest	≥ 10	74.1
	≥ 12	15.3		≥ 12	48.7
	≥ 20	1.7		≥ 20	7.7

DEAD DOWNWOOD

Downwood densities will not be compared to DecAid because "no wildlife data on downwood cover is available for the wildlife habitat type and structural condition class" (Mellen et al. 2003) used for this evaluation. Table 32 compares the downwood standard to the existing condition of the equivalent dry upland forest, based on current vegetation survey data.

Table 32. Forest Plan Standards for Dead Downwood (logs) Density Compared with the Dead Downwood Density in the Lower John Day River/Kahler Creek Watershed

Umatilla Forest Plan, Amended (1995)			CVS[1] Data in the Lower John Day River/Kahler Creek Watershed		
Species Group	Minimum Log Size Criteria	Downwood Density (pcs per acre)	Potential Vegetation Group	Minimum Log Size Criteria	Downwood Density (pcs per acre)
Ponderosa Pine	Small end Diameter ≥12 inches Piece Length ≥ 6 feet Total Length 20-40 feet	3 to 6	Dry Upland Forest	Small end Diameter ≥12 inches Piece Length ≥ 6 feet Total Length 20-40 feet	8

[1] Current Vegetation Survey last updated in 1999.

Dead downwood is dependent on disturbances creating snags, and snags subsequently falling to the ground. Downwood would remain on site until it decomposes or is burned up in a wildfire, resulting in a reduction of downwood until snag fall occurs again. As a result of the tussock moth infestation in the analysis area, downwood occurs as scattered individuals, clusters, or piles within the affected area. Stand exams conducted in the affected area did not record

downwood data. For this analysis current vegetation survey data was used to provide information on downwood in the Bologna Basin analysis area and across the watershed. When compared to the Forest Plan standard (Amended 1995) for downwood density, current estimates, at the watershed scale, exceed the Forest Plan standard for the dry forest potential vegetation group/species group by 2 to 5 pieces per acre (Table 32). Dead downwood would be affected in stands proposed for treatment and downwood outside treated areas would remain unaffected by the proposed action.

MANAGEMENT INDICATOR SPECIES

The Forest Plan designates Management Indicator Species to represent larger groups of animals associated with the major habitat types on the Forest. Habitat conditions for management indicator species, as well as for all other wildlife species on the Forest, must be managed to maintain viable populations (Forest Plan, p. 2-9). Rocky Mountain elk and primary cavity excavators are the Management Indicator Species that inhabit the analysis area. Although the pileated woodpecker, three-toed woodpecker, and pine marten are designated in the Forest Plan as Management Indicator Species, preferred habitat for these species does not occur in the Bologna Basin analysis area. Therefore, no analysis of environmental effects to these species will be performed.

ROCKY MOUNTAIN ELK

The Monument Winter Range is the largest winter range (about 59,800 acres) on the Forest. It generally occurs on the southern portion of the Heppner Ranger District from Tamarack Creek to east of Potamus Creek. Most of the Bologna Basin analysis area (42 percent) consists of Management Area C3 – Big Game Winter Range and is part of the Monument Winter Range. The evaluation criteria used to measure impacts to elk and their habitat are total cover, satisfactory cover, forage, and habitat effectiveness index. Open road density will be evaluated as a component of habitat effectiveness index. These evaluation criteria are measured and compared within the individual winter range (Forest Plan, 4-152).

Management activities are not proposed in the C1 and C5 management areas; therefore elk habitat would remain unchanged by the proposed action and Forest Plan standards and guidelines for elk in these management areas will not be addressed further

Management activities would occur in the E1 management area. Currently, satisfactory cover is 11 percent, total cover is 78 percent, and the habitat effectiveness index is 61. The existing condition for the habitat effectiveness index is above the Forest Plan standard of 30 (Forest Plan 4-179). The habitat effectiveness index for E1 remains at 61 even after any of the alternatives are implemented and far above the Forest Plan standard for that management area. Therefore, cover and habitat effectiveness for elk in E1 management area of the Bologna Basin analysis area will not be discussed further.

Currently, in the Monument Winter Range, satisfactory cover is 15 percent and total cover is 44 percent of the area. There are approximately 47 miles of open road in the winter range, resulting in an open road density of 0.5 miles per square mile for the area during the winter use period. The C3 management area does not prohibit road construction. Some roads would remain open in winter if they are needed as through routes or to access private lands.

"The big game habitat effectiveness model (Forest Plan, Appendix C) was used to predict the influence of forest management on elk and other big game species. The model is biologically based using the distribution of cover-forage; cover quality and road factors to help indicate how effective an area will be in supporting big game. The assumption made was that potential big game populations were proportional to the habitat effectiveness index for elk and deer. It was intended to be a relative measure of effectiveness, and does not consider many factors (such as weather, predations, diseases, hunters, harvest, etc.) that would influence the "actual number" of elk (or other wildlife species) found on an area." (Forest Plan EIS, page IV-71)

An analysis of habitat effectiveness index was conducted for the Monument Winter Range. The current habitat effectiveness index value for the winter range is 67. This value is the result of cover-forage not well distributed across the C3 Monument Winter Range, the low natural potential of the warm-dry ponderosa pine cover type to sustain satisfactory cover in the long-term across the winter range, and 47 miles of open road.

The habitat effectiveness value of 67 (existing condition) is not consistent with the Forest Plan standard which states

> *"Elk habitat will be managed on designated big game winter ranges to achieve a habitat effectiveness index of no less than 70, including discounts for roads open to motorized vehicular traffic as described in Wildlife Habitats in Managed Forest (*Thomas and others 1979*). The habitat effectiveness standard will be managed on an individual winter range basis."*

A need to re-evaluate the habitat effectiveness model and habitat index values in the forest plan has been raised as part of the Bologna Basin analysis. Although these issues could be analyzed in an amendment process, this approach was not carried forward because the forest plan revision process started in October 2003, and conducting two parallel processes is not practical. This potential need for change has been forwarded to the team responsible for revising the Forest Plan. During plan revision, management direction for habitat effectiveness index in the current plan will be validated, management direction no longer relevant will be deleted, and new management direction will be added to form a balanced management strategy for the next planning period.

The State of Oregon manages a herd of approximately 200 to 300 elk that winter in the Bologna Basin area. Currently, the big game populations and management objectives set by the State of Oregon for the Heppner Wildlife Unit, including Monument Winter Range, are being met (Pers. Com. Russ Morgan,

ODFW). In addition, forest recreation objectives for the C3 management area are being met.

PRIMARY CAVITY EXCAVATORS

This category refers to 15 bird species on the Umatilla National Forest that create holes for nesting or roosting in live, dead, or decaying trees. Secondary cavity users such as owls, bluebirds, and flying squirrels may use cavities later for denning, roosting, and/or nesting. With the dry forest types dominating the Bologna analysis area and the limited amount of moist forest types, 11 of the 15 primary cavity excavators have the potential to occur in the analysis area (Table 33). These species are listed along with their preferred habitat type.

Table 33. Primary Cavity Excavators in the Bologna Basin Analysis Area

Common Name	Habitat Community[1, 2]	Nest Tree Size[2]
Lewis' woodpecker	Ponderosa pine, riparian cottonwood, oak woodland, and burned stands.	13"– 43" DBH.
Red-napped sapsucker	Riparian cottonwood, aspen, conifer forests. Mid-high elevations.	11" DBH. Avg.
Williamson's sapsucker	Mid-high elevation mature or old conifer forests (ponderosa pine, fir, lodgepole pine, etc.) with large dead trees present.	27" DBH. Avg.
Downy woodpecker	Riparian cottonwood, willow, aspen, mixed deciduous, and mixed-conifer.	8" DBH. Min.
Hairy woodpecker	Mixed conifer, ponderosa pine, and adjacent deciduous stands.	17" DBH. Avg.
White-headed woodpecker	Open ponderosa pine or mixed conifer, dominated by ponderosa pine.	26" DBH. Avg.
Northern flicker	All forest types with older open forests and edges adjacent to open country.	22" DBH. Avg.
Mountain chickadee	Open canopy, ponderosa pine, lodgepole pine and other conifer forests.	4" DBH. Min.
Red-breasted nuthatch	Coniferous forests with mid to late seral stages.	12" DBH. Min.
White-breasted nuthatch	Mature ponderosa pine and mixed-conifer forest. Oak woodlands	12" DBH. Min.
Pygmy nuthatch	Mature to old ponderosa pine or mixed conifer with ponderosa dominant.	12" DBH. Min.

[1] Based on Johnson and O'Neil 2001.

[2] From Thomas 1979, Ehrlich et al.1988, Degraaf 1991, and Marshall et al.2003.

Primarily, habitat for primary cavity excavators consists of dead and/or dying

trees in various size classes. Primary habitat can occur in a variety of vegetative communities with various structural conditions (Thomas 1979). In general, existing and potential habitat can be found throughout the analysis area, except for non-forest areas and forest stands in the process of regeneration (stand initiation and stem exclusion). Habitat for primary cavity excavators will be evaluated in the *Dead Wood Habitat* section under *Dead Standing Trees*. Dead standing trees retained in the affected area would provide habitat for primary cavity excavators

THREATENED, ENDANGERED, PROPOSED, AND SENSITIVE SPECIES

Federally "listed" species include those identified as Endangered, Threatened, Proposed, or Candidate species by the U.S. Fish and Wildlife Service (1999 and 2001). "Sensitive" species are those identified on the Regional Forester's (R6) Sensitive Animal List (USDA 2000) that meets National Forest Management Act obligations and requirements. Sensitive species addressed on the Umatilla National Forest include those that have been documented or suspected (likely to occur, based on available habitat to support breeding pairs/groups) and occurring within or adjacent to Forest boundary. Based on District records, surveys, and monitoring, as well as published literature about the distribution and habitat use, Table 34 identifies the federally listed species that may be present and the regionally sensitive species with the potential to occur in the analysis area.

Table 34. Status of Threatened and Sensitive Species in Bologna Basin

Species	U.S Fish and Wildlife Service	Regional Forester's Sensitive Animals	Umatilla NF Occurrence[1]
Northern Bald Eagle *Haliaeetus leucocephalus*	Threatened		D
Gray flycatcher *Empidonax wrightii*	-	Sensitive	S
Gray wolf *Canis lupus*	Threatened		S

[1] S = Suspected

D = Documented through valid, recorded observation

Other listed or sensitive species may occur on the Umatilla National Forest but have never been observed in the analysis area and their preferred habitat does not exist in the analysis area. These species include:

- Painted turtle (sensitive)
- Peregrine falcon (sensitive)
- Upland sandpiper (sensitive)

- Yellow-billed cuckoo (Candidate and sensitive)
- California wolverine (sensitive)
- Canada lynx (Threatened)
- Rocky Mountain bighorn sheep (sensitive)

None of these species would be affected by the proposed activities or alternatives. Therefore no further analysis of the environmental effects on these species will be performed.

NORTHERN BALD EAGLE (THREATENED)

An active bald eagle nest (Dry Creek bald eagle nest site) was found in May 1994, south of the Ant Hill Lookout (Figure 14) outside the analysis area. This is the only known active northern bald eagle nest on the Umatilla National Forest, and is one of three known recently occupied bald eagle nest sites in the Blue Mountains. Wintering bald eagles are observed within the analysis area typically from December through mid-March each year. Suitable nesting and foraging habitat for the northern bald eagle is present in the analysis area (Anthony and Issaacs 1981). The North Fork John Day River is within easy access and could provide additional feeding and nesting habitat for eagles (Anthony et al. 1982).

The U.S. Fish and Wildlife Service approved a Site-Specific Management Plan for the Dry Creek Bald Eagle Nest in December of 1999. This management plan allows harvest activity as close as 0.5 mile from this nest site. For more information on the bald eagle and the nest site see the Site-Specific Management Plan for the Dry Creek Bald Eagle Nest Site (USDA Forest Service 1999).

GRAY FLYCATCHER (SENSITIVE)

Although the habitat characteristics offer potential for the species, the gray flycatcher has not been observed in the analysis area or documented on the District (see Project Record, *Wildlife Supplement*).

GRAY WOLF (THREATENED)

Habitat for this species does occur throughout the Umatilla National Forest and within the analysis area. Habitat quality is considered good because of the low open road densities and moderate ungulate population. Openings for potential natal dens or rendezvous sites occur throughout the analysis area.

Gray wolf could occur in the Bologna Basin area, although use has not been documented. Previously, a collared wolf from the experimental, non-essential Idaho population traveled to the Blue Mountains and stayed until she was captured and returned to Idaho (Cody 1999). A second gray wolf was found dead on Interstate 84 near Baker City. Another wolf was killed in October 2000, north of Ukiah. It is probable that suitable habitat for wolves occurs on the Forest.

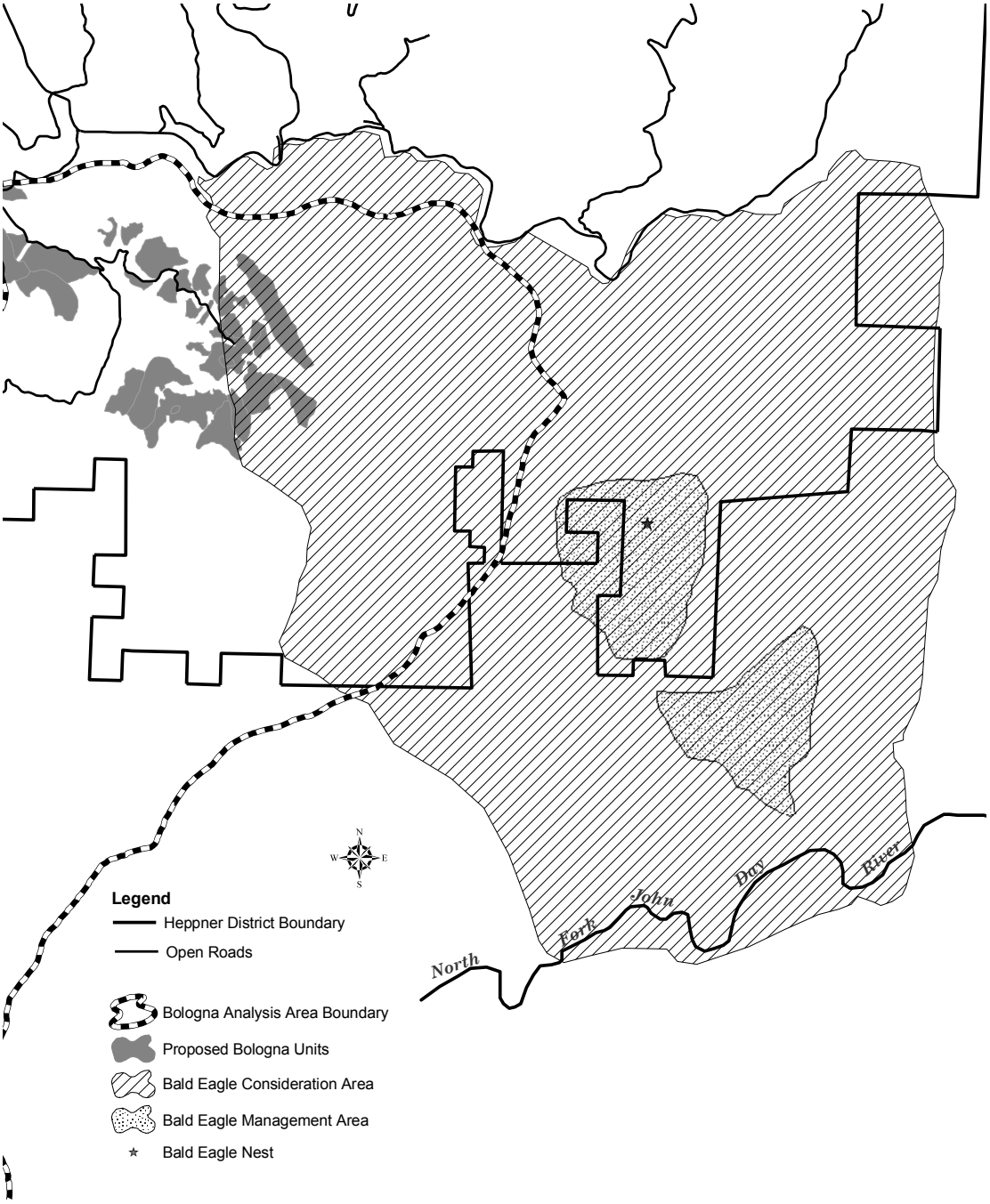

Figure 14. Dry Creek Bald Eagle Management Area

SPECIES OF INTEREST

These are species that are "of interest" to the public at the local or regional level, or have been identified as a species of concern by the Fish and Wildlife Service. Many of these species are considered uncommon or their status is unknown in the Pacific Northwest. Table 35 lists the species of interest that could occur based on observations or potential habitat in the analysis area. Habitat requirement and current populations for some of these species are described below.

Table 35. Species of Interest in Bologna Basin

Common Name	Generic Name	Oregon Status (1998)
Northern Goshawk	*Accipiter gentilis*	Sensitive
Olive-sided flycatcher	*Contopus cooperi*	Sensitive
Long-eared myotis	*Myotis evotis*	Sensitive
Long-legged myotis	*Myotis volans*	Sensitive
Yuma myotis	*Myotis yumanensis*	Sensitive

NORTHERN GOSHAWK

Preferred habitat for the goshawk consists of coniferous forests with a mosaic of structural stages. Nesting sites typically consist of a dense cluster of large trees, surrounded by a similar forest type with a more open overstory. The understory is relatively open and the nest site is generally situated within 0.25 mile of a stream or other water source. The best foraging habitat occurs in a mosaic of structural stages scattered across the landscape.

Potential Habitat for the goshawk occurs throughout the analysis area. Nest stands have not been observed in the project area or in affected stands. Nesting habitat is considered unsuitable because of the recent tussock moth outbreak resulted in an abundance of dead trees and fewer green trees for a nest site. The project area and affected stands remain suitable for foraging because the area provides a mosaic of structural stages, creating microhabitats for prey species. The northern goshawk has been observed in the Bologna analysis area (Heppner Ranger District Wildlife Database). However, a nest site has not been found in the analysis area.

OLIVE-SIDED FLYCATCHER

Although the olive-sided flycatcher is a species of interest that occurs on the Umatilla National Forest, this species would not be affected by the proposed activities because preferred habitat does not occur in the affected area. Habitat does occur in riparian corridors adjacent to affected areas but no activities are proposed in riparian corridors. In addition, the species has not been observed in the analysis area. Therefore, no further analysis of environmental effects will occur for the olive-sided flycatcher.

BATS OF INTEREST

Bats associated with cave or cave like dwellings (mines, buildings, etc.) for hibernation or roosting (maternity or day/night roost) are not included in this assessment because the surrounding area does not provide this key habitat feature. Available habitat for bats in the analysis area includes dry forest types that may be associated with water. Forest dwelling bats often use large-diameter snags and trees as roosts. The following species will be assessed as a group and not individually: long-eared myotis, long-legged myotis, and Yuma myotis.

With the current condition of the analysis area, potential roost habitat (large-diameter snags and trees) for forest bats occurs within the project area and affected stands. In general, bats have not been specifically surveyed (with mist-nets or bat detection devices) within the analysis area. Although some bats may be more rare in the Blue Mountains than others, some species have the potential to occur in the project area. For example, Whitaker et al. (1981 a:285) considered the long-eared bat to be "the most abundant bat in northeastern Oregon forests." While the Yuma myotis was considered "exceeding scarce" in eastern Oregon (Whitaker et al. 1981a:282).

NEOTROPICAL MIGRATORY BIRDS

Neotropical migratory birds are those that breed in the U.S. and winter south of the border in Central and South America. Continental and local declines in population trends for migratory and resident landbirds have developed into an international concern. Partners in Flight (PIF) led an effort to complete a series of Bird Conservation Plans for the entire continental United States to address declining population trends in migratory landbirds. The primary goal of Partners in Flight Landbird Conservation Planning is to ensure long-term maintenance of healthy populations of native landbirds. Partners in Flight Conservation Planning provides the framework to develop and implement landbird conservation strategies by recommending conservation actions on the ground that may prevent the need for future listings. These plans include priority setting, establishment of objectives, necessary conservation actions, and evaluation criteria necessary for bird conservation in the western hemisphere.

The Partners in Flight Bird Conservation Plan is used to address the requirements contained in Executive Order (EO) 13186 (January 10, 2001), *Responsibilities of Federal Agencies to Protect Migratory Birds*. Under Section 3(E)(6), through the National Environmental Policy Act, the Executive Order requires that agencies evaluate the effects of proposed actions on migratory birds, especially species of concern. Partners in Flight Conservation Planning allows the analysis of effects of proposed projects on neotropical migratory birds through the use of guidelines for priority habitats and bird species of concern for each planning unit. The conservation strategy does not directly address all landbird species of concern, but instead uses "focal" species as indicators to describe the conservation objectives, and measures project effects in different "priority" habitats for the avian communities found in the planning unit. The

conservation strategy identifies "priority" habitats and "focal" species for each planning unit in the nation. The Umatilla National Forest occurs in the Northern Rocky Mountain Landbird Conservation Planning Region, which includes the Blue Mountains sub-region and the Blue Mountains sub-province. Conservation planning for the Blue Mountains, Ochoco Mountains, and Wallowa Mountains sub-provinces is addressed in the *Conservation Strategy for Landbirds* in the Northern Rocky Mountains of Eastern Oregon and Washington (Altman 2000), hereafter referred in this section as the Strategy.

The Strategy discusses the migratory and landbird species of concern for the Northern Rocky Mountain Region and the Blue Mountain sub province. "Focal" species were selected and used to represent species of concern and priority habitats identified in the Strategy. Table 36 identifies priority habitat, habitat features, and focal species identified in the Strategy (Altman 2000).

Table 36. Priority Habitat Features and Associated Landbird Species for Conservation in the Northern Rocky Mountain Landbird Conservation Region of Oregon and Washington (Altman 2000)

Habitat Type	**Habitat Feature/Conservation Focus**	**Focal Species**
Dry Forest	Large patches of old forest with large trees and snags	White-headed woodpecker
	Old forest with interspersion of grassy openings and dense thickets	Flammulated owl
	Open understory with regenerating pines	Chipping sparrow
	Large patches of old forest with large trees and snags	White-headed woodpecker
Mesic Mixed Conifer	Large snags	Vaux's swift
	Overstory canopy closure	Townsend's warbler
	Structurally diverse; multi-layered	Varied thrush
	Dense shrub layer in forest openings or understory	MacGillivray's warbler
	Edges and openings created by wildfire	Olive-sided flycatcher
Riparian Woodland	Large snags	Lewis' woodpecker
	Canopy foliage and structure	Red-eyed vireo
	Understory foliage and structure	Veery
Riparian Shrub	Willow/alder shrub patches	Willow flycatcher
Subalpine Forest	Subalpine Forest	Hermit thrush
Montane Meadow	Wet/dry meadows	Upland sandpiper
Steppe Shrublands	Steppe shrublands	Vesper sparrow

Habitat types and features will be used to evaluate effects of the proposed

actions on migratory and landbird species. Those habitat types affected by the proposed action in the Bologna analysis area include Dry forest and Riparian shrub. The remaining habitat types would not be affected because those habitat types do not occur in or adjacent to stands proposed for treatment. Therefore, stand structure or composition would not be altered by the proposed actions. No further analysis of the environmental effects will occur for the mesic mixed conifer, riparian woodland, subalpine fir forest, montane meadow, steppe shrublands, aspen, and alpine habitat types.

DRY FOREST HABITAT

This habitat type includes coniferous forest composed exclusively of ponderosa pine or dry stands co-dominated by ponderosa pine and Douglas fir and/or grand fir (Altman 2000). Dry forest habitat generally occurs throughout the analysis area and would be specifically affected by the proposed actions. Habitat criteria for the dry type include old forest single-stratum stands, a mosaic of forest structural stages, openings, and burned areas. Forest Plan Standards and Guidelines call for snags with 0.7 to 20 inches diameter breast height, and 350-acre patches of old forest single-stratum connected to another old forest single-stratum patch. The habitat criteria listed here summarizes the biological objectives in Altman (2000) for the focal species representing the dry forest habitat type.

In general, the project area meets the dry forest habitat criteria. The late and old forest condition, old forest single-stratum, is two percent below the historical range of variability (Table 17) in the analysis area. Currently, old forest single-stratum stands are not affected by the proposed action, but eight stands of old forest multi-strata would be affected by the proposed action. As a result of the recent tussock moth outbreak, the old forest stands in the project area have increased snag levels and very little structural diversity (mosaic). Patch size exceeds 350 acres and is connected to other late old structure stands in the analysis area (see *Late and Old Structural Stages* section). Potential habitat for the white-headed woodpecker, flammulated owl, chipping sparrow, and Lewis' woodpecker occurs in scattered locations throughout the analysis area. All four species have been observed on the District. However, the white-headed woodpecker, flammulated owl, and Lewis' woodpecker are seen infrequently. The chipping sparrow is observed more often. These species have not been documented but could occur, based on the vegetative composition and structure in the project area.

RIPARIAN SHRUB HABITAT

This habitat type includes riparian shrubs (willow, alder, etc.) that occur along bodies of water (e.g. streamside, lakeside) or in association with wet meadows and wetlands (Altman 2000). The riparian habitat type generally occurs along creeks and streams in the analysis area and may occur adjacent to or within proposed actions. Riparian shrub habitat in the project area is more than 0.6 mile from residential areas and greater than 3 miles from high use cowbird areas.

Habitat criteria for the riparian shrub type includes shrubs occupying greater than 40 percent of the site, shrub cover interspersed with open (herbaceous) areas, tree cover less than 30 percent, and patch size greater than 5 acres in size. The habitat criteria listed here summarizes the biological objectives in Altman (2000) for the focal species representing the riparian shrub habitat type.

In general, the project area meets the riparian shrub habitat criteria mentioned above. Along streams and creeks in the affected area, shrub cover occurs in scattered clumps, occupying less than 50 percent of the area. Shrubs are intermixed with open areas. As a result of the recent tussock moth outbreak, tree cover has decreased to less than 40 percent of the area in some locations; in other locations it is greater than 40 percent. Generally, patch size is greater than 2 acres in size. Potential habitat for the willow flycatcher occurs along streams at scattered locations throughout the analysis area. The flycatcher has not been documented but could occur, based on the vegetative composition and structure in the analysis area.

ENVIRONMENTAL EFFECTS

The quantity and quality of wildlife habitat was assessed using aerial photographs, district records, and field reconnaissance. Where quantitative information is available, it is presented.

ALTERNATIVE 1: NO ACTION

LATE AND OLD STRUCTURE

LATE AND OLD STRUCTURAL STAGES

In the short term, late and old structure would continue to occupy 42 percent of the analysis area. However, single-layer old forest would remain below the historical range of variability and multi-layered old forest would remain above the historical range of variability. Indirectly, the amount of late and old structure would change over time. With the existing management direction, including fire suppression, late and old structure stands in the project area would continue to grow into a multistory structure, including old forest single-stratum stands. This multi-layer condition would increase the stand density, making the stands increasingly susceptible to high-intensity wildfires and susceptible to insect or disease outbreaks. A major disturbance on the landscape would change the composition and structure to an open shrubland/grassland with little or no tree cover. This would result in fewer to no late and old structure stands in the project area. In particular old forest single-stratum would be below the historical range of variability and old forest multi-strata would be within, but no longer above, the historical range of variability.

CONNECTIVITY

In the short term, late and old structure stands and old growth stands would remain connected across the landscape and within the project area with medium

to large trees, corridor widths greater than 400 feet, and late and old structure stands connected by two or more corridors. Indirectly, current connectivity to late and old structure stands in the project area would change over time. With the existing management direction including fire suppression, stands in the project area would continue to grow into denser multi-layered stands. This condition would increase the susceptibility to wildfire and insect or disease outbreaks. A major disturbance on the landscape would change the composition and structure to an open shrubland/grassland with little or no tree cover. As a result, late and old structure and old growth stands outside the project area could be disconnected from other late and old structure stands in the analysis area and/or watershed. This would limit "free" movement between late and old structure and old growth stands for wildlife species associated with a late and old structure conditions in the analysis area.

DEAD WOOD HABITAT

DEAD STANDING TREES

Within the next three to five years, dead standing trees (snags) would continue to occupy the project area at current densities and size classes. With the existing management direction including fire suppression, snags would eventually fall and change the density within the project area. Numerous factors influence the length of time snags remain standing on a site, including weather events, diameter, tree species, height, aspect, slope, elevation, and soil type/moisture (Bull et al. 1997). Diameter is one of the most important factors that influence snag fall rates. Typically, large diameter snags (greater than or equal to 20 inches diameter breast height) stand longer on a site then small diameter snags (Bull et al. 1997). This is attributed to decay moving through the sapwood quicker than the heartwood, and small diameter trees generally have a higher proportion of sapwood than heartwood. Another important factor with regards to utilization and longevity is tree species. Typically, ponderosa pine and Douglas-fir are favored by cavity excavators and tend to stand longer on dry sites (Bull et al.1997)

Based on a snag study (Bull and Partridge 1986) in northeast Oregon with a similar tree species composition, 50 percent of the snags less than 20 inches in diameter would be expected to fall within 6 years and 50 percent of the snags greater than 20 inches diameter breast height would fall within 9 years in the affected area. Without recruitment, within 10 years the snag density in the affected area would be 50 percent less than the current estimate. That would be approximately 6.3 snags per acre greater than or equal to 10 inches diameter breast height, 3.0 snags per acre greater than or equal to 12 inches diameter breast height, and 0.3 snags per acre greater than or equal to 20 inches diameter breast height. Even with an additional 50 percent falling in the 10-inch and 12-inch diameter class, densities would exceed Forest Plan standards in all three size classes. Assuming some recruitment would occur, snag density could be slightly greater than the estimated 50 percent level and remain above Forest Plan standards for dead standing trees.

Beyond the next 10-year period, snag densities in the affected area would continue to decline, especially in the 10-inch and 12-inch size classes. Snags greater than or equal to 20 inches diameter breast height would persist longer on the site than the smaller size classes. With the continued amount of snag fall occurring on the site, the dead downwood component would increase. With an increasing downwood density, the susceptibility to a wildfire event would increase on the site. Depending on the intensity and severity of the fire, this would reduce or even eliminate snags currently occupying the site. However, snags resulting from a wildfire would most likely be sufficient to meet Forest Plan standards based on the size and density of live trees on the site prior to the fire. However, many of the newer snags would be fire hardened and not available to most cavity excavators until they begin to decay and soften up, about two to three years after the fire. The project area at some point in time, especially after a series of wildfires, would be below the Forest Plan standard for dead standing trees.

At the watershed scale, dead standing trees would continue to occur at current densities and size classes for the next three to five years. When compared to white-headed woodpecker cumulative species curves in DecAid for this habitat type and structural condition, densities would continue to exceed the 80 percent tolerance level for the white-headed woodpecker in the 10-inch group and remain between the 30 percent and 50 percent tolerance levels for the 20-inch group. With the existing management direction including fire suppression, snag densities would have the potential to increase across the watershed within the next five to ten years. The potential increase would result from increasing tree mortality from insect and disease infestation from live trees within the denser patches of conifers not previously thinned by the tussock moth outbreak. In addition, as a result of the current tree density, composition, and structure, the watershed would remain susceptible to wildfire. Depending on the size and severity of the next major disturbance, snag density would increase temporarily (for more than 10 years) in the watershed and then fall back to "normal" levels maintained by the "natural" mortality of green trees. The resulting high snag density in the watershed would exceed the 80 percent tolerance level for the white-headed woodpecker in the 10-inch group and most likely exceed the 50 percent tolerance levels for the 20-inch group.

SNAG REPLACEMENT TREES

Within the next three years, green/live trees would remain available for recruitment into the snag population. Snag replacement trees (live/green) would continue to occupy the project area near current densities and size classes, exceeding Forest Plan objectives. With the existing management direction including fire suppression, mortality among live trees would continue within the denser patches of conifers not previously thinned by the tussock moth outbreak. Denser patches of conifers in the affected area remain susceptible to insect and disease outbreaks. Therefore, beyond the next three to five years, the availability of replacement trees is expected to decrease. However, current densities of green trees in the affected area would need to decline approximately 60 percent to fall below Forest Plan objectives for replacement trees. Given

sufficient time, this would most likely occur as a result of a wildfire with the current composition and structure in the affected area. Depending on the intensity and severity of the fire, this would reduce or even eliminate green replacement trees currently occupying the site. After a severe fire event, it would take in excess of 80 years to regain sufficient quantities of replacement trees, in all size classes, to meet the Forest Plan objectives again.

DEAD DOWNWOOD

Over the next three to five years, dead downwood would continue to occupy the watershed near the current density of eight pieces per acre, well above the Forest Plan standard. Over the next ten years, falling snags would be the primary source of downwood habitat, maintaining or slightly increasing downwood densities across the watershed and the Bologna Basin analysis area. With the existing management direction including fire suppression, stands in the analysis area would continue to grow into denser multi-layered stands. Eventually, tree vigor would decrease and trees would become stressed, increasing their susceptibility to insects and disease. As a result, tree mortality would increase in the smaller to medium (10-inch to 12-inch) size classes. Within 6 years, snags would fall, maintaining downwood levels above the Forest Plan standard of 3 to 6 pieces per acre in the analysis area and the watershed. Increases in downwood density would also increase fuel loading at the site and the susceptibility of the site to wildfire. Typically, a wildfire would eventually increase the amount of downwood in the affected area after snag fall. After a series of major disturbances on the site, downwood densities would eventually fall below the Forest Plan standard. Replacement could take up to eighty years to develop replacement trees greater than 12 inches diameter breast height.

MANAGEMENT INDICATOR SPECIES

ROCKY MOUNTAIN ELK

In the short term, elk habitat would remain unchanged (Table 37). Over time, with the existing management direction including fire suppression, stands would continue to grow and develop into a multistory structure, increasing the amount of total cover above 30 percent and satisfactory cover above 15 percent. Generally, stands would shift from forage to cover and marginal cover to satisfactory cover. Overall, elk habitat effectiveness index would remain near 67 or decrease slightly for the Monument Winter Range because patches of forage would, over time, become cover, reducing the distribution of cover-forage.

In the long-term, the increase in cover and multi-layer condition would increase the areas susceptible to higher intensity wildland fires and insect or disease outbreaks. A disturbance event similar to the Wheeler Point fire in 1996 (22,000 acres) and the Monument Complex fire in 2001 (32,000 acres) is likely given Bologna Basin has similar vegetative conditions. The severity of effects observed following those events shifted cover habitat to forage habitat, resulting in a reduction of total cover below 30 percent and satisfactory cover below 10 percent for the Monument Winter Range. If a similar event occurs in the Bologna

Basin area the habitat effectiveness index for the Monument Winter Range would likely be less than 67 because of the reduction of cover (satisfactory and total) and the increase in forage.

The open road density in the Monument Winter Range during the winter use period would remain at 0.5 miles per square mile. With the current management direction the road density is not expected to change.

Table 37. Effects of Alternatives on Big Game Habitat within the Bologna Basin Analysis Area.

Habitat Parameter	Forest Plan Standard[1]	Alternative 1	Alternative 2	Alternative 3
Satisfactory Cover (%)	≥10	15	15	15
Total Cover (%)	≥30	44	44	44
Habitat Effectiveness Index	≥70	67	67	67

[1] For C3 – Big Game Winter Range management area

THREATENED, ENDANGERED, PROPOSED, CANDIDATE, AND SENSITIVE SPECIES

NORTHERN BALD EAGLE (THREATENED)

The bald eagle would not be directly affected by current management direction because the Site Specific Management Plan for the Dry Creek Nest Site (Van Winkle 1999) provides guidance for successful eagle occupation and nesting in the Bald Eagle Consideration Area. Indirectly, nesting habitat in the Bald Eagle Consideration Area would change. Over time, stands in the Bald Eagle Consideration Area would continue to grow and develop into a multistory old forest stands, maintaining or slightly increasing the amount of potential nesting habitat in the Bald Eagle Consideration Area. However, the multi-layer condition would increase stand density, making stands increasingly susceptible to high-intensity wildfires and susceptible to insects and disease outbreaks. A major disturbance in the Bald Eagle Consideration Area, such as the Wheeler Point Fire or Monument Fire, would change the large tree composition and structure, reducing potential nesting habitat in the Bald Eagle Consideration Area.

GRAY FLYCATCHER (SENSITIVE)

The gray flycatcher would not be directly affected by current management direction in the analysis area because the species is not known to occur in the analysis area. Indirectly, potential flycatcher habitat (open ponderosa pine with a shrub understory) in the project area would remain unchanged for the short term. Over time, stands in the project area would continue to grow and develop into dense multistory stands. The understory would primarily consist of grand fir and Douglas-fir tree species. These tree species would out compete shrub species. As a result, habitat in the project area would slowly become unsuitable. The multi-layer condition would increase the susceptibility of stands to high-intensity

wildfires and insect or disease outbreaks. A major disturbance on the landscape would change the composition and structure to an open shrubland with little or no tree cover. This would result in unsuitable habitat for the gray flycatcher.

GRAY WOLF (THREATENED)

The gray wolf would not be directly affected by current management direction in the analysis area because the species is not known to occur in the analysis area. Indirectly, open road density in the analysis area is expected to remain at 0.5 miles per square mile in the Monument Winter Range. Openings for potential natal dens or rendezvous sites over time may experience some conifer encroachment but not enough to significantly reduce the overall size of the opening in the analysis area.

SPECIES OF "INTEREST"

NORTHERN GOSHAWK

The goshawk would not be directly affected by current management direction because nest sites have not been observed in the project area or analysis area. In addition, unknown nest sites and foraging habitat would remain unchanged. Indirectly, habitat in the project area would remain unchanged for the short term. Over time, stands in the project area would continue to grow and develop into dense multistory stands. As a result, nesting habitat would essentially remain unchanged because of the continued presence of large diameter trees. However, foraging habitat would be reduced as the area grows denser and more homogenous, resulting in fewer microhabitats for prey species. The multi-layer condition would increase the susceptibility of stands to high-intensity wildfires and insect or disease outbreaks. A major disturbance on the landscape would change the composition and structure to an open shrubland/grassland with little or no tree cover. This would result in fewer large trees or no large tree habitat in the project area for potential nest sites. Foraging habitat would be limited along the edges of the project area or other locations in the analysis area.

BATS

The forest bats of interest (long-eared myotis, long-legged myotis and Yuma myotis) would not be directly affected by current management direction because potential roosting habitat (large snags and trees) would remain unchanged in the project area. Indirectly, habitat in the project area would remain unchanged for the short term. Over time, stands in the project area would continue to grow and develop into dense multistory stands. As a result, potential roosting habitat would essentially remain unchanged because of the continued presence of large diameter snags and trees in the project area. However, the multi-layer condition would increase the susceptibility of stands to high-intensity wildfires and insect or disease outbreaks. A major disturbance on the landscape would change the composition and structure to an open shrubland/grassland with little or no tree cover. This would result in fewer large green trees and typically an abundance of large snags for a twenty- to thirty-year period. A severe wildfire would reduce the overall number of large green trees and snags. Roosting habitat would be limited

to the amount of large snags and green trees remaining in the project area after a "natural" disturbance.

NEOTROPICAL MIGRATORY BIRDS

DRY FOREST HABITAT

The direct and indirect effects to the dry forest habitat are the same as those previously described in the *Late and Old Structure* section and *Dead Wood Habitat* section. Patch size would remain the same until stands become susceptible to high-intensity wildfires or insects and disease outbreaks. A major disturbance on the landscape would change the composition and structure to an open shrubland/grassland with little or no tree cover. This would reduce or eliminate the old forest patch in the project area. As a result, old forest stands outside the project area may be disconnected from other old forest stands in the analysis area.

RIPARIAN SHRUB HABITAT

Riparian shrub habitat would not be directly affected by current management direction because habitat criteria would essentially remain unaltered in the project area in the short term. Over time, riparian shrub stands in the project area would continue to grow and develop into a more dense community, eventually occupying more of the site. Herbaceous open areas would decrease in size with the encroachment of shrub cover. Tree seedlings and saplings may also encroach into openings and occupy those sites along streams in the project area. Patch size would increase as shrubs occupy more of the area. As upland vegetation grows and develops into a dense multi-layer condition, uplands and riparian shrub communities would become more susceptible to high-intensity wildfires and insect or disease outbreaks. A major disturbance on the landscape would change the composition and structure of riparian communities. Initially, riparian communities would have little vegetative cover, but eventually they would become occupied with shrubs and grasses. Typically, after such a disturbance shrub densities would increase and occupy more than 60 percent of the site. Tree densities would decrease initially, but may eventually begin regenerating along the stream channel. Patch size would ultimately increase as shrubs occupy more of the site. Overall, habitat suitability for the willow flycatcher would improve as the riparian shrub community developed.

ALTERNATIVE 2: PROPOSED ACTION

LATE AND OLD STRUCTURE

LATE AND OLD STRUCTURAL STAGES

Direct/Indirect Effects

Salvage timber harvest and commercial thinning would occur in late and old structural stages in the project area. Approximately 275 acres of late and old structure would be harvested, changing the composition and structure of the

stand. Tree harvest would essentially change the stands from a multi-layered old forest to a single-layered old forest and from a mixed conifer type to a dominant ponderosa pine type. As a result, the historical range of variability would change the old forest multi-strata from 29 percent to 25 percent and old forest single stratum from 13 percent to 17 percent in the analysis area (Table 17). After harvest, old forest single-stratum would be within the historical range of variability and old forest multi-strata would remain above the historical range of variability. The stands' composition and structure would be maintained over an extended period of time as ponderosa pine, old forest single-stratum stand, within the historical range of variability. Harvest activities would reduce the late and old structure stands' susceptibility to high-intensity wildfires and insect or disease outbreaks.

Non-commercial thinning and juniper reduction would occur in late and old structural stages in the project area. This action would essentially change late and old structure stands from a multi-layered stand to a single-layered stand. The understory composition would change to more fire tolerant tree species, like ponderosa pine. The overstory would remain unchanged from this action. The old forest single-stratum condition resulting from harvest would remain unchanged. The stands' understory would remain more open, with patches of regeneration occurring through the stand. Thinning activities would reduce the stands susceptibility to high-intensity wildfires and insect or disease outbreaks.

Fuels treatment, hereto referred to as burning would occur in one late and old structure Unit (18). The burn would reduce fuels created from harvest activities and understory vegetation. Shrubs, grasses, and seedlings would be temporarily removed from the understory. Within a year after the burn, grasses, forbs, and seedlings would re-occupy the more open understory. This action would not change the tree composition or structure. The stand would remain as an old forest single-stratum stand within the historical range of variability. Burning activities would reduce the stands' susceptibility to high-intensity wildfires and insect or disease outbreaks.

Temporary roads and existing roads used for harvest would not change the composition or structure of late and old structure stands in the project area. Therefore, no direct or indirect effects would occur to late and old structure stands from this action.

Tree planting would not occur in any of the late and old structure stands, therefore no direct or indirect effect would occur to late and old structure stands from this action.

Cumulative Effects

Past activities (Appendix B) and events in the Bologna Basin watershed that would cumulatively affect late and old structure stands include harvest (4,090 acres), wildfire (786 acres), and private-land harvesting (7,145 acres). Past harvest activities and wildfires throughout the area have directly affected the structure and composition of large trees in the watershed through the removal of trees greater than 21 inches diameter breast height. However, with the

continued growth of desirable (dry forest) and non-desirable trees (not-dry forest), this has led the project area, analysis area, and watershed to its current late and old structure condition of old forest multi-strata and old forest single-stratum structural stages. The area has largely recovered or is recovering from past harvest and wildfire events to where the late and old structure structural condition constitutes about 42 percent of the analysis area and meets the requirement of the Regional Forester's Amendment for late and old structure in the analysis area.

Present activities that would have a cumulative effect on late and old structure include wildfire suppression tactics. Decades of fire suppression have reshaped the landscape of the Bologna analysis area, through fire exclusion. Historically, fire played a role in thinning the forest and maintaining a higher proportion of fire resistant species, e.g. ponderosa pine. Fire exclusion has allowed an increase in the density of trees and a change in species composition. As a result, fire behavior has changed from frequent low-intensity to infrequent high-intensity stand replacing burns. Few late and old structure stands have burned in more recent times, but all old forest multi-strata stands in the watershed are highly susceptible to stand replacement fires.

Future activities and events in the watershed that would have a cumulative effect on late and old structure stands include prescribed burning 50 percent of the Bologna analysis area. Controlled burns in forested areas of the watershed would be beneficial to late and old structure stands. Prescribed burning could reduce the density of vegetation in late and old structure stands, eventually moving old forest multi-strata stand toward an old forest single-stratum condition. Prescribed burning would also serve to maintain old forest single-stratum stands in a more historic ecological condition.

CONNECTIVITY

Direct/Indirect Effects

Timber harvest would occur on approximately 1,000 acres of stem exclusion closed canopy, young forest multi-strata, old forest multi-strata, and understory reinitiation. Harvest activities would change the density of live trees and/or remove dead trees in the stand. As a result, the composition and structure of the stand would change. Multi-layered stands would change to single-layer stands and closed canopy stands would change to open canopy stands. Stand composition would shift from a Douglas-fir, mixed conifer type to a more historical ponderosa pine type.

As a result of this action, connectivity corridors would remain unchanged in the project area for all but four units (13, 19, 22, and 23) in the project area. After harvest, units 13, 19, 22, and 23 would change to a stand initiation structural stage, from a stem exclusion closed canopy or an understory reinitiation structural stage. Stand initiation structural stages would not be considered connective corridors/habitat because of the lack of medium and large trees in the stand, potentially creating holes or gaps in connectivity. However, in this situation (the gap created by Unit 13) connectivity to late and old structure stands

is maintained through a stem exclusion open canopy stand to the west and a stem exclusion closed canopy stand to the east. Late and old structure stands remain connected to Unit 19 through stem exclusion open canopy and old forest multi-strata stands to the north and south of the unit. Late and old structure stands between units 22 and 23 remain connected through stem exclusion open canopy and old forest multi-strata stands to the northwest and southeast. After harvest, late and old structure stands in the project area would remain connected to other late and old structure stands in the project area and the analysis area, by two or more connections.

Thinning would occur on approximately 555 acres of the previously mentioned harvest acres. This action would change the stand to a single-layered stand. The understory composition would change to more fire tolerant tree species, such as ponderosa pine, and become somewhat more open. This action would not change the overstory composition or structure with regards to connectivity. Structural conditions that resulted from harvest activities would remain unchanged by thinning activities. Habitat connectivity would not change and remain as described after harvest activities. After thinning, the understory would represent a more ecologically appropriate dry site condition. Thinning activities would reduce the stands' susceptibility to high-intensity wildfires and insect or disease outbreaks.

Burning would occur on 448 acres, with 249 acres of pile burning and 199 aces of underburning. The burn would reduce fuels created from harvest activities and thinning. Shrubs, grasses, and seedlings would be temporarily removed from the understory in stands underburned. Within a year after the burn, grasses, forbs, and seedlings would re-occupy the more open understory. Pile burning would essentially be limited to three to four debris piles per acre within the stands. Effects would be limited in area to the piles and the immediate area around the piles. Shrubs, grasses, and seedlings would be temporarily removed next to the pile. Within a year after the burn, grasses, forbs, and seedlings would re-occupy the site of the pile and surrounding area. Burning would not change the overstory composition or structure. Structural conditions that resulted from harvest activities would remain unchanged by burning activities. Habitat connectivity would not change and remain as described after harvest activities. Burning activities would reduce the stands' susceptibility to high-intensity wildfires and insect or disease outbreaks.

Temporary roads and existing roads used for harvest would not change the composition or structure of connective habitat in the project area. Therefore, no direct or indirect effects would occur to habitat connectivity from this action.

Tree planting would not directly affect habitat connectivity in the project area because it would occur in harvest units that do not provide habitat connectivity (stand initiation). Indirectly, units planted with ecologically appropriate trees would eventually grow to a size and height appropriate to provide habitat that would connect late and old structure stands with other late and old structure stands in the project area.

Cumulative Effects

Past activities (Appendix B) and events in the Bologna Basin watershed that would cumulatively affect connective habitat includes harvest (4,090 acres), wildfire (786 acres), and private-land harvesting (7,145 acres). Past harvest activities and wildfires throughout the area have directly affected the structure and composition of medium and large trees in the analysis area through the removal of trees greater than 12 inches diameter breast height. However, with the continued growth of desirable (dry forest) and non-desirable trees (not-dry forest), this has lead the project area, analysis area, and watershed to its current condition of habitat connectivity. The area has largely recovered or is recovering from past harvest and wildfire events to where habitat connectivity meets the Forest Plan Amendment # 11.

Present activities that could have a cumulative effect on late and old structure include wildfire suppression tactics. Decades of fire suppression have reshaped the landscape of the Bologna analysis area through fire exclusion. Historically, fire played a role in thinning the forest and maintaining a higher proportion of fire resistant species, such as ponderosa pine. Fire exclusion has allowed an increase in the density of trees and a change in species composition. As a result, fire behavior has changed from frequent low-intensity to infrequent high-intensity stand replacing burns. Few connectivity stands have burned in more recent times, but all multi-layered stands in the watershed are highly susceptible to stand replacement fires.

Future activities and events in the watershed are not expected to have a cumulative effect on connectivity including prescribed burning 50 percent of the Bologna analysis area. Controlled burns in forested areas of the watershed would be beneficial to habitat connectivity. Prescribed burning could reduce the density of vegetation in connective stands, eventually moving multi-layered stands toward a single-layered condition. Prescribed burning would also serve to maintain dry site stands in a more historic ecological condition.

DEAD WOOD HABITAT

DEAD STANDING TREES

Direct/Indirect Effects

Proposed harvest activities (salvage and commercial thinning) would directly and indirectly affect dead standing trees in the project area. A high proportion of the trees being harvested would be dead trees. Harvesting dead trees would reduce the density of dead trees in the affected area for all size classes. In addition, the effects of harvest operations (skidding, skid trails, landings, etc.) would reduce snags in the project area. However, three of the largest dead standing trees per acre would not be harvested and would remain standing in the affected area. Snags greater than 20 inches diameter breast height would remain in the affected area when that size class occurs on the site. Ponderosa pine and Douglas-fir would be the preferred snag for retention. As a result of this action, snag density after treatment would be at least 3 dead standing trees per acre, or

about 3,009 snags over the 1,003 harvested acres. This is above the total snag requirement in the Forest Plan by 0.75 snags per acre. All snags retained would be at least greater than or equal to 12 inches diameter breast height, and approximately a third of the remaining snags would be greater than or equal to 20 inches diameter breast height after harvest. Snags would be retained as clumps, singles, or groups in the affected area. Additional snags of varying size classes would be maintained in non-harvest areas like riparian habitat corridors.

Temporary roads used for harvest operations would also directly and indirectly affect dead standing trees in the project area. Dead standing trees along and adjacent to the route could be removed. Most if not all of this activity would occur within a harvest unit. Therefore, dead standing trees removed by this action would be compensated as part of the harvest unit retention rate (largest 3 snags per acre) described previously. As a result of this action, snag density would be maintained above the Forest Plan standard, resulting in the same density and size classes described previously in the harvest activity effects.

Burning (fuels treatment) is not expected to directly affect large snags retained after harvest. Low intensity underburns would reduce fuels (slash) created from harvest and thinning activities and understory vegetation. Shrubs, grasses and seedlings would be temporarily removed from the understory in stands underburned. Effects of pile burning would be limited to the pile and the immediate area around the pile. Pile burning would occur on 3 to 4 debris piles per acre, piles would not be placed next to snags identified for retention. Where high accumulations of slash occur around the base of retention trees, burning might indirectly affect dead standing trees retained in the project area. The potential loss of dead standing trees from underburns is expected to be negligible. Snag density in stands underburned is expected to remain above Forest Plan standard of 2.25 snags per acre after treatment.

Thinning (non-commercial and juniper reduction) would not directly or indirectly affect dead standing trees left in the project area. Dead standing trees would not be cut down during thinning activities. Only green ponderosa pine and Douglas-fir trees (saplings) generally up to 7 inches diameter breast height would be thinned or removed. Juniper trees on these sites are not desirable as snag replacement trees because of the desire to have taller trees and bigger diameters for future snag trees.

Tree planting would not directly or indirectly affect dead standing trees in the project area. Dead standing trees would not be cut down during planting activities. Planting restores tree cover (seedlings) in open areas.

When compared to Alternative 1, the proposed activities in this alternative would reduce the total number of snags in the affected area. Dead standing trees greater than or equal to 10 inches would decrease from 12.6 snags per acre to 3 snags per acre, a reduction of about 9.6 snags per acre in the affected area. However, the retention of 3 snags per acre (greater than or equal to 10 inches diameter breast height) in the project area is above the Forest Plan standard of 2.25 snags per acre. Snag densities for the 10- and 12-inch size classes, when

compared to Alternative 1, would also be lower in this alternative because most of the snags removed by harvest would occur in these size classes. In addition, the intent is to retain the larger size classes (greater than 16 inches) in lieu of the smaller size class (10-inch and 12-inch) densities, as much as possible. The larger snags have a better chance of remaining upright on the site than smaller snags (less than 16 inches). Cavity excavators can use snags more extensively when they remain on the site longer. In this alternative, the density estimates for the 20-inch size class would be about the same as Alternative 1 (0.7 snag per acre).

As mentioned previously, proposed harvest, temporary roads, and burning activities could directly affect dead standing trees in the project area (see Project Record, Project Analysis Section, *Terrestrial Wildlife Report –Supplement*). At the watershed scale, effects from the proposed action would reduce the snag density for the greater than or equal to 10-inch group by 0.2 snags per acre (Table 38) when compared to the current condition (Table 30). This is about a 3 percent reduction in snags between 10 and 20 inches. No change in snag density is expected to occur in the greater than or equal to 20-inch group (Table 38). When compared to white-headed woodpecker cumulative species curves in DecAid for this habitat type and structural condition, densities would continue to exceed the 80 percent tolerance level for the white-headed woodpecker in the 10-inch group and remain between the 30 percent and 50 percent tolerance level for the greater than or equal to 20-inch group.

Table 38. Snag Densities for Pre-harvest and Post-harvest Treatment in the Lower John Day River/Kahler Creek Watershed.

			Diameter Group	
	Evaluation Areas	**Unit**	**>= 10" dbh**	**>= 20" dbh**
Analysis Area	Watershed	Acres	27,825	27,825
	Affected Area		1,003	1,003
Pre-Harvest	Snag Density	Snags/Acre	10.3	1.0
	Watershed	Total Snags	286,598	27,825
	Affected Area		10,331	1,003
Post-Harvest	Affected Area	Total Snags	3,009	1,003
	Watershed		279,276	27,825
	Difference from Pre-Harvest		7,322	0
	Snag Density	Snags/Acre	10.1	1.0

As mentioned previously, thinning (non-commercial and juniper reduction) and tree planting would not directly or indirectly affect dead standing trees left in the affected area. Therefore, dead standing trees would not be affected and snag densities at the watershed scale would not change as a result of thinning and planting.

Cumulative Effects

Past activities (Appendix B) and events in the Bologna Basin analysis area that

cumulatively affect dead standing trees include harvest (4,090 acres), wildfire (786 acres), and private-land harvesting (7,145 acres). Past harvest activities and wildfires throughout the area have directly affected snag density in the analysis area through the removal of dead standing trees greater than or equal to 10 inches diameter breast height and greater than or equal to 20 inches diameter breast height, and the recruitment of snags through wildfire. Overall, these effects have led to high proportion of snags greater than 10 inches and lower proportion of snags greater than 20 inches in the affected area and across the watershed. At the watershed scale, the current summation of these activities has resulted in 10.3 snags per acre greater than or equal to 10 inches diameter breast height and 1.0 snag per acre greater than or equal to 20 inches diameter breast height. These densities are above Forest Plan standards and within the 30 percent and 50 percent tolerance levels identified for the white-headed woodpecker in DecAid.

Present activities that have a cumulative effect on dead standing trees include wildfire suppression tactics. Decades of fire suppression have reshaped the landscape, through fire exclusion. Historically, fire played a role in reducing heavy fuel build-up and recruiting snags on the landscape, typically in small patches. Fire exclusion interrupts deadwood dynamics on the landscape, allowing dead standing trees and resulting downwood to remain longer on the site, and building higher densities of dead wood on the landscape. Over time, the frequency of dead wood patches and size of patches would increase, resulting in a higher proportion of deadwood on the landscape. These patches and the surrounding landscape would become highly susceptible to wildfire. A high intensity wildfire event would result in the total loss of snags within dead wood patches. Snag densities would most likely fall below the Forest Plan standard for the area and snag densities at the watershed level could be reduced to levels near the 30 percent tolerance level for the white-headed woodpecker. It would take more than 80 years to re-establish the snag component in the area and meet Forest Plan standards. Wildfire also recruits snags on the landscape. However, potential snags for the area would be limited to the fire perimeter where fire intensity and severity would be less.

Future activities and events in the watershed that may have a cumulative effect on dead standing trees include prescribed burning 50 percent of the Bologna Basin area and proposed harvest in the Rail Salvage Project. All other reasonably foreseeable future activities with the potential to affect dead standing trees are outside the watershed. Controlled burning in forest areas within the watershed would essentially maintain dead standing tree habitat in the area. A prescribed burn can remove snags in the area, but snags would also be recruited to dead standing trees when the prescribe burn kills green trees.

As mentioned previously, low intensity prescribed fires would not be expected to remove larger snags (greater than 16 inches) in the affected area. However, the prescribed burn could remove some snags between 10 inches and 16 inches. The effects from future prescribed burn projects in the Bologna Basin area would not be expected to reduce the snag density below Forest Plan standards for the

area. In addition, the effect of prescribed burning on snag densities at the watershed level is expected to maintain snag densities above or near the 80 percent tolerance level for the white-headed woodpecker in the greater than or equal to 10-inch group and between 30 percent and 50 percent for the greater than or equal to 20-inch group.

Proposed harvest in the Rail Salvage project is expected to remove dead standing trees in the project area. It is assumed that snags would be left in the affected area at the rate of 3 of the largest snags per acre. Every effort would be made to retain snags greater than 20 inches diameter breast height and meet or exceed the standard for this size class. Snags in the 10-inch and 12-inch size class may be deferred to the larger size class. Overall, dead standing trees in the affected area would be retained to meet or exceed Forest Plan standards. At the watershed scale, snag densities less than 20 inches diameter breast height would most likely be reduced in the Rail Salvage project. However, the number of snags removed in Rail Salvage project would be fewer than the Bologna Basin area because the affected area of Rail Salvage is expected to be much smaller than Bologna Basin. This would result in fewer snags removed in the Rail Salvage project. As a result, snag densities at the watershed level are expected to remain above or near the 80 percent tolerance level for the white-headed woodpecker in the greater than or equal to 10-inch group and between 30 percent and 50 percent for the greater than or equal to 20-inch group.

SNAG REPLACEMENT TREES

Direct/Indirect Effects

Proposed harvest activities (salvage and commercial thinning) and temporary roads would directly and indirectly affect green trees in the project area. Commercial thinning would reduce the density of green trees in the affected area for all size classes. In addition, the effects of temporary roads and harvest operations (skidding, skid trails, landings, etc.) would reduce the density of green trees in the project area. However, at least 15.8 green trees per acre greater than 10 inches diameter breast height would be retained in the affected area as snag replacement trees. This would include about 10 (10.2) trees per acre greater than 12 inches diameter breast height and 1 (1.1) tree per acre greater than 20 inches diameter breast height. As a result of harvest activities in the affected area, a sufficient number of green trees would be retained and recruited as snags throughout the life of the stand. A snag replacement tree density of 16 trees per acre would meet the Forest Plan snag replacement tree objective.

Burning (fuels treatment) is not expected to directly or indirectly effect snag replacement trees retained after harvest. Low intensity underburns would reduce fuels (slash) created from harvest and thinning activities, and also understory vegetation. Shrubs, grasses, and seedlings would be temporarily removed from the understory in stands underburned. The prescribed fire would not consume green trees left on site as snag replacement trees. Effects of pile burning would be limited to the pile and the immediate area around the pile. Pile burning would occur on 3 to 4 debris piles per acre. Piles would not be placed next to snag

retention trees. Pile burning would not consume green trees left on site as snag replacement trees. As a result of the prescribed burn and pile burning, green tree density would remain at or above the Forest Plan objective of 16 snag replacement trees per acre after treatment.

Thinning (non-commercial and juniper reduction) would not directly or indirectly affect snag replacement trees in the project area. Large ponderosa pine and Douglas-fir trees (greater than 10 inches) would not be cut down during thinning activities. Only green trees (saplings) generally up to 7 inches diameter breast height would be thinned or removed. Juniper trees on these sites are not desirable as snag replacement trees because the taller, larger diameter trees such as ponderosa pine and Douglas are more desirable as snag replacement trees.

Tree planting would not directly or indirectly affect snag replacement trees in the project area. Green trees retained, as snag replacement trees would not be cut down during planting activities. Planting would restore tree cover (seedlings) in open areas.

When compared to Alternative 1, the proposed activities in this alternative would reduce the total number of green trees the affected area. Currently, there are approximately 74 trees per acre greater than 10 inches in the affected area. At least 16 trees per acre greater than 10 inches would be retained in the affected area as snag replacement trees in order to meet Forest Plan snag replacement objectives.

Cumulative Effects

Past activities (Appendix B) and events in the Bologna Basin analysis area, that cumulatively affect snag replacement trees include harvest (4,090 acres), and wildfire (786 acres). Past harvest activities and wildfires throughout the area have directly affected the size and number of green trees in the analysis area through the removal of trees greater than or equal to 10 inches diameter breast height and greater than or equal to 20 inches diameter breast height. Overall, these effects have led to high proportion of green trees less than 20 inches and a lower proportion of trees greater than 20 inches in the affected area. The current summation of these activities has resulted in 74.1 trees per acre greater than or equal to 10 inches diameter breast height and 7.7 trees per acre greater than or equal to 20 inches diameter breast height. Current densities of trees in the affected area are above Forest Plan standards for snag replacement trees. As a result of past harvest activities in the analysis area, a sufficient number of green trees occur in the affected area to provide snags throughout the life of the stand.

Current fire suppression tactics continue to limit the extent of fire on the landscape. Heavy fuel build-up continues in the affected area and across the analysis area. Over time, there could be a higher proportion of deadwood on the landscape than if fire played a more historic role. The project area could become increasingly susceptible to wildfire. A high intensity wildfire event like Wheeler Point fire could result in a total loss of green trees in the project area. This could result in either reductions in or the total lack of green trees for future snags in the

affected area to levels well below Forest Plan objectives for snag replacement trees. It could take more than 80 years to re-establish a snag replacement tree component to the area.

No known future activities or events would have a cumulative effect on snag replacement trees in the Bologna Basin analysis area. All other reasonably foreseeable future activities with the potential to affect snag replacement trees in the affected area are outside the watershed. Overall, snag replacement trees in the affected area would be retained to meet or exceed Forest Plan standards.

DEAD DOWNWOOD

Direct/Indirect Effects

Proposed harvest activities (salvage and commercial thinning) and temporary roads would not have a direct effect on dead downwood, because current levels of downwood in the affected areas would not be harvested or removed from the site by this action. Indirectly, dead wood may be affected by harvest operations (skidding, skid trails, landings, etc.) or temporary roads, where existing down logs may be moved, cut in pieces, or broken apart within the project area. However, direct and indirect effects of the proposed action would not be expected to reduce the downwood densities in the affected area or the watershed. Downwood densities in the affected area would be expected to meet or exceed the Forest Standard of 3 to 6 pieces per acre greater than 12 inches in diameter (large end) and greater than 6-foot lengths after harvest. Pieces of downwood meeting this standard would remain on site as singles, groups, or piles. Because downwood densities would not be expected to change in the affected area, downwood would remain at or near 8 pieces per acre at the watershed scale after harvest. Additional downwood in the project area would be maintained in non-harvest areas like riparian habitat corridors.

Burning (fuels treatment) could directly affect downwood retained after harvest. Low intensity underburns would reduce fuels (slash) created from harvest and thinning activities, and understory vegetation. Shrubs, grasses, and seedlings would be temporarily removed from the understory in stands underburned. As a result of underburning, some smaller logs (less than 16 inches) may be consumed or partially consumed by the burn. Logs with the potential to burn completely would be those in close proximity to high accumulations of slash. However, this potential loss of down logs from the underburns is not measurable. Effects of pile burning would be limited to the pile and the immediate area around the pile. Pile burning would occur on 3 to 4 debris piles per acre and piles would not be placed next to down logs identified for retention. Stands underburned or pile burned would be expected to meet or exceed the Forest Plan standard of 3 to 6 pieces per acre after burning. Effects of the proposed action would not be expected to reduce downwood densities at the watershed scale. Downwood densities would remain at or near 8 pieces per acre at the watershed scale after burning.

Thinning (non-commercial and juniper reduction) would not directly or indirectly affect dead downwood left in the project area. Dead wood would not be cut or

removed during thinning activities. Only green trees (saplings) generally up to 7 inches diameter breast height would be thinned or removed.

Tree planting would not directly or indirectly affect dead downwood in the project area. Dead wood would not be cut down or removed during planting activities. Planting would restore tree cover (seedlings) in open areas.

When compared to Alternative 1, the proposed activities in this alternative would not reduce the density of downwood in the affected area. Essentially, there is no difference in downwood densities between Alternative 1 and after the proposed action is implemented in this alternative. Downwood densities would remain at or near 8 pieces per acre at the watershed scale for both Alternatives, because downwood pieces across the landscape, including the affected area, would not be removed from the site.

Cumulative Effects

Past activities (Appendix B) and events in the Bologna Basin analysis area, that cumulatively affect dead downwood include harvest (4,090 acres), wildfire (786 acres), and private-land harvesting (7,145 acres). Past harvest activities also include fuelwood harvest. Past harvest activities and wildfires throughout the area have directly affected downwood density in the watershed, through the removal of downwood and dead standing trees. Overall, the result of these effects has led to current levels of downwood in the affected area and across the landscape. At the watershed scale, past activities have resulted in the current estimate of 8 pieces of downwood per acre. These densities are 2 to 5 pieces per acre above Forest Plan standard for dead downwood.

Present activities that have a cumulative effect on dead standing trees include fuelwood harvest and wildfire suppression tactics. Fuelwood harvest occurs within 300 feet of open roads and is limited to downwood less than 24 inches at the stump (large end). With the random distribution of downwood on the landscape, effects from fuelwood harvest are not measurable. Current fuelwood harvest activities in the watershed are expected to retain downwood density within or above the Forest Plan standard of 3 to 6 pieces per acre in the affected area and within the watershed.

Current fire suppression tactics continue to limit the extent of fire on the landscape and interrupt deadwood dynamics. Heavy fuel build-up and snag and downwood recruitment continues on the landscape in increasingly larger patch sizes. Over time, there could be a higher proportion of deadwood on the landscape, than if fire played a more historic role on the landscape. These patches and the surrounding landscape could become highly susceptible to wildfire. A high intensity wildfire event like the Wheeler Point fire could result in a total loss of downwood patches in the affected area and across the watershed. With current fire suppression tactics, downwood density could eventually fall below the Forest Plan standard of 3 to 6 pieces per acre for the affected area and at the watershed scale. Wildfire does recruit snags on the landscape. However, potential snags and eventual downwood for the area would be limited to the fire perimeter where fire intensity and severity would be lower.

Future activities and events in the watershed that may have a cumulative effect on dead standing trees include prescribed burning 50 percent of the Bologna Basin area, proposed harvest in the Rail Salvage Project, and fuelwood harvest. All other reasonably foreseeable future activities with the potential to affect dead standing trees are outside the watershed. Controlled burning in forest areas within the watershed would essentially maintain dead standing tree and ultimately maintain downwood habitat. A prescribed burn can remove snags and downwood in an area, but green trees would also be recruited to dead standing trees and downwood when they are killed by fire. As mentioned previously, some smaller logs (less than 16 inches) may be consumed or partially consumed by the burn. Logs with the potential to burn completely would be those in close proximity to high accumulations of slash. However, this potential loss of down logs from the underburns is not measurable. The effects from future prescribed burn projects in the Bologna Basin area would not be expected to reduce the downwood density below the Forest Plan standard of 3 to 6 pieces per acre. As a result of prescribed burning and anticipated fuelwood harvest in the Bologna Basin analysis area, downwood densities at the watershed level would be expected to meet Forest Plan standards.

MANAGEMENT INDICATOR SPECIES

ROCKY MOUNTAIN ELK

Direct/Indirect Effects

Project activities would occur in satisfactory and marginal cover of the Monument Winter Range. Harvest and thinning activities affect approximately 1,000 acres in the project area. Two units (14 and 16) totaling 58 acres change from marginal cover to forage. In the remaining units, the composition and structure would not change significantly, resulting in no change in the current cover condition for those units. Burning would temporarily remove shrubs, grasses, and seedlings from the understory and next to piles. Within a year after the burn, grasses, forbs, and seedlings would re-occupy the more open understory. Prescribed burning is not expected to alter the cover condition in the project area. This is because the low intensity underburn would remove shrubs, grasses, and seedlings, but not larger trees that provide satisfactory or marginal cover for the area.

In the Monument Winter Range, total cover would be at 44 percent and satisfactory cover would be 15 percent. This would yield a habitat effectiveness index of 67. Total cover is above the minimum standard of 30 percent for the winter range and satisfactory cover is above the minimum standard of 10 percent and at the lower range of “desirable” identified in the Forest Plan.

Temporary roads and existing roads used for harvest would not change open road densities because these roads would be closed and harvesting would not occur in the Monument Winter Range during the restricted winter-use period (December 1 to April 15). The open road density in the Monument Winter Range during the winter-use period would remain at 0.5 miles per square mile.

A sensitivity analysis of habitat effectiveness index was conducted for the Monument Winter Range relative to open roads. How many miles of open roads would need to be closed during the winter use period to reach a habitat effectiveness index of no less than 70? The answer was 24 miles. What would happen if all 47 miles of open road were closed? With all roads closed in the Monument Winter Range the habitat effectiveness index would be 73. While achieving a habitat effectiveness index of no less than 70 is theoretically possible and may be achieved someday, achieving this index was not a purpose and need for action for this specific project (EA, Chapter 1). The habitat effectiveness index remains below the habitat effectiveness index standard of 70 identified in the Forest Plan, but unchanged when compared to the existing condition.

All cover related values displayed in Table 37 are consistent with Forest Plan standards. In meeting the cover related management direction for elk in the C3 management area, the Monument Winter Range would continue to provide sufficient cover habitat (total, satisfactory, and marginal) as well as continue to contribute to the elk management population objectives of the State of Oregon. As such, it follows that recreation hunting opportunities (State-issued permits) would continue in the Monument Winter Range. These impacts are expected because the big game habitat effectiveness model predicts the influence of forest management on elk and other big game species. Potential big game populations were assumed to be proportional to the Habitat Effectiveness Index for elk and deer (Forest Plan EIS, page IV-71). Therefore, an index of 67, while not 70, provides a high level of potential habitat effectiveness and maintains elk populations in the management area near or above management objectives.

The Forest Plan habitat effectiveness index amendment for the Bologna Basin Salvage project would change the habitat effectiveness index value from 70 to the existing condition of 67 in the Monument Winter Range for the duration of the Bologna Basin project. The direct and indirect effects of changing the Forest Plan habitat effectiveness index standard for this project are expressed in the habitat effectiveness index value of 67 and the high quality habitat it provides. Achieving a habitat effectiveness index of no less than 70 was not a purpose and need for action for this specific project. In addition, future projects that are intended to improve habitat effectiveness index are not precluded, nor is the attainment of 70 prevented. The direct and indirect effects of the amendment are that elk habitat remains essentially unchanged from current conditions (Project File) and therefore the ability of the State of Oregon to manage the elk herd in the Monument Winter Range is maintained. Because the amendment only applies to the Monument Winter Range for the duration of this project there are no impacts to other winter ranges across the forest.

Cumulative Effects

Past, present, and reasonably foreseeable future activities considered in this analysis are displayed in Appendix B. The direct and indirect effects to cover and habitat effectiveness index values for the action alternatives (Table 37) were added to residual past, present, and reasonable foreseeable future effects relative to the evaluation criteria for elk (total cover, satisfactory cover, and

habitat effectiveness index). The cumulative value for total cover is 44 percent, 15 percent for satisfactory cover, and 67 for habitat effectiveness index. Additional details of the cumulative effects analysis are in the project file.

Past harvest and road building actions throughout the area impacted the structure and composition of cover in the winter range through the removal of trees and understory vegetation. Decades of fire exclusion have reshaped the landscape of the Bologna analysis area. Historically, fire played a role in thinning the forest and maintaining a higher proportion of fire resistant species, such as ponderosa pine. Although well intentioned, fire exclusion has resulted in an increase in the density of trees and a change in species composition (Table 20). Ironically, fire exclusion may have contributed to the amount and distribution of total cover. While beneficial to elk, these increases may not be sustainable over time partly because fire and insect disturbances within the ponderosa pine ecosystem are inevitable. The current cover and habitat effectiveness index values for the Monument Winter Range (Table 37) reflect the sum of impacts of all past human actions and natural disturbances.

Present and reasonably foreseeable future activities and events would change cover, open road densities, the distribution of cover and forage across the area, and the habitat effectiveness index. For example the Rimrock project would decrease the amount of satisfactory cover and close roads, however, the cumulative result is no change in the habitat effectiveness index.

All cumulative cover related values are consistent with Forest Plan standards. In meeting the cover related management direction for elk in the C3 management area, the Monument Winter Range would continue to provide sufficient cover habitat (total, satisfactory, and marginal) as well as continue to contribute to the elk management population objectives of the State of Oregon. As such, it follows that recreation hunting opportunities (State-issued permits) would continue in the Monument Winter Range. The cumulative effects are that elk habitat remains essentially unchanged from current conditions (Project File) and therefore the ability of the State to manage the elk herd in the Monument Winter Range is maintained. While a habitat effectiveness index of 70 would not be achieved by implementation of the Bologna Basin project, this project does not cumulatively reduce the index from its current level.

The forest plan habitat effectiveness index amendment for the Bologna Basin project and the reasonably foreseeable future habitat effectiveness index amendments for the Rimrock and Bacon-Sunflower projects would change the habitat effectiveness index value to the existing condition of 67 only in the Monument Winter Range and for those projects. Because the cumulative amendments only apply to the Monument Winter Range for the duration of those projects there are no changes in the habitat effectiveness index standard for other winter ranges across the forest. All other cumulative effects of amending the Forest Plan habitat effectiveness index standard are the same as described for direct and indirect above.

THREATENED, ENDANGERED, PROPOSED, CANDIDATE, AND SENSITIVE SPECIES

NORTHERN BALD EAGLE (THREATENED)

Direct/Indirect Effects

Harvest and thinning activities directly and indirectly affect bald eagle habitat and individuals incidentally using habitats in the project area. Since eagles currently use the project area as a nesting territory, effects are expected to occur to individuals that use the area. Live trees greater than 21 inches diameter breast height would not be harvested as per the Regional Forester's Plan Amendment #2 (USDA Forest Service, 1995). Eagles prefer large diameter (greater than 21 inches in diameter) snags, with widely spaced limbs for roosting or perching. These types of snags are the most desirable, and where feasible would be maintained. Some harvest units are within the Dry Creek Bald Eagle Consideration Area but the nest is located in a different subwatershed than the harvest project. Proposed harvest and thinning activities would not alter potential nesting habitat or potential nest trees, because no activities would occur within the Bald Eagle Management Area.

The proposed harvest and thinning would not affect perching or roosting habitat (USDI, FWS 1986) for wintering eagles. This is because proposed harvest is outside the Bald Eagle Management Area and harvest is limited to trees, which are less than 21 inches in diameter. Snags would be retained as described previously across the analysis area and in harvest units to provide potential perching sites. Currently, the majority of winter eagle use (perching) is within one mile of the North Fork John Day River and on the ridgeline north of the river.

Any temporary road construction would open additional areas to motor vehicle access and future management activities. A total of 1.1 miles of road is proposed for closure in Alternative 3. This closure would result in reducing the total area accessible to motor vehicle travel within the planning area. Spatially and temporally, the level of human activity and disturbance from implementation would be within current levels present within the planning area over the last 20 years. There is sufficient suitable habitat within the planning area in which incidental use by eagles would not be affected negatively as this species is capable of traveling great distances and could avoid areas being disturbed. All temporary roads used for proposed activities would be closed after activities are completed.

Mitigations

Harvest activities would only be permitted in the winter range from April 15 through November 31. This would preclude any activity during bald eagle winter use and nesting season.

Determination of Effects

The proposed activities "*May Effect—not likely to adversely affect*" the northern bald eagle or its habitat. This determination was based on surveys, which

indicate nesting and/or foraging eagles occur inside the analysis area. However, proposed thinning and salvage would not alter potential nesting habitat or potential nest trees, because no activities would occur within the Bald Eagle Management Area. In addition, proposed activities would not alter riparian habitat along major streams in the analysis area. In expedited consultation as required by the Endangered Species Act, the U.S. Fish and Wildlife Service issued a letter of concurrence with this finding (Project Record, Clearances Section).

Winter eagle use is relatively low and sporadic within the analysis area. Perching or roosting habitat should remain along the river corridor and would not be affected by proposed activities. Prey species should continue to occur along the river corridor and proposed activities would not affect potential habitat for those species.

Cumulative Effects

No past and present activities listed in Appendix B have impacted potential northern bald eagle populations or their habitat in the North Fork John Day River system. Over the last 15 years, bald eagle populations (residents and migrants) have been increasing in the North Fork John Day River system (Isaacs and Anthony 1998). Currently, the Dry Creek nesting pair nests along the lower portion of the North Fork John Day River. Nesting sites could expand throughout the North Fork John Day River system as long as reproductive success continues in the resident population. Wintering eagle populations have expanded throughout the river system more rapidly than resident populations and should remain stable or increase over the next few years.

Habitat along and adjacent to the river corridor continues to improve and recover. Numerous large trees (greater than 30 inches in diameter) for roosting and nesting occur within the analysis area and the North Fork John Day River system. Habitat connectivity is adequate on National Forest lands but tends to fragment on private lands downstream from the analysis area. Habitat should maintain or improve its “potential” for nesting sites along the river corridor. Foraging habitat should improve through the system as fish populations increase in the North Fork John Day River.

No proposed and future activities in Appendix B would impact potential northern bald eagle populations or their habitat in the North Fork John Day River system because the activities are too far from the eagles’ habitat.

GRAY FLYCATCHER (SENSITIVE)

Direct/Indirect Effects

The gray flycatcher would not be directly affected by harvest and thinning activities because the species is not known to occur in the project area. Indirectly, harvesting and thinning would change the structure and composition of potential habitat characteristics (open ponderosa pine with shrubby understory) for the flycatcher. Harvest activities would change the density of live trees in units from closed stands to open stands and thinning would change multi-layered

stands to a single-layered stands. Stand composition would shift from Douglas-fir, mixed conifer types to a more historical ponderosa pine type. The majority of stands would change to a stem exclusion open canopy condition with the understory changing to more fire tolerant tree and shrub species. After thinning and harvest, stands would represent a more ecologically appropriate dry site condition. Thinning activities would reduce the stands' susceptibility to high-intensity wildfires and insect or disease outbreaks.

Burning would reduce fuels created from harvest activities and thinning. Shrubs, grasses, and seedlings would be temporarily removed from the understory in stands underburned. Within a year after the burn, grasses, forbs, shrubs, and seedlings would re-occupy the more open understory. Burning would not change the overstory composition or structure. Structural conditions that resulted from harvest and thinning activities would remain unchanged from burning activities. Burning would not alter the cover condition of unit in the project area.

Temporary roads and existing roads used for harvest would not change open road densities, because, these roads would be closed and harvesting would not occur in the Monument Winter Range during the restricted use period (December 1 to April 15). The open road density in the Monument Winter Range during the winter use period would remain at 0.5 miles per square mile.

Determination of Effect

For the Gray Flycatcher and its habitat, a no impact determination was reached because the probability of use of habitat within the affected area by flycatchers is expected to be remote.

The alternative would have no environmental effects on habitat, individuals, the population or the species.

Cumulative Effects

Past activities (Appendix B) and events in the watershed that would cumulatively affect flycatcher habitat include wildfire (786 acres). Natural wildfire enhances flycatcher habitat by encouraging shrub habitat that is important for flycatchers.

Present activities in the watershed that would cumulatively affect flycatcher habitat include fire suppression, grazing, and water developments. Decades of fire suppression have reshaped the landscape of the Bologna analysis area. Fire suppression has caused juniper to encroach onto sagebrush-dominated habitats reducing the total biomass of herbaceous cover, shrub cover, and overall plant diversity. Livestock grazing has contributed to the loss of plant diversity, negatively affecting invertebrate communities that flycatchers depend upon. Water developments would provide habitat and water for flycatchers.

Future activities and events in the watershed that could have a cumulative effect on flycatcher habitat include grazing and prescribed burning. This was discussed in past and present activities. Present and future activities in the analysis area would essentially maintain habitat for the gray flycatcher at the current condition.

GRAY WOLF (THREATENED)

Direct/Indirect Effects

Harvest, thinning, or burning activities would not directly affect the gray wolf because the species is not known to occur in the project area. Indirectly, harvest, thinning, and burning activities that change forage availability for deer and elk populations affect wolves. Opening up the overstory and reducing the understory through thinning or burning would result in an increased production of grasses, forbs, and shrubs in the understory. Forage productivity would remain moderate to high, until the overstory closes and forage production decreases. Populations of deer and elk would continue to be managed at their current management objective for the management area. Burning and wildfires would rejuvenate and maintain forage quality and quantity.

The increase in temporary roads and opening closed roads for harvest would temporarily increase open road densities in the area. The increase in open roads over the area would lead to increased human activity in more parts of the project area. Spatially and temporally, the level of human activity and disturbance from more open roads would be near the same levels observed in the planning area over the last 20 years.

Determination of Effects

For the gray wolf and its habitat a “no effect” determination was reached because:

- No populations currently occupy this Forest.
- No denning or rendezvous sites have been identified.
- There is an adequate prey base.

Generally, Forest Service management activities for non-breeding populations are compatible with wolf protection and recovery.

Cumulative Effects

Past activities (Appendix B) and events in the Monument Winter Range could cumulatively affect forage or road density. These activities have affected forest structure and composition, including grasses, forbs, and shrubs. The removal of trees has increased the quantity of forage, and prescribed fires and wildfires have improved the quality of forage, resulting in the current population levels of deer and elk. Livestock grazing competes with big game for forage, potentially affecting prey populations. Open road densities have increased over the years as a result of past management activities. More recently, new road construction has declined and road closure and obliteration has increased, resulting in a declining open road density in the analysis area. Past activities have resulted in a current habitat condition that is suitable for gray wolf utilization.

Present activities that would have a cumulative effect on forage and road density include grazing and wildfire suppression tactics. The potential for livestock grazing to compete with big game for forage continues, although to a lesser extent than in the past. Current allotment management plans balance livestock

utilization with big game management objectives, resulting in a shared utilization of the forage resource. Fire suppression has excluded the historical role of fire on the landscape, resulting in an increase in the density of trees and a change in species composition. As a result, fire behavior has changed from frequent low-intensity to infrequent high-intensity stand replacing burns. While high-intensity fires are not desirable for big game because of the probable loss of cover, low-intensity fires would periodically enhance forage quality and quantity in the analysis area. As a result, present activities maintain habitat suitability for gray wolf.

Future activities and events in the watershed that would have a cumulative effect on forage and road density include harvesting, thinning, and road closures in the Rail Salvage Project, livestock grazing, and prescribed burning. The assumption is that stands would be harvested, resulting in a more open overstory, allowing more grasses, forbs, and shrubs to develop, increasing the forage availability for deer and elk. Planned or proposed road closures would reduce human-wildlife interactions, benefiting prey species and potential wolf populations. Proposed prescribed burns would enhance forage quality and quantity, maintaining forage availability across the landscape. Overall, reasonably foreseeable future activities would maintain or improve habitat suitability for gray wolf.

SPECIES OF "INTEREST"

NORTHERN GOSHAWK

Direct/Indirect Effects

Proposed activities would maintain or improve potential northern goshawk habitat in the analysis area. Salvage, thinning, and prescribed burning activities are not proposed in or near existing potential goshawk nesting habitat. Commercial thinning would retain all live trees 21 inches in diameter at breast height or larger, and move stands toward a late and old structural condition that would provide potential goshawk nesting habitat.

Cumulative Effects

Past activities (Appendix B) and events in the watershed that would cumulatively affect goshawk habitat include harvest, wildfire, thinning, prescribed burns, and private-land harvesting. These activities have reduced old forest structure that is important to goshawks. However, past activities have resulted in the current suitable habitat condition for goshawk in the Bologna analysis area.

No present activities in the watershed would have a cumulative effect on the suitability of goshawk habitat in the Bologna Basin analysis area.

Future activities and events in the watershed that could have a cumulative effect on goshawk habitat include harvesting and thinning in the Rail Salvage Project. All other future activities (Appendix B) occur outside the watershed. The assumption is that stands would be harvested, resulting in an old forest structure habitat that would maintain suitable habitat conditions for goshawk. Proposed activities would follow guideline provided in the "Eastside" screens (USDA 1995)

for goshawk and late and old forest structure. Reasonably foreseeable future activities would maintain or improve habitat suitability for the goshawk.

BATS OF INTEREST

Direct/Indirect Effects

Snag habitat provides temporary roosting habitat for foraging bats. Bat habitat could be affected by a reduction in snag habitat due to dead tree removal and potential hazard tree removal, but not to the degree that bat populations would be affected. No suitable hibernating habitat or colonial roosting habitats are known to occur within the analysis area. Snag retention guidelines for dead standing trees in harvest units would provide potential day roost habitat for bats within the affected area. Dead trees retained in riparian habitat corridors would also provide potential rooting habitat for bat. Dead stand trees outside the affected area would remain at their current densities.

Cumulative Effects

Past activities (Appendix B) and events in the watershed that would cumulatively affect bat habitat include dead standing tree harvest and wildfire. These activities have resulted in the current habitat condition for bats in the Bologna analysis area.

No present activities in the watershed would have a cumulative effect on the suitability of potential bat roosting habitat in the Bologna Basin analysis area.

Future activities and events in the watershed that would have a cumulative effect on bat habitat include dead standing tree harvesting in the Rail Salvage Project. All other future activities (Appendix B) occur outside the watershed. The assumption is that dead trees would be harvested, resulting in a reduction of dead standing trees in the project area. However, snag densities are expected to remain above Forest Plan standards in the affected area and densities at the watershed scale would be maintained near current levels as a result of this action. Reasonably foreseeable future activities would maintain the suitability for potential bat roost habitat in the Bologna Basin analysis area.

LANDBIRDS AND NEOTROPICAL MIGRATORY BIRDS

DRY FOREST HABITAT

Direct/Indirect Effects

Harvest and thinning activities would affect old forest single stratum, the forest mosaic, openings, snag densities, and patch size of dry forest habitats. The direct and indirect effects to old forest single stratum and snag densities are discussed in the *Late and Old Structure* section and *Dead Wood Habitat* section for Alternative 2. Changes in the composition and structure of a stand, after harvest and thinning, would generally result in a change in the structural stage. A variety of structural stages provide a mosaic of habitat conditions. As a result of the proposed treatments, all seven structural stages would occur in the analysis area. However, based on their historic range of variability in the

analysis area, some stages exceed their historical range of variability while others are below or at the lower end of their historical range of variability (Table 22 and Table 23). Harvest and thinning activities would move structural stages in the affected area to a more sustainable condition and toward a more balanced historical range of variability and mosaic condition in the analysis area. In addition, units harvested and thinned would provide a mosaic of open areas, shrub patches, large trees, and medium-small trees in the affected area. Patch size is not expected to change through harvest and thinning activities. Habitat conditions for migratory landbirds in the dry forest type would improve in the affected area, because old forest single-stratum, forest mosaic, openings, snag densities, and patch size would either be maintained or improved as a result of harvest or commercial thinning.

Proposed thinning and burning activities would promote the development of larger trees, single-layered canopies, open park-like understory dominated by herbaceous cover, scattered shrub cover, and pine regeneration. Shrubs and herbaceous vegetation, that favored open stands of old ponderosa pine, have declined as these stands have grown in with more shade-tolerant species. Understory burning and thinning, where appropriate, is beneficial to restoring or maintaining the site for migratory landbirds. Prescribed burning could temporarily displace birds associated with grass and shrub communities beneath a forested overstory, but these species would re-occupy the habitat as shrubs regenerate within 3 to 5 years after the burn. Prescribed burning and harvest activities in the spring could temporarily displace nesting birds during the burn. However, re-nesting would be expected in unburned patches and/or other locations outside the affected area.

Tree planting and temporary road use would not directly or indirectly affect habitat conditions for migratory birds in the project area. This because planting would restore tree cover (seedlings) in open areas and temporary roads would occur in previously effected harvest units.

Cumulative Effects

Past activities (Appendix B) and events in the watershed that could cumulatively affect dry forest habitat include harvest, wildfire, and grazing. Changes occurred in old forest structure and understory shrubs and herbaceous vegetation. However, these activities have resulted in the current dry forest habitat condition for migratory birds in the Bologna analysis area.

Present activities that could cumulatively affect shrubs and herbaceous vegetation in the dry forest habitat include grazing and wildfire suppression tactics. The potential for livestock to utilize forage and shrubs continues, although to a lesser extent than in the past. Current allotment management plans balance livestock utilization with other wildlife management objectives, resulting in a shared utilization of the forage/shrub resource. Fire suppression has excluded the historical role of fire on the landscape, resulting in an increase in the density of trees and a change in species composition. As a result, fire behavior has changed from frequent low-intensity to infrequent high-intensity

stand replacing burns. High-intensity fires are not desirable because of the probable loss of overstory tree cover. However, low-intensity fires would periodically maintain and improve the quality and quantity of shrub and herbaceous vegetation in the analysis area. As a result, present activities are expected to maintain the current suitability of dry forest migratory bird habitat in the Bologna Basin analysis area.

Future activities and events in the watershed that could have a cumulative effect on dry forest habitat include harvest in the Rail Salvage Project, livestock grazing and prescribed burning. All other future activities (Appendix B) occur outside the watershed. The assumption is that stands harvested would result in more old forest single-stratum habitat, which would maintain or improve suitable habitat conditions for migratory birds. Proposed prescribed burns would temporarily reduce shrubs and herbaceous vegetation on the site, but in the long term it would enhance the quality and quantity of understory vegetation across the landscape. Prescribed burning in the spring could temporarily displace nesting birds during the burn. However, re-nesting would be expected in unburned patches and/or other locations outside the affected area. Livestock grazing would continue as described in the present condition. Therefore, reasonably foreseeable future activities are expected to maintain the current suitability of dry forest migratory birds habitat in the Bologna Basin analysis area.

RIPARIAN SHRUB HABITAT

Direct/Indirect Effects

Harvesting, thinning, and tree planting activities would not occur in riparian habitat corridors. Therefore, no direct or indirect effects would occur to migratory birds in riparian shrub habitat from this action.

Prescribed burning adjacent to riparian corridors may directly or indirectly alter riparian shrub habitat within the riparian corridor. Burning (underburning and pile burning) to reduce fuels created from harvest activities and thinning may slop-over into the riparian corridor. Shrubs, grasses, and seedlings would be temporarily removed but regenerated within 1-3 years after the burn. Overstory tree composition and structure would remain unchanged. The amount of area affected would not be measurable. Portions of the riparian corridor burned could temporarily displace birds associated with this habitat type. However, re-nesting or re-occupation of the habitat would be expected in unburned patches and/or other locations along the corridor or even outside the affected area.

Cumulative Effects

Past activities (Appendix B) and events in the watershed that could cumulatively affect riparian shrub habitat include wildfire and grazing. However, these activities have resulted in the current habitat condition for migratory birds associated with riparian shrubs in the Bologna analysis area.

Present activities that could cumulatively affect riparian shrub habitat include grazing and wildfire suppression tactics. The potential for livestock to utilize riparian shrubs for forage continues, although to a lesser extent than in the past.

Current allotment management plans balance livestock utilization with other wildlife management objectives, resulting in a shared utilization of the forage/shrub resource. Fire suppression has excluded the historical role of fire on the landscape, resulting in an increase in the density of trees and a change in species composition. As a result, fire behavior has changed from frequent low-intensity to infrequent high-intensity stand replacing burns. High-intensity fires within riparian corridors are not desirable because of the probable loss of overstory tree cover. However, low-intensity fires would periodically maintain and improve shrub quality and quantity in the analysis area. As a result, present activities are expected to maintain the current habitat suitability for migratory birds associated with riparian shrub communities.

Future activities and events in the watershed that could have a cumulative effect on riparian shrub habitat include livestock grazing and prescribed burning. All other future activities (Appendix B) occur outside the watershed. Proposed prescribed burns would temporarily reduce shrubs on the site but in the long term it enhance shrub quality and quantity. Prescribed burning in the spring could temporarily displace nesting birds during the burn. However, re-nesting would be expected in unburned patches and/or other locations outside the affected area. Livestock grazing would continue as described in the present condition. Therefore, reasonably foreseeable future activities are expected to maintain the current habitat suitability for migratory birds associated with riparian shrub habitat.

EFFECTS OF ANIMAL CONTROL

Animal control would occur on the 190 acres scheduled for replanting in both action alternatives. Pocket gophers and browsing wildlife can inhibit the successful regeneration of conifer seedlings. Damage from gophers results from root pruning, stem clipping, girdling, partial removal of stems and crowns, and the total removal of small seedlings. While gopher damage can occur for up to 10 years after planting, the most serious damage occurs within the first two or three years and damage to young seedlings often results in mortality. Non-baited mechanical gopher traps would be placed in the main runways of burrow systems to control gopher populations for the first two to three years after seedlings are planted. Trapped gopher carcasses would be scattered through the units for use by scavengers.

Trapping would have no permanent adverse effect to gopher habitat. Additionally, gophers would continue to exist in areas outside of the regeneration units, there would be no effect on the survival of these animals, and gophers would recolonize the planted areas once the seedlings are established and the traps are removed. Gopher trapping would have negligible direct or indirect effects to non-target wildlife species. A 1996 monitoring of a gopher-trapping project on the Heppner Ranger District found one non-targeted species killed out of over 3,400 gophers trapped.

To prevent the browsing of conifer seedlings by both wildlife and grazing animals, seedlings would be wrapped in Vexar® tubing. This control measure would have

no direct or indirect effect on any wildlife or non-target wildlife species either present or having the potential to be present in the project area.

Because of the absence of any direct or indirect effects to non-target species, there would be no cumulative effects to non-target wildlife species.

ALTERNATIVE 3

Direct, indirect, and cumulative effects would be similar to those described in Alternative 2.

SOILS

This Environmental Assessment hereby incorporates by reference the *Soils Specialist Report* in the Project Record (40 CFR §1502.21). The *Soils Specialist Report* is located in the *Project Analysis* section of the Project Record and contains the detailed data, methodologies, analyses, conclusions, maps, references, and technical documentation that the Soils specialist relied upon to reach the conclusions in this Environmental Assessment. The analysis area for the Soils section includes only the area of the proposed treatment units.

EXISTING CONDITIONS

GEOLOGY

Ninety percent of the analysis area is composed of Columbia River Basalt of the Picture Gorge flows. The northern part of the analysis area is firmly grounded on basalt, with occasional slumps and head walls at the tops of the streams. The remaining 10 percent of the analysis area is "thick soils atop ash beds" (Orr and Orr 1996) of the John Day Formation, which is located in the canyon of the John Day River in the south part of the area.

MORPHOLOGY

The Umatilla Soil Resource Inventory was used to identify soil types within the proposed activity units. There are several soil types in the Bologna area, composed of both ash and ash-influenced residual soils. Ash soils formed from wind-borne ash deposited from volcanic eruptions in the Cascade Range, notably Mount Mazama, while ash-influenced residual soils formed from the weathering of the underlying basalt bedrock. Ash soils are generally found on north-facing slopes where the ash was originally deposited, and in draws and slope bottoms where it accumulated after initial erosion. Residual soils are generally found on south slopes and ridge tops, where the ash has eroded away.

Dominant soil characteristics for each proposed treatment unit are listed in Table 39. The proposed activity units are on the more productive soil components of the map unit complexes. The character is of shallow soils with grass and shrub vegetation in complex association with moderately-deep to deep soils that support dry forest vegetation.

PRIOR ACTIVITY IMPACTS

Most of the proposed units have had some harvest activity in prior decades, typically with individual-tree or group selection harvesting. Disturbance from these activities has been largely recovered with good surface stabilization and good buildup of organic matter. No erosion within units is evident. Occasional ruts from skidder/dozer track turns are still observable, but are generally widely scattered and very limited in extent.

Roads in the area are generally in good condition, with many of the closed roads stabilized and growing adequate vegetation, including trees in several sections.

The disturbance levels in Table 39 were the result of condition assessments conducted in the proposed activity units by a trained technician during the summer of 2002. Units of concern were checked by the Forest Soil Scientist and found to be within Forest Plan standards. The adjective-based (high, moderate, low) determinations are based on the Umatilla Qualitative Soil Condition Protocols (USDA Forest Service 2002).

ENVIRONMENTAL EFFECTS

For the Bologna Basin Project, an estimate of soil disturbance resulting from harvest activities was determined for each alternative. All harvester/forwarder units are assumed to create an average of 6 percent detrimental soil disturbance as compared to 12 percent for tractor/skidder units.

ALTERNATIVE 1: *NO ACTION*

Conditions in the analysis area would remain much the same as now. Slow accumulation of woody material, including smaller branches, would continue unless interrupted by wildfire. Organic material buildup on the surface would increase productive capacity somewhat, but it would also increase the risk of widespread, high-intensity wildfire that could remove large amounts of this protective material at once over large areas.

ALTERNATIVE 2: *PROPOSED ACTION*

Shallow and mixed ash/residual soils in the area have high soil strength when dry. Volcanic ash soils are more susceptible to compaction impacts even when quite dry, and would be at risk of displacement due to “dusting-up” if highly disturbed. This concern would be reduced through standard contractual language associated with timber sales. Normal operating season contract provisions would provide for machinery to operate on soils either sufficiently dry or frozen (where winter operation is allowed) to withstand forces from machinery that might otherwise create puddling (or rutting) and compaction. The low impacts to physical soil characteristics expected under this alternative should also keep any adverse impacts to soil biotic organisms to minimal levels.

Table 39. Dominant Soil Characteristics and Interpretations by Unit

Unit	Total Depth (Inches)	Ash Depth (Inches)	Surface Depth (Inches)	Comp. Hazard	Displ. Hazard	Erosion Hazard	Mass Waste	Current Disturbance Level
1	44	24	2	High	Mod.	High	Stable	Low
2	40	22	4	High	Low	Moderate	Stable	Low
3	40	22	4	High	Low	Moderate	Stable	Low
4	40	22	4	High	Low	Moderate	Stable	Low
5	26	0	5	Low	High	High	Stable	Low
6	44	24	2	High	Mod.	High	Stable	Low
7	40	22	4	High	Low	Moderate	Stable	Low
8	26	0	5	Low	High	High	Stable	Low
11	26	0	5	Low	High	High	Stable	Low
12	26	0	5	Low	High	High	Stable	Low
13	49	14	7	Mod	Low	Mod-High	Stable	Low
14	14	0	2	Low	Low	High	Very Stable	Low
15	14	0	2	Low	Low	High	Very Stable	Low-Mod.
16	40	22	4	High	Low	Moderate	Stable	Low
17	49	14	7	Mod	Low	Mod-High	Stable	Low
18	49	14	7	Mod	Low	Mod-High	Stable	Low
19	49	14	7	Mod	Low	Mod-High	Stable	Low
20	40	22	4	High	Low	Moderate	Stable	Low
21	26	0	5	Low	High	High	Stable	Low
22	49	14	7	Mod	Low	Mod-High	Stable	Low
23	49	14	7	Mod	Low	Mod-High	Stable	Low
24	49	14	7	Mod	Low	Mod-High	Stable	Low
25	49	14	7	Mod	Low	Mod-High	Stable	Low
26	49	14	7	Mod	Low	Mod-High	Stable	Mod.
27	49	14	7	Mod	Low	Mod-High	Stable	Low
28	49	14	7	Mod	Low	Mod-High	Stable	Low-Mod.
29	49	14	7	Mod	Low	Mod-High	Stable	Low-Mod.
30	49	14	7	Mod	Low	Mod-High	Stable	Mod.
31	49	14	7	Mod	Low	Mod-High	Stable	Low
32	26	0	5	Low	High	High	Stable	Low
33	49	14	7	Mod	Low	Mod-High	Stable	Low
34	49	14	7	Mod	Low	Mod-High	Stable	Low

Whole-tree yarding (424 acres), using a tracked or rubber-tired skidder, would drag the entire tree (including the needles and small branches) to a landing area where the tree would be processed into logs. The majority of nutrients in the above-ground tree portion reside in these needles and small branches, and so

would be removed from the site. Dragging the entire tree concentrates the weight of the tree in the middle of the skid trail and the dragging limbs disturb soil. Debris would be piled onto the landing areas, which would create 50 percent larger landings than with cut-to-length systems. Burning the large debris piles could create areas of severely burned soils due to the intense heat generated by their size. Most of the skid trails with multiple passes would have the organic layer removed and some displacement of the surface soils due to tractor operation and dragging trees the length of the skid trail.

Erosion risk would be created with the exposure of bare mineral soil, especially on ash soils. However, monitoring of prior use of this system on the Pomeroy District has shown detrimental soil impacts to be within Forest Plan guidelines, generally in the 8 to 12 percent range. Assuming a detrimental soil impact factor of 12 percent, 424 acres of whole-tree yarding would result in 51 acres out of the total 1003-acre project receiving detrimental soil impacts. Mitigation measures (such a the required 100-foot spacing between skid trails), implementation of Best Management Practices (Appendix A) to address erosion hazard risk, and careful contract administration of soil conditions during operations would keep adverse soil impacts to the minimums possible with this harvest system. The only rehabilitation of adverse soil conditions necessary would be associated with constructed landings related to whole-tree yarding systems. Subsoiling of landings (as needed) and retention of as much organic matter as fire risk/fuel objectives permit would improve site conditions for productive capacity and reduce erosion hazard.

The use of full tree suspension yarding systems (579 acres) would nearly eliminate exposed soil and displacement, and reduce compaction associated with harvest (where there is sufficient debris or downed wood). Branches are removed in front of the processing and skidding equipment, which then drive on top of the debris to spread out compressive forces from the weight of the machines. Nearly all of the smaller branches and needles would be left on site, where they would allow nutrient retention in the unit, even if debris is later pile burned or underburned. Potential for increased fire severity due to concentrated debris in the processor trails should be negligible if the burning prescription is followed. Retention of as much of the debris material on site, even if burned later, would allow for more of the nutrient component to be retained and utilized by both trees and other vegetation. Retention of debris and larger woody material must be weighed against risk of wildfire control problems, loss of residual stands from the potential fires, and any increase in pathogens or insects that may be attracted to thinning debris.

None of the resulting logs would drag on the ground, so there would be minimal turning forces to displace surface soil. Many of the landings would overlap existing roads, with logs stored along the length of adjacent haul roads, limiting additional impacts to unaffected soil areas. Monitoring of past harvest activity on the Umatilla indicates full tree suspension yarding systems would result in detrimental soil impacts (per Forest Plan definition) in the 5 to 10 percent range, with lesser compaction on the shallower soil types. Residual soils and those with

thin volcanic ash mantles (10 inches or less), have high strength in dry conditions and do not compact easily, although they would still be susceptible to surface displacement. The deeper soils, most with high ash content in the Bologna area, would still be susceptible to compaction even when dry, as soil strength does not increase in ash soils to the same degree as in other parent materials. Assuming a 6 percent detrimental soil impact factor of the 579 acres proposed for full tree suspension yarding, 35 acres out of the 1003-acre project would receive detrimental soil impacts. The total area that would receive detrimental soil impacts from the harvest of all units under this alternative would be 86 acres, or 8.6 percent.

Several other mitigations would be applied to reduce predicted increases in soil disturbance and sediment. Machines would avoid slopes that average 35 percent to avoid potential erosion and instability. Skid trails would be spaced as wide as operationally possible and trees would be felled at an angle to the skid trail to minimize compaction and disturbance. Ephemeral draws (which collect snowmelt or stormwater) would be protected from mechanical soil disturbance through avoidance where possible and a protective layer of debris at crossings. Debris could be pre-treated in portions of the units using grapple-piling equipment. This equipment is usually mounted on a small excavator body with wide tracks. As such it would have relatively low ground-pressure and could work on top of downed logs and existing or created debris. The machine would produce additional compaction and some displacement while turning, however, operation on debris along with the use of existing skid trails would keep additional compaction and displacement effects very low. Monitoring of grapple-piling operations on the Umatilla National Forest indicates detrimental soil impacts in the range of 0 to 2 percent.

When activities are complete, skid trails, landings, and exposed mineral soil would be seeded, waterbarred, and otherwise treated as needed to reduce soil erosion. Where appropriate, subsoiling would occur in heavily compacted areas (such as landings) to reduce compaction. The Timber Sale Officer would continuously monitor roads, landings, and trails for detrimental soil effects, halting any operation that is causing damage because of wet conditions. As a result, beneficial uses are not likely to be affected.

Hand thinning and juniper removal operations would have virtually no adverse impacts to soils. Nutrients would remain largely within the units. Burning, if prescribed, would occur from 1 to 3 years later, allowing for needles to fall from branches and reduce fire threat to residual trees. Piles in residual stands would be small enough that fire intensity from pile burning would not produce severe burning impacts on the soil.

Tree planting would have no direct adverse effect on the soil resource, as impacts would be limited to those from walking and planting with a shovel or similar implement. Indirect effects would be those related to transportation to and from the sites (road use) and associated effects from crews moving through the area.

Prescribed fire burn prescriptions for underburning would be designed to mimic low to moderate intensity fires. While these prescriptions would be designed to consume larger woody material on the surface, they would also be designed to have minimal effects to subsurface organic material, and would comply with down woody retention guidelines. Burning with designed prescriptions would minimize the impact to the protective surface mat reducing the exposure of mineral soil that could cause erosion from wind and rain.

Prescribed burning of large woody piles would affect surface soils and subsurface organic material immediately beneath piles. Piled concentrations of fuels would have a higher likelihood of severe heat levels. High temperatures and intensities from burning piles would expose mineral soil and sterilize areas immediately beneath burned pile sites, but would achieve acceptable results when prescriptions are followed. The extent of severely burned areas would be highly variable depending on the concentrations, numbers, location, fuel loadings, and burning conditions. Piles sites would measure an average of 12 feet by 15 feet each, with an average of 3.5 sites per acre in treated areas. Recovery would take an average of 3 to 5 years. Erosion would be restricted to burned pile sites. Release of nutrients from burning debris would allow utilization by vegetation and a flush of new growth.

Using existing roads to access activities could create some sediment if roads are used during wet conditions or dust is produced during dry conditions. This would be mitigated by dust abatement practices and other measures listed in the *Mitigation Requirements* section of this Environmental Assessment (page 44). Short-term erosion could occur with the increased (truck) traffic and there is potential for fine soil particles to move from the road surface during any concurrent heavy rain events.

ALTERNATIVE 3

In this alternative, all ground-based logging would be accomplished using full tree suspension yarding. This would substantially reduce the impact of harvest activities on soil disturbance and compaction to a total area of 60 acres. One study conducted in the Blue Mountains 15 miles southwest of Ukiah, Oregon, examined soil effects associated with ground-based, full suspension systems. The study demonstrated that the erosion hazard from exposed or compacted soil is low, and that localized soil displacement and slight increases in soil bulk density would have little or no impact on site productivity (McIver 1995). Another study revealed a 53 percent reduction in soil compaction on main skid trails using a full suspension system versus a conventional whole-tree harvest and skidder system, including a 26 percent reduction in soil disturbance (Society of American Foresters 1997). All other effects would be similar to those in Alternative 2, except the number of piles to be burned, and resulting soil disturbance from pile burning, would be less.

CUMULATIVE EFFECTS

Analysis of cumulative effects to soils is focused on the proposed salvage, commercial harvest and thinning units, and prescribed fire areas. These activity areas would receive most of the soil disturbance from proposed activities. Some other activities such as roads and prescribed fire are best viewed in a larger context such as subwatershed or total analysis area. These other activities will reuse previously disturbed land and are not relevant to discussions regarding additional soil disturbance concerns.

Evaluation criteria are as found in the Forest Plan (page 4-80) and updated with the Forest Service Manual's Region 6 Supplement 2500.98-1. Soil quality is maintained when soil compaction, displacement, puddling, burning, erosion, loss of organic matter, and altered soil moisture regimes are maintained within defined Forest Plan standards and guidelines on 85 percent of an activity area (excluding roads which are generally assumed to consume an additional 5 percent of the productive area of an activity unit). In addition, bare soil created due to management activities is considered by measuring effective ground cover remaining after cessation of soil disturbing activities.

TIMBER HARVEST

Appendix B of this Environmental Assessment lists documented previous timber sales in Bologna Basin. Prior tractor skidding on the proposed units is well recovered. Field assessments indicated the majority of proposed activity units have generally low levels of existing disturbance outside the road system with a few areas noted with remaining skid trails and landings evident. Most of the units proposed for harvest have had only one previous entry, and most of them have not had a timber harvest entry during the past 28 years. Considering the low level of existing detrimental soil conditions and the design, including mitigation measures of the proposed alternatives all alternatives would be able to meet the Forest Plan standard of maintaining a minimum of 80 percent of the soils in the proposed harvest units at an acceptable level of productivity.

ROADS/ROAD CONSTRUCTION

The total area of existing roads is about 99 acres of the analysis area. No new permanent road construction is proposed. Approximately 0.9 miles of temporary road construction is proposed. This would add about 2 acres of temporary road with reduced productivity potential and erosion hazard in the short term. Road maintenance activity generally has no effect to productivity issues and typically improves road drainage conditions such that potential sediment production is reduced if any problems were occurring prior to the maintenance.

Temporarily opening closed roads in the area will have not effect on soil productivity as the area in the roads is already considered out of production as long as they exist in present status. Reopening closed roads that have been stabilized and vegetated will produce the potential for increased sediment production from the road surfaces due to the renewed disturbance. Best

management practices and maintenance (and other mitigation) addresses this concern.

PRESCRIBED BURNING

Prescribed burning has been occurring on about 5,000 acres in the area on a 7-year rotation. Little to no evidence of detrimental soil impacts from prior broadcast burning is evident in the area. Prescribed burning over large areas in these vegetation types on this Forest generally produces a very small total area of severely burned soil comprised of numerous small spots (hundreds of square feet or smaller) or areas of a few acres in any one spot.

Planned burning on approximately half of the area would not be expected to produce detrimental burn severity in any large contiguous areas such that erosion hazard would be of concern. Severe burning area acreage or continuity would not be expected to be of long enough duration to compound any detrimental effects. Soil productivity can be improved in some burn situations as nutrients are more available after burning and the growth of microbes may be enhanced (Zasoski 1993).

Piling and burning can add additional detrimental soil condition due to machine traffic and high burn severity often found under larger piles (Umatilla Forest monitoring).

Future prescribed fire and thinning activities would be suitable if it is not possible to complete all desired treatments in this entry. Returning the area to a more natural low-severity/higher frequency fire regime would help to recover a greater soil resiliency. Several years of relative inactivity from ground-disturbing operations would allow natural processes to re-stabilize the area and restorative processes to continue.

GRAZING AND GRAZING DEVELOPMENTS

Grazing impacts to soils tend to be very broad in extent and limited in intensity outside of water developments and trails. In other words, highly disturbed areas are concentrated to gathering areas and trails. Conditions of this area due to changes in grazing management are showing improvement in vegetative cover and the amount of heavily impacted sites. Grazing impacts sufficient to exceed detrimental soil impacts criteria are not sufficient in extent to add a full percentage to detrimental soil conditions in any logical activity area (e.g. harvest unit, pasture). Certain of the water developments and riparian areas have concentrated impacts of concern but none that require additional discussion beyond that in the *Hydrology* and *Fish Populations and Aquatic Habitat* sections or elsewhere in this document.

OTHER ACTIVITIES

Present noxious weed treatments are not of sufficient extent or intensity to be of concern relative to soil resource issues. Maintenance of native plant species would generally be of positive value for erosion control and soil sustainability.

No residual effects of severe burning are evident or measurable from past wildfire. Little to no fire suppression related soil disturbance remains within the analysis area.

Past non-commercial thinning activities typically do not produce disturbance meeting detrimental thresholds as most of this work is done by hand. Any identifiable travel access routes would be detected in unit surveys.

Past and present activities on private or BLM land cannot reasonably be evaluated nor are they relevant to productive capacity or erosion concerns on Forest lands.

HYDROLOGY

This Environmental Assessment hereby incorporates by reference the *Hydrology Specialist Report* in the Project Record (40 CFR §1502.21). The *Hydrology Specialist Report* is located in the *Project Analysis* section of the Project Record and contains the detailed data, methodologies, analyses, conclusions, maps, references, and technical documentation that the Hydrology specialist relied upon to reach the conclusions in this Environmental Assessment. The analysis area for the Hydrology section includes the 18,220 acres of land within the Bologna Basin subwatershed.

EXISTING CONDITIONS

The Bologna Basin subwatershed drains into the main stem John Day River immediately downstream of Kimberly, Oregon. The Bologna Basin analysis area encompasses East and West Bologna creeks. West Bologna Creek is 6.8 miles long, with 3.3 miles on National Forest land. The portion of West Bologna Creek that falls within the Forest boundary is classified as a Class 3 stream, (bears water year-round, but no fish). East Bologna Creek is 7.2 miles long, with 4.4 miles on National Forest land. The lower 2.7-mile section located on National Forest land is fish-bearing and classified as a Class 1 stream (bears water year-round and supports ocean-migrating fish). The two forks join to form the main stem of Bologna Creek more than 2 miles downstream and outside of the Forest boundary.

The Bologna Basin analysis area covers 18,220 acres. Fifty percent of the analysis area is composed of lands that are managed by the USDA Forest Service (Table 40).

The entire analysis area is within the Lower John Day Sub-Basin. Elevation in the area ranges from approximately 1,800 feet at the confluence with the John Day River to 5,013 feet on Little Tamarack Butte, and slopes generally face southwest.

Within the analysis area, consumptive uses of surface water are:

- Livestock watering

- Firefighting
- Road construction and maintenance
- Wildlife

Fish and other aquatic species are the primary non-consumptive users of surface water. The primary downstream consumptive uses are irrigation, municipal, livestock watering, and industrial uses.

Table 40. Land Ownership within the Analysis Area by Subwatershed (Acres)

	Subwatershed		
Ownership	**West Bologna**	**East Bologna**	**Total**
USDA Forest Service	3,623	5,561	9,184
USDI BLM	1,614	270	1,884
Private	5,460	1,692	7,152
Total	10,697	7,523	18,220

WATER FLOW

The nearest stream gauging station with watershed characteristics similar to Bologna Creek is approximately 50 miles northeast of the analysis area on Camas Creek. The annual water flow (hydrograph) of Bologna Creek is similar to that of Camas Creek (Figure 15), but Bologna Creek has lower discharge and the peak flow occurs earlier in the spring because it has a lower elevation than Camas Creek.

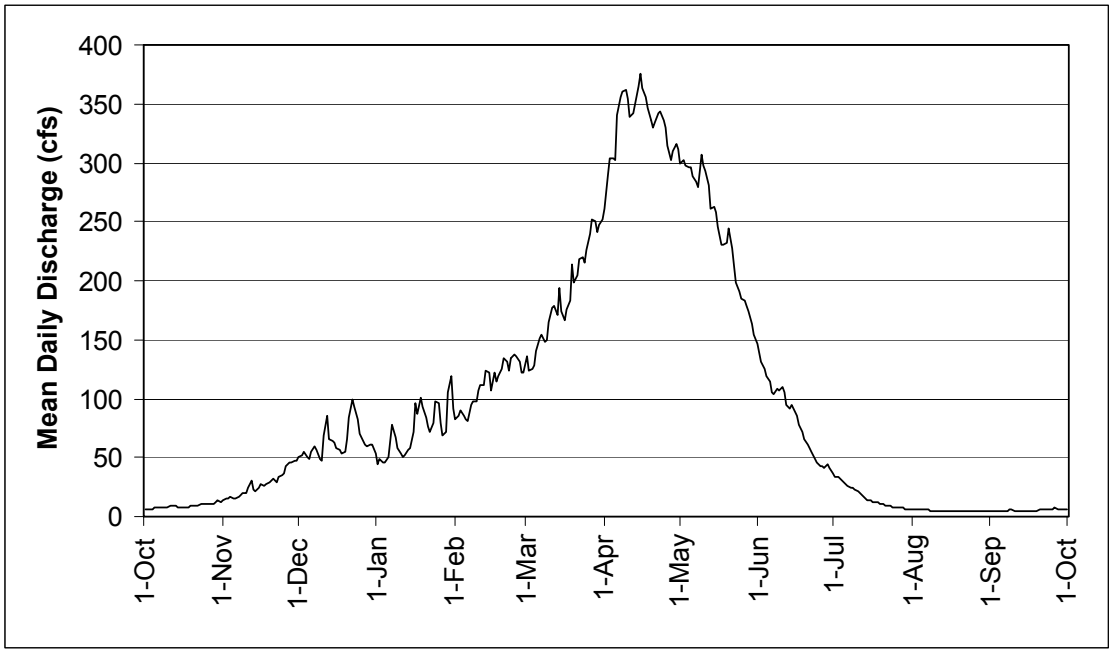

Figure 15. Mean Annual Hydrograph for Camas Creek, 1914 to 1990 (USGS Station 14042500)

Based upon stream flow measurements collected by the State of Oregon between 1914 and 1990, the mean annual water yield at the Camas station is equal to 10.77 inches of water distributed over the entire watershed (USGS 1991). Approximately one-third of the precipitation leaves the watershed as stream flow; the remainder is used by plants or soaks into the ground. The mean annual peak discharge is usually the result of rain-on-snow events.

Primary factors that affect watershed flows include climate, geology and soils (see *Soils* section), vegetation (see *Forest Vegetation* section), and recent watershed disturbances.

CLIMATE

Mean annual precipitation ranges from less than 15 inches at the mouth of Bologna Creek to 25 inches on Little Tamarack Butte. Most precipitation falls between November and June. Precipitation usually falls as snow during the months of December, January, February, and March, though rain-on-snow events frequently occur during December and January. Rain-on-snow events mainly affect the 2,500 to 4,500 foot elevations, and most of the analysis area is in that range. During July, August, and September, precipitation typically originates as isolated thunderstorms. Though rainfall intensity is usually low, isolated high intensity thundershowers do occur.

RECENT WATERSHED DISTURBANCES

DEFOLIATION BY TUSSOCK MOTH

The 2001 tussock moth outbreak is by far the greatest disturbance now evident in the analysis area. In 1972 and 1973, there was a large tussock moth outbreak in the northern Blue Mountains of Oregon. Thirteen percent of the South Fork Walla Walla River, 16 percent of the North Fork Walla Walla River, and 25 percent of the Upper Umatilla River were defoliated. Hydrology was studied for the years 1974 to 1976. There were no changes in water yield for the North and South Forks of the Walla Walla River. There appeared to be a change in 1974 for the Upper Umatilla, but this could not be statistically validated. Also, no changes in peak flows were detected (Helvey and Tiedemann 1978).

The effect of insect defoliation on forest shade is similar to the effects of logging, so impacts resulting from defoliation can be compared to impacts from harvest. The Umatilla National Forest studied the effects of logging on water yield in the High Ridge Evaluation Area, 100 miles northeast of Bologna Basin. The High Ridge watersheds are all basalt (as is Bologna Basin), but receive half again as much precipitation as Bologna Basin. In 1976, after a ten-year calibration period, timber was removed from 43 percent, 50 percent, and 22 percent of watersheds 1, 2, and 4, respectively. Watershed 3 was used as a control. Researchers did not find statistically significant changes in annual water yield following this treatment. In 1984, most of the remaining trees from watersheds 1 and 2, and an additional 38 percent of watershed 4 were removed. A small but statistically

significant increase in the average annual water yield was detected on watersheds 1 and 2 after the second entry. No change was detected on watershed 4. The authors concluded that forest removal had a minor influence on annual water yield from these watersheds (Helvey and Fowler 1995).

Helvey and Tiedemann (1978) found a possible change in water yield when 25 percent of a watershed was defoliated, and no changes in peak flows when 13, 16, and 25 percent of watersheds were defoliated. In the small watersheds studied by Helvey and Fowler, small changes in yield were detected after 100 percent of the area was clearcut.

Because of the moth outbreak and concerns about its effect on water yield and peak flows, an Equivalent Clearcut Acres analysis (Ager and Clifton 1995) was performed for this analysis to compare the relative effects of past and proposed logging, road building, and tussock moth defoliation on the two subwatersheds in the Bologna analysis area.

Prior to the tussock moth outbreak in 2001, based on past logging and existing roads, 1.4 percent of the Bologna analysis area remained in an equivalent to clearcut condition (98.6 percent of the area had recovered from previous activities). The tussock moth infestation defoliated an additional 5.6 percent, for a total of 7 percent equivalent to clearcut at the end of 2001 (Table 41).

Because the current proportion of equivalent clearcut acres for the whole watershed due to past harvest, roads, and defoliation is 7 percent, and the greatest proportion of equivalent clearcut acres for a single subwatershed is 9 percent, there is a low likelihood of immediate detectable changes in water yield have occurred because of defoliation (Table 41) (Fowler, Helvey, and Felix 1987; Harr et al. 1982; and Cheng 1989).

Table 41. Equivalent Clearcut Acres (ECA) by Disturbance Type for Bologna Basin's Forested Areas after Moth Outbreak of 2001

Subwatershed	Past Harvest[1]	20-Foot Roads	Tussock Moth	ECA	% of Subwatershed
West Bologna	2	58	196	256	9
East Bologna	3	42	221	266	6
Totals	5	100	417	522	7

[1]Although 944 acres have been harvested in this area since 1982, none have been harvested since 1988 and the forested areas had 99.5 percent recovered by 2001, leaving a total of 5 Equivalent Clearcut Acres as a result of past harvest by 2001.

FIRE HISTORY

The last major wildfire occurred in 1961. No persistent evidence of disturbance resulting from this wildfire exists in the analysis area.

GRAZING

Ninety-six percent (8,862 acres) of the Forest Service land in the analysis area is

grazed. Overall watershed condition has been improving under current grazing practices. The lower 3 miles of East Bologna Creek, on Forest, is fenced to exclude cattle. West Bologna Creek is in a very steep-sided canyon that physically excludes cattle from the riparian area.

TIMBER HARVEST

There has been no logging in the analysis area since 1988. In the 1980s, 52 acres were logged in West Bologna and 892 acres were logged in East Bologna. Most of this harvest left a fully stocked stand, though some harvest removed most or all trees within the cut area. The Umatilla Forest Plan requires that no more than 30 percent of the subwatershed area be composed of forest in the 0- to 10-year age class (Forest Plan, p. 4-77). In 2002, none of the analysis area was within the 0- to 10-year age class because of harvest, however, the tussock moth has affected approximately 6 percent of the area. Still this is well within the Forest Plan standard. Also, because none of the subwatershed is in the 0- to 10-year age class, and a total of 5 Equivalent Clearcut Acres remain from past harvest out of the 18,220 acres in the watershed, the watershed is not being affected by past timber management activities.

The effects of past timber harvest are discussed further in the Water Quality discussion (page 143).

TRANSPORTATION SYSTEM

There are 41 miles of classified roads on the Forest Service portion of the analysis area (Table 42). Of the roads in the analysis area, approximately 40 percent are open and 60 percent are closed. Some constructed roads in the analysis area have returned to nature through revegetation. Other closed roads that have not returned to nature continue to function hydrologically the same as open roads. For this analysis, all closed roads are assumed to function hydrologically the same as open roads.

Table 42. National Forest Roads in the Bologna Basin Analysis Area

	Road Miles				
Subwatershed	Open	Closed	Total	Road Area[1]	% of Subwatershed Roaded
West Bologna	7.82	15.91	23.73	0.089	0.54
East Bologna	8.80	8.50	17.30	0.065	0.56
Total	16.62	24.41	41.03	0.155	0.55

[1] Road area is in square miles based upon a 20-foot road width.

A review of literature shows that the effects of roads on annual water yield are variable and that no or very little increase occurred when less than 8 percent of the watershed area was in roads (King and Tennyson 1984). Several studies show that there may not be a statistically significant increase in average peak flows until approximately 12 percent of the watershed area is composed of roads

or other compacted area (Harr 1975). However, King and Tennyson (1984) measured a variable but statistically significant change in discharge rates after a smaller percentage of watersheds were affected by road construction. They showed a statistically significant increase of 30.5 percent in moderate discharge rates (25 percent exceedence flows) when 1.8 percent of one watershed was roaded and a statistically significant decrease of 29.4 percent in low discharge rates (5 percent exceedence flows) in small watersheds that had 4.1 percent of the area roaded. Four other watersheds that had 3.0 percent, 3.9 percent, 2.6 percent and 3.7 percent of the area roaded did not show statistical changes in the discharge rate. This study in north central Idaho only collected two years of post road-construction data, so the data set was too small to make more statistically significant conclusions. Since roads occupy approximately 0.55 percent of the Bologna Basin area at the subwatershed scale, roads alone are not likely to be causing a measurable change in the discharge rates. Effects of roads are further discussed in the *Water Quality* section.

WATER QUALITY

The water quality objective on the Umatilla National Forest is to maintain and improve water quality for all beneficial uses, fish habitat being the most limiting of these uses.

Sedimentation, temperature, and aquatic habitat (discussed in the *Fish Populations and Aquatic Habitat* section, page 155) are the primary water quality parameters that have been affected by past management activities. Road building, grazing, timber harvest, and burning have contributed to increased sediment in the analysis area. Road building, grazing, defoliation, and timber harvest have also contributed to a reduction in shade, and thus an increase in stream temperature. Reducing shade allows sunlight to heat streams more quickly than if they retain shade. This results in higher stream temperatures. Even so, none of the streams in the analysis area appear on the State of Oregon's 1998 303(d) list of Water Quality Limited Streams for any reason.

The results of particle size sampling (Wolman pebble counts[11]) within Bologna Basin streams are shown in Table 43. Silt-sized and smaller particles (less than 2 mm) cover large areas of the stream channel. Fine particles cover greater than 12 percent of the channel surface are associated with insufficient spawning gravels. This condition may limit cold-water fish populations because fish do not spawn in this size material. It is not known if this condition is the result of management activities or other conditions.

[11] Wolman pebble count: A method of measuring the size of the particles at the bottom of a stream.

Table 43. Wolman Pebble Counts for East and West Bologna Creeks (Surveyed on 4/29 – 4/30/02)

Reach	Percent Fines (<2mm)	Percent Fines (<6mm)
West Bologna Reach 1 p1	71	80
West Bologna Reach 1 p2	32	34
East Bologna Reach 1 p1	50	59
East Bologna Reach 1 p2	25	27
East Bologna Reach 2 p1	67	67
East Bologna Reach 2 p2	68	73

There are 3 channel reference reaches[12] on the Heppner District, one of which is on Wall Creek, 5 miles northeast of the analysis area. It was installed in 1995 and resurveyed in 1999. This site is scheduled for resurvey in 2004. There were no obvious changes in channel geometry in this short period, even though there were region-wide high water events in 1996 and 1997. While far from conclusive, this data infers that the channel is stable, even during high flows.

The general standard for stream temperature in the analysis area is 64° F. This standard is set by the Oregon Department of Environmental Quality under the Clean Water Act and is based upon requirements for fish habitat. Stream temperature is continuously monitored and recorded during the period from May to September with electronic hydrothermographs at two sites in the analysis area. The Oregon Department of Environmental Quality protocol is followed, and results are reported to the Department of Environmental Quality biannually. Seven-day maximum water temperatures for East and West Bologna creeks are shown in Table 44 and Table 45. These data show that the creeks meet the temperature standard.

Table 44. Annual Summary of Stream Temperature in East Bologna Creek (Degrees Fahrenheit)

Year	7-Day Max	Days >50°	Days >55°	Days >61°	Days >64°
2001	61	116	67	0	0
2000	61	95	78	10	0
1999	60	102	75	1	0
1998	59	96	73	0	0
1997	57	108	69	0	0
1996	N/A	N/A	N/A	N/A	N/A
1995	64	110	79	8	4

[12] Channel reference reach: A surveyed section of stream where channel cross-sections, longitudinal profiles, and substrate particle sizes are recorded. Periodic re-surveys may reveal changes in channel geometry caused by deposition and/or erosion of sediment. Channel reference reaches are designed to monitor changes over large areas of watersheds and long periods of time.

Table 45. Annual Summary of Stream Temperature in West Bologna Creek (Degrees Fahrenheit)

Year	7-Day Max	Days >50°	Days >55°	Days >61°	Days >64°
1992[1]	60	29	17	2	0
1993	56	92	41	0	0

[1] Recorder exposed to air temperature when pool dried up.

ENVIRONMENTAL EFFECTS

Analysis of effects was done at the subwatershed scale. The beneficial use in question is fish and aquatic habitat. The analysis considered effects on annual water yield, soil disturbance and the associated sediment, and stream temperatures. These factors have the potential to affect the beneficial use of fish and aquatic life. They were chosen because they are more likely to be affected by the tussock moth outbreak and the forest management activities proposed in this document. Water yield was analyzed quantitatively with the Equivalent Clearcut Acres model (Ager and Clifton 1995). The results of the model were compared with studies by Fowler and Helvey (1995), and Helvey and Tiedemann (1978) to draw conclusions about the magnitude, extent, and duration of effects to annual water yield. Sedimentation and stream temperature are analyzed qualitatively.

Figure 16 illustrates the Equivalent Clearcut Acre values for the Forest Service portion of the analysis area. It shows the existing condition (resulting from past harvest, roads, and defoliation) and projects the future effects of each alternative. Data includes field measurements and reports from stream surveys.

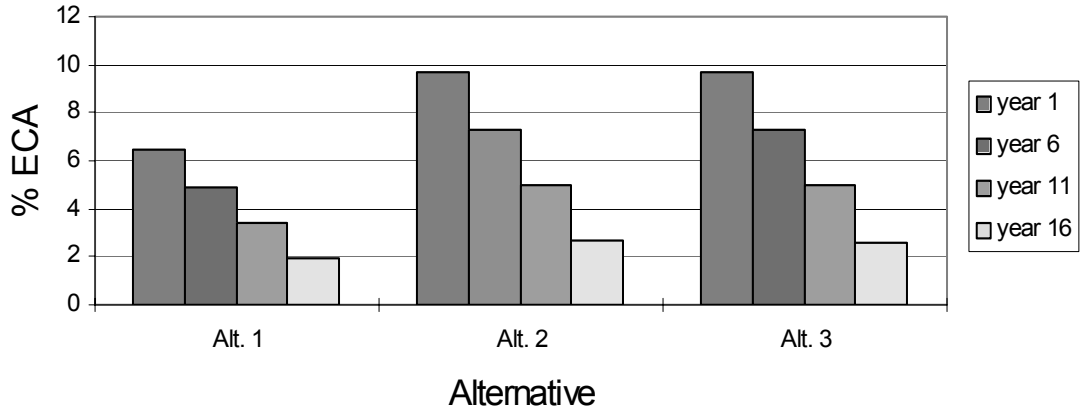

Figure 16. Percent Equivalent Clearcut Acres (ECA) in Bologna Analysis area for Selected Years after Harvest by Alternative

ALTERNATIVE 1: *NO ACTION*

DIRECT/INDIRECT EFFECTS

WATER YIELD AND PEAK FLOW

Climate, geology, and vegetation would continue to control water yield and peak flows at the landscape level. The effects of the defoliated condition of the approximately 6 percent of the area managed by the Forest Service would continue, and would not be measurable because of the small area that is affected (see *Project Record, Hydrology Specialist Report, Defoliation* section). It is likely that defoliation effects would similarly be unmeasurable off the National Forest. The competing effects of the condition of forest vegetation outside the historical range of variability (see *Project Record, Hydrology Specialist Report, Vegetation* section) would tend to balance each other out, and would not be noticeable in the two subwatersheds.

The effects on the Forest Service-managed portion of the area of past timber harvest, road construction, and insect defoliation are summarized in the equivalent clearcut acres analysis results. The equivalent clearcut acres for the Bologna watershed would be approximately 6 percent in 2003, considerably less than the lowest level at which effects were found by Fowler and Helvey (1995), and Helvey and Tiedemann (1978). The equivalent clearcut acres would fall to approximately 2 percent after 16 years Figure 16 shows the steady decline of equivalent clearcut acres over a 16-year period.

WATER QUALITY – SEDIMENT

Climate, geology, soils, streams, and vegetation would continue to control sediment processes at the landscape scale. Existing poorly designed and maintained roads such as the 2400140 would continue to supply a small but steady amount of sediment to area streams in the vicinity of crossings and ditches. On-going grazing on lands managed by the Forest Service in the area would be expected to continue a trend of gradual improvement in bank stability, with a decrease in sediment supply as riparian vegetation is restored. There has been no harvest on the National Forest portion of the area since 1988 and therefore, no land in the 0 to 10 year age class. With no land in this age class, there would be little likelihood that past harvest is contributing to stream sediment. There was a 5,000 acre landscape prescribed burn in 2000. It is unlikely that this low intensity fire had any direct effects on sediment, but indirectly the reduction in fine fuels reduces the rate of spread for future fires, which helps to protect soil from erosion.

WATER QUALITY – TEMPERATURE

Climate, geology, soils, streams and vegetation continue to control stream temperature processes at the landscape scale. Existing roads in riparian areas would continue to occupy tree habitat and thus reduce shade on streams. On-going grazing on lands managed by the Forest Service would be expected to continue a trend of gradual increase in riparian vegetation. Past harvest did

reduce shade on streams in the area. Since there has been no harvest on Forest Service managed lands for 15 years (since 1988), it is assumed that shade is recovering. There was a 5,000 acre landscape prescribed burn in 2000. There are no direct effects to stream temperature from this low intensity burn, but indirectly the reduction of fine fuels reduces the rate of spread for future fires, which helps to protect riparian shade.

ALTERNATIVE 2: *PROPOSED ACTION*

DIRECT/INDIRECT EFFECTS

The landscape processes and on-going activities described in Alternative 1 would continue.

WATER YIELD AND PEAK FLOWS

The underburning prescribed for this alternative would be of a low intensity. It is assumed that a few trees would be killed – in the range from 0 to 10 percent. The pile burning would be of a higher intensity in small spots, but piles would cover only about 20 percent of the area for pile burning, and piles would be constructed away from trees. Therefore the range of area of trees that would be killed by both the underburning and the pile burning is 0 to 10 percent. Ten percent of the burning acreage is 45 acres.

The salvage harvest would not have an effect because the trees are already defoliated. The commercial thinning, temporary road construction, non-commercial thinning, and juniper eradication would reduce the canopy by approximately 371 acres over a 3 year period (see Project Record, Hydrology Report). Remaining foliage would respond to the increased sunlight, and canopy recovery would be complete in 10 to15 years. There would be no direct effect to the canopy from road maintenance, but the indirect effect would be to keep the roads functioning as roads, and prevent their return to nature. The tree planting on 190 acres would add to the canopy and allow it to recover more quickly than without planting.

The temporary reduction in canopy on as many as 416 acres would be partially offset by the planting of 190 acres of trees in defoliated areas. Recovery is expected in 10 to15 years. Since such a small percentage of the area is affected, compared to the percentages at which (Helvey and Tiedemann, 1978) and (Fowler and Helvey, 1995) found effects, this alternative would not cause water yield and peak flows to change from their historic range.

A direct effect of the prescribed burning and timber harvest is that future uncontrolled fires would spread more slowly and have lower intensity than without this project. This would decrease the risk that future fires would affect the canopy enough to cause changes in water yield and peak flows.

WATER QUALITY – SEDIMENT

Because of the geology of the analysis area, there is a high background amount of fine sediment already in the streams and floodplains. Past management

activities, such as harvest, roads, and grazing have added a small amount to the background levels. In order for management activities to add sediment to streams, the soil must be laid bare, it must be eroded by wind or water, and it must be delivered to a stream. The activities in this project would avoid baring the soil as much as possible, and would re-seed it as soon as possible after use.

Forest monitoring has shown that the types of burning proposed in this alternative would typically expose 5 to 20 percent of the soil. Underburning is toward the lower end of the range, and pile burning is toward the upper end. Assuming a mid-level of 10 percent, the proposed burning would expose approximately 45 acres. The underburning would expose soil in a mosaic pattern. The pile burning would expose soil directly under the piles. Since the patches of soil would be discontinuous, there would be few long "runs" where water flowing overland could build up enough energy to erode large amounts of soil.

Also, there would be no burning in riparian areas. Because stream buffers would be 100 to 300 feet wide, it is unlikely that overland flow would carry sediment all the way across the buffers, so the burning would not add sediment to any stream.

The ground-based salvage harvest, commercial and non-commercial thinning, and juniper treatments would expose approximately 5 to10 percent of the soil in the units.

Harvester/forwarder systems would expose less soil, because they would suspend the logs above the ground. Also, harvester/forwarder systems would travel on top of the limbs that they remove from the logs, so they would be partially cushioned from the ground. Whole tree systems would expose more soil because the tree with limbs attached would be dragged by the machine. It is possible that some of this exposed soil would be mobilized by overland water flow. Mitigations to restrict steep slope operation and the crossing of swales would reduce the likelihood of eroded soil being transported. Since there would be no harvest or thinning in riparian areas, it is doubtful that any eroded soil would travel through a riparian buffer and enter a stream.

The temporary road construction and use of closed roads would expose no more than 2.5 acres of soil per mile. This soil could be mobilized by overland flow. However, it is unlikely that soil would be transported to a stream unless the road is within a riparian buffer. Being in a buffer would increases the chance of sediment reaching a stream. There is one such road proposed for use in this alternative, the road to unit 13. This road is proposed for use as a skid trail. Approximately 0.1 mile of this skid trail would be within the riparian area of an unnamed class 4 (intermittent) stream and would be used for yarding (hauling of logs to the road where they would be loaded onto trucks). The road currently has water bars. While the road surface is vegetated, the cut bank has some bare patches. The fill slope is fully vegetated and ends on the floodplain of the unnamed stream.

This road functions as a barrier to soil creep, overland flow, and soil

displacement that originates from small areas of instability above it. Using this road for heavy yarding vehicles would disrupt a portion of the vegetation and reduce the interception of sediment from above the road. Any effects on stream sediment would be very small and localized. Using filter cloth above and below the road would be effective in reducing sedimentation from overland flow if it is maintained by periodically cleaning trapped sediment and debris (see Mitigation #8).

The proposed road maintenance would reduce sedimentation. Maintenance would include shaping the road surface, which would reduce ruts and wash boards so they would be less likely to concentrate overland flow. Stored sediment would be removed from drainage structures so they would detain soil that is eroded in the future. Also, cleaning them would make them more efficient at conducting water into safe locations. Finally, post-harvest maintenance would include reconstruction of water bars and seeding, which would prepare the roads for future storms.

The proposed tree planting would have no effect on sediment.

An indirect effect of the prescribed burning and timber harvest would be that future uncontrolled fires would spread more slowly and have lower intensity than without this project. This would decrease the risk that future fires would expose enough riparian soil so that sediment is delivered directly to streams.

WATER QUALITY – TEMPERATURE

This alternative proposes prescribed under burning, pile burning, salvage harvest, commercial thinning, non-commercial thinning, juniper reduction, and tree planting. Since none of these activities would take place in the riparian areas, they would have no effect on stream shade or water temperature.

This alternative also proposes to open closed roads and construct temporary roads. These actions are also unlikely to affect stream shade, except for the road that is within a riparian area.

Using this closed road for a skidder trail would necessitate cutting a few small trees. This would reduce shade in the riparian area by a small amount but it would not have a measurable effect on water temperature.

Some road maintenance would take place in riparian areas, but this activity would not affect shade.

An indirect effect of the prescribed burning and timber harvest is that future uncontrolled fires would spread more slowly and have lower intensity than without this project. This would decrease the risk that future fires would reduce shade enough to raise stream temperatures.

CUMULATIVE EFFECTS

WATER YIELD AND PEAK FLOWS

The prescribed burning associated with this alternative is expected to kill as many as 45 acres of canopy. The timber harvest, non-commercial thinning,

juniper eradication, and temporary road construction would add 4 percent to the existing condition equivalent clearcut acres of 6 percent, for a total of 10 percent in the first year after harvest. In the 16 years after harvest, equivalent clearcut acres would decline to less than 3 percent, approximating the equivalent clearcut acres of the "no action" alternative. This equivalent clearcut acres reflects recovery from harvest and defoliation, and assumes that permanent roads such as the ones maintained by this alternative would not recover. Planting 190 acres of trees in the defoliated and salvage units would quicken the rehabilitation of the canopy.

The existing condition equivalent clearcut acres (6 percent) includes the effects of past timber harvest, defoliation, and existing roads on the public land portion of the analysis area that is managed by the Forest Service. It is assumed that the effects from these activities are similar on the land which is not managed by the Forest Service. Grazing is an on-going activity which is not included in the equivalent clearcut acres total. Riparian vegetation is improving under current Forest Service management plans. It is assumed that it is not recovering as quickly on the non-Forest Service land.

Another on-going activity is fire suppression. This activity is related to the condition of the vegetation, and creates a trade-off in water yield effects (Hydrology Specialist Report, Vegetation Section).

Other on-going activities include maintenance of aspen stands, recreation, and noxious weed treatments. These projects have no effect on water yield and peak flows.

A foreseeable future activity is a 5,000 acre landscape prescribed burn on the Forest Service-managed portion of the analysis area, scheduled for 2007. Forest monitoring has shown that these burns typically kill from less than 1 percent to 5 percent of the canopy. Assuming a mid range of 2.5 percent, this project would affect approximately 125 acres. When added to the 45 acres which would be killed by the prescribed burning in this alternative, and the projected equivalent clearcut acres of 10 percent, the total effected acres is considerably less than the 30 percent to 100 percent levels at which Helvey and Tiedemann (1978) and Fowler and Helvey (1995) found effects on water yield and peak flows.

Figure 16 shows the 16 year period during which equivalent clearcut acres are elevated because of this alternative. During this time, project effects would combine with background effects in any storm events. After this time, it is unlikely that project effects would combine with storm effects, because disturbance caused by this alternative would have recovered. The chance of a 100-year storm occurring during this 16-year period is approximately 16 percent, so the hydrologic risk of these activities contributing to the effects of a 100-year storm is 16 percent (after Van Haveren, 1988).

Other foreseeable future actions on the Forest Service portion of the area include aspen stand fencing at Bologna Springs. This future project would have no effect on forest canopy, because such a small area is involved.

Foreseeable future activities outside the analysis area, but in watersheds that eventually drain into the John Day River include the Rimrock Ecosystem Restoration Projects and the Bacon-Sunflower Project in the Wall Creek Watershed, north of the analysis area. Wall Creek is a tributary of the North Fork John Day River, which is the principal tributary of the John Day River. These projects propose to log approximately 6000 acres and prescribe burn approximately 32,000 acres, with proportional temporary roads, road opening, and reconstruction. There are also several watershed restoration activities included in these projects. There is another salvage project in Rail Canyon, east of the Bologna area. Rail Canyon is a tributary of Cupper Creek, which is tributary to the North Fork John Day River. The Rail Canyon Salvage involves approximately 67 acres with similar activities to those described in the Bologna Project. All three of these projects would affect the timber canopy. However, they are predominantly commercial thinning projects, and thus have less impact to the canopy than other types of harvest. The effects would be spread over a very large area. Because less of the sub-watersheds would be affected than the 30 to 100 percent levels at which Helvey and Tiedemann (1978) and Fowler and Helvey (1995) found effects it is unlikely that there would be changes in water yield and peak flows from those projects.

Since there would be no measurable effects in the analysis area of the East and West Bologna sub-watersheds, nor from the Wall Creek and Rail Canyon projects, there would also be no measurable effects in the watershed of the John Day River. For this reason, the activities analyzed in this alternative would comply with the Forest Plan requirements to follow the Clean Water Act.

WATER QUALITY – SEDIMENT

There is a large amount of naturally derived sediment in and around the area's streams. Past management has contributed a small amount. The road systems contribute more sediment than other management activities in forested watersheds. While the opening of a closed road in Alternative 2 carries a slight risk of contributing to stream sedimentation, the road maintenance in that alternative would reduce the sediment delivered to streams by the existing roads.

Bank stability on lands managed by the Forest Service appears to be improving under the new grazing management plans. On-going upland water source development construction would have an indirect beneficial effect on stream sediment, because they reduce cow clusters along live streams. On-going pasture and riparian fencing also have indirect beneficial effects because they assist range managers in better controlling the location of grazing.

Bank stability does not appear to be recovering as quickly on non-Forest Service range land. On-going burning, harvest, non-commercial thinning, road construction, and juniper eradication on non-Forest Service land in the Bologna analysis area is regulated by the Oregon Forest Plan, which restricts the introduction of sediment into streams.

On-going fire suppression activities such as line construction, both on and off the National Forest may create bare soil both inside and outside of riparian areas.

These fire lines are immediately rehabilitated when the danger is past, by water-barring, mulching, and seeding.

Other on-going activities included maintenance of aspen stands, recreation, and noxious weed treatments. These projects have no effect on stream sediment.

Proposed and on-going activities in the analysis area are planned to mitigate and/or restrict sediment production and delivery to streams.

A foreseeable future activity in the analysis area is the 5,000 acre landscape prescribed burn scheduled for 2007. Forest monitoring has shown that this type of burn typically exposes 5 to 10 percent of the soil area. Picking a mid-range of 7.5 percent, this burn is expected to cause 375 acres of bare soil in a mosaic pattern. It is likely that ignition of this future burn would not be allowed in the riparian areas, although fire could be allowed to backburn into these areas. Burns of this type are commonly lit after the first rains of the fall, and generally don't consume much fuel in the riparian areas, which have the higher fuel moistures and humidities. Since the burned patches would not be continuous, and since there would be little if any burned patches in the riparian areas, it is unlikely that any soil eroded from burned patches would be transported to area streams.

Foreseeable future activities outside the analysis area, but in watersheds that eventually drain into the John Day River include the Rimrock and Bacon-Sunflower projects in the Wall Creek Watershed, north of the analysis area. Wall Creek and two of its tributaries, Wilson Creek and Porter Creek are listed as water quality limited for sediment by the Oregon Department of Environmental Quality's 303(d) list. Because of this listing, there can be no increase in sediment to Wall, Wilson, or Porter Creeks. Wall Creek is a tributary of the North Fork John Day River, which is the principal tributary of the John Day River. These projects propose to log approximately 6000 acres and prescribed burn approximately 32,000 acres, with proportional temporary roads, road opening, and reconstruction. There are also several watershed restoration activities included in these projects. There is another salvage harvest project in Rail Canyon, east of the Bologna area. Rail Canyon is a tributary of Cupper Creek, which is tributary to the North Fork John Day River. The Rail Canyon Salvage involves approximately 250 acres with similar activities to those described in the Bologna Project. All three of these projects have the potential to increase stream sediment by creating bare soil. However, the projects are designed to minimize sediment delivery to streams. Also, they contain watershed restoration activities which would reduce sediment delivered to streams.

Since sediment effects are very unlikely in the analysis area of the East and West Bologna sub-watersheds, and from the Wall Creek and Rail Canyon projects, they would also be very unlikely in the watershed of the John Day River. For this reason, the activities analyzed in this alternative would comply with the Forest Plan requirements to follow the Clean Water Act.

WATER QUALITY – TEMPERATURE

The climate of the analysis area predisposes streams to high temperatures. Past timber harvest, road building, defoliation, and grazing have contributed to higher stream temperatures by reducing riparian shade. Opening the one closed road to Unit 13 in Alternative 2 would reduce stream shade by a small amount, but there would be no measurable change in stream temperature.

On-going grazing management plans are allowing riparian vegetation to improve on the National Forest. Off the National Forest, a watershed restoration plan has been proposed for a parcel of private land in Bologna Creek. The proposal is to re-introduce beaver. Because it lacks the support of the Oregon Department of Fish and Wildlife, this plan was not endorsed by the Monument Soil and Water Conservation District (Conley, 2004). On-going timber harvest, road construction, burning, non-commercial thinning, and juniper reduction is regulated by the Oregon Department of Forestry, and the removal of riparian shade is restricted.

Both on and off the National Forest, on-going upland water source development construction causes an indirect increase in riparian shade, by reducing cattle clusters along streams. On-going pasture and riparian fencing also benefit shade, because they allow range managers to better control the location of grazing.

Other on-going activities included maintenance of aspen stands, recreation, and noxious weed treatments. These projects have no effect on riparian shade.

Proposed and on-going activities in the analysis area are planned to mitigate and/or restrict the reduction of shade on streams.

A foreseeable future activity in the analysis area is the 5,000 acre landscape prescribed burn scheduled for 2007. Forest monitoring has shown that this type of burn typically kills from less than 1 percent to 5 percent of the canopy. However, it is unlikely that trees would be killed in the riparian area, especially since ignition would not generally be allowed along streams. Burns of this type are commonly lit after the first rains of the fall, and generally don't consume much fuel in the riparian areas, which have the higher fuel moistures and humidities. For these reasons, it is unlikely that stream shade would be reduced by this project.

Foreseeable future activities outside the analysis area, but in watersheds that eventually drain into the John Day River include the Rimrock and Bacon-Sunflower projects in the Wall Creek Watershed, north of the analysis area. Wall Creek and two of its tributaries, Wilson Creek and Porter Creek are listed as water quality limited for temperature by the Oregon Department of Environmental Quality's 303(d) list. Because of this listing, there can be no increase in temperature in Wall, Wilson, or Porter Creeks. Wall Creek is a tributary of the North Fork John Day River, which is the principal tributary of the John Day River. These projects propose to log approximately 6000 acres and prescribed burn approximately 32,000 acres, with proportional temporary roads, road opening,

and reconstruction. There are also several watershed restoration activities included in these projects. There is another salvage harvest project in Rail Canyon, east of the Bologna area. Rail Canyon is a tributary of Cupper Creek, which is tributary to the North Fork John Day River. The Rail Canyon Salvage involves approximately 67 acres with similar activities to those described in the Bologna Project. All three of these projects have the potential to reduce riparian shade. However, the projects are designed to have no effect on stream shade. Also, they contain restoration activities planting riparian vegetation.

Since increases in stream temperatures are very unlikely in the analysis area of the East and West Bologna sub-watersheds, and from the Wall Creek and Rail Canyon projects, they would also be very unlikely in the watershed of the John Day River. For this reason, the activities analyzed in this alternative would comply with the Forest Plan requirements to follow the Clean Water Act.

ALTERNATIVE 3

This alternative is similar to Alternative 2 except that all salvage and commercial thinning would be done with full tree suspension instead of a mixture of full tree suspension and whole tree yarding. This alternative would also not use the road to Unit 13 as a skid trail, in order to reduce stream sediment. It would also close 1.1 miles of Forest Road 2400140 (allowing only administrative use by permit only) that fords the east fork of Bologna Creek.

DIRECT/INDIRECT EFFECTS

WATER YIELD AND PEAK FLOWS

The direct and indirect effects to water yield and peak flows would be the same as Alternative 2.

WATER QUALITY – SEDIMENT

The effects of this alternative on sediment would be almost identical to Alternative 2 with the following exceptions: (1) the closed road to unit 13 would not be used, so the risk of sediment from that source would be eliminated; and (2) the closing of Forest Road 2400140 would allow vegetation to grow on the road surfaces, which would reduce the overland flow of sediment into the stream. Also, the channel banks where the fords are located could begin to stabilize, and further reduce sediment in the stream.

WATER QUALITY – TEMPERATURE

The effects of this alternative on stream temperature would be almost identical to Alternative 2 with the following exceptions: (1) there would be no reduction in riparian shade associated with opening the closed road to Unit 13, because that road would not be opened; and (2) closing the 2400140 road would increase the likelihood that vegetation would become re-established in the riparian area.

CUMULATIVE EFFECTS

WATER YIELD AND PEAK FLOWS

The cumulative effects of this alternative to water yield and peak flows would be the same as Alternative 2.

WATER QUALITY – SEDIMENT

The cumulative effects of this alternative to sediment would be almost identical to Alternative 3, with the following exceptions: (1) using the harvester/forwarder system exclusively would cause less soil exposure, and consequently less risk of soil erosion than using the whole tree yarding system for some units; and (2) closing the 2400140 road would slightly reduce the sediment delivered to the stream, and would allow the surface and channel banks to stabilize and vegetate.

WATER QUALITY – TEMPERATURE

The cumulative effects of this alternative to temperature would be almost identical to Alternative 3, with the following exception: (1) closing the 2400140 road increases the likelihood that vegetation would become re-established in the riparian area that this road traverses.

FISH POPULATIONS AND AQUATIC HABITAT

This Environmental Assessment hereby incorporates by reference the *Fisheries Biology Specialist Report* and Biological Evaluation in the Project Record (40 CFR §1502.21). The *Fisheries Biology Specialist Report* is located in the *Project Analysis* section of the Project Record and the Fisheries Biological Evaluation is located in the *Clearances* section of the Project Record. Both reports contain the detailed data, methodologies, analyses, conclusions, maps, references, and technical documentation that the Fisheries Biologist relied upon to reach the conclusions in this Environmental Assessment. The analysis area for the Fish Populations and Aquatic Habitat section includes the 18,220 acres of land within the Bologna Basin subwatershed.

EXISTING CONDITIONS

FISH PRESENCE

There are no known man-made barriers to fish passage in either East or West Bologna Creeks or the main stem of Bologna Creek. The main stem of Bologna Creek is 2.8 miles downstream of the Forest boundary on East Bologna Creek and 3.5 miles downstream of the Forest boundary on West Bologna Creek. The lower portions of both East and West Bologna creeks downstream and outside of the Forest boundary were surveyed by the Confederated Tribes of the Umatilla

Indian Reservation in 2001. Juvenile salmonids (redband/steelhead trout[13]) were found in isolated pools throughout the survey area. Habitat within the Forest has been surveyed by the Forest Service. The Forest Service conducted a Hankin and Reeves Level II stream survey on East Bologna Creek in 1993, from the Forest boundary upstream to the headwaters. Redband/juvenile steelhead trout were the only fish documented, and they only occurred in Reach 1 (from the Forest boundary upstream 2.1 miles to a tributary on the west bank below Forest Road 240820). Another survey was conducted by Forest Service personnel on April 29, 2002 to determine the presence/absence of Middle Columbia steelhead trout in East Bologna Creek (from the Forest boundary upstream for 2.5 miles). There was a lack of suitable steelhead spawning gravel throughout Reach 1 and no steelhead redds[14] or adults were observed. However, a pair of adult redband trout was observed building a spawning redd in smaller gravel approximately 1 mile upstream from the Forest boundary.

In 1991, West Bologna Creek was surveyed from the Forest boundary upstream to the headwaters using Hankin and Reeves Level II stream survey protocol. No fish of any species were documented in this survey. Another survey was conducted on April 30, 2002 to check for the presence/absence of Middle Columbia steelhead trout in Reach 1 (covering 0.5 miles). This survey did not detect any spawning redds or fish of any species. West Bologna Creek has an average gradient of five percent, with numerous small waterfalls and logjams. These waterfalls and logjams have 3- to 6-foot drops that are passage barriers to adult steelhead during low flows, and barriers to Redband trout/juvenile steelhead in that portion of West Bologna Creek above the Forest Boundary. The Camas Creek hydrograph in the *Hydrology* section (page 138) shows high flows occurring in Camas Creek in April and early May. Due to its lower elevation, the peak discharge in Bologna Basin occurs earlier than that and earlier than the time in which the 2002 Bologna Basin survey was conducted. There is also not enough flow during the spring high flow on West Bologna Creek for steelhead to navigate this portion of West Bologna Creek. The only time flows would be sufficient to allow steelhead in this portion of West Bologna Creek would be during episodic rain events during the summer months, when adult steelhead are not present.

Table 46 summarizes the results of these surveys. Only those species in which presence is documented, or for which suitable habitat exists, would be analyzed in this report.

[13] Redband trout and middle-Columbia steelhead trout are the same species. The redband trout is the non-ocean-migrating (non-anadromous) form. Unless there is a barrier that prevents upstream migration by steelhead, they are indistinguishable. In this case no such barriers exist.

[14] Redd: A spawning nest dug in the gravel of a streambed by salmonids.

Table 46. Existing Condition of Threatened, Endangered, and Threatened Aquatic Species in Bologna Basin

	East Bologna		West Bologna	
Species/Status	**Species Presence**	**Habitat Presence**	**Species Presence**	**Habitat Presence**
Middle Columbia Steelhead Trout (Threatened)	Not Present[1]	Present[2]	Not Present	Not Present
Bull Trout (Threatened)	Not Present	Not Present	Not Present	Not Present
Redband Trout (Species of Concern) (Sensitive)	Present	Present	Not Present	Not Present
Westslope Cutthroat Trout (Species of Concern)	Not Present	Not Present	Not Present	Not Present
Pacific Lamprey (Species of Concern)	Not Present	Not Present	Not Present	Not Present
Middle-Columbia Spring Chinook Salmon (Sensitive)	Not Present	Not Present	Not Present	Not Present
Columbia Spotted Frog (Sensitive)	Not Present	Present	Not Present	Not Present
Blue Mountain Cryptochian (Sensitive)	Not Present	Not Present	Not Present	Not Present

[1] Species has been documented in the analysis area downstream from National Forest Land.

[2] Habitat is suitable for juvenile stage of the species.

MIDDLE COLUMBIA STEELHEAD TROUT

The Middle Columbia steelhead trout (anadromous *Oncorhynchus mykiss*) was listed as Threatened on March 25, 1999 (USDC National Marine Fisheries Service 1999b). This species was also identified by the Forest Plan as a management indicator species for anadromous fish (Project Record, Fisheries Specialist's Report). Although surveys have found no indication that steelhead are present, suitable habitat for this species exists in East Bologna Creek.

Steelhead trout are an ocean-migrating form of rainbow trout. Juvenile Middle Columbia steelhead smolt after two years in freshwater and typically spend one or two years in the ocean before returning to freshwater to spawn. Middle Columbia steelhead enter fresh water in a sexually immature condition, requiring several months to mature and spawn. They are critically dependent upon the quality of the water and instream habitats, particularly for spawning and rearing. A critical feature of habitat quality is a stream's temperature, especially during summer conditions (Beschta 1999). For spawning, the preferred stream temperatures are between 39° and 49° F. The upper lethal temperature for steelhead trout is 75° F, while the preferred temperature range is 45° to 59° F

(Bell 1986, Beschta et al. 1987).

The John Day River is the "largest producer of wild, natural steelhead" in the Columbia Basin (Busby et al. 1996). The Oregon Department of Fish and Wildlife has done annual steelhead spawning surveys in the John Day River and its tributaries for the past 40 years. One adult steelhead was documented on East Bologna Creek at the Forest boundary in 2001 (Unterwegner, Personal Communication 2002). Middle Columbia steelhead have not been documented on National Forest land within the Bologna Basin analysis area. Steelhead redd numbers for the John Day River showed a declining trend in the 1990s, however redd counts for 2001 (5.1 per mile) are up from those numbers. The Oregon Department of Fish and Wildlife goal is 5.8 redds per mile (Unterwegner and Neal 2001).

REDBAND TROUT

Redband trout have been found in both East and West Bologna Creeks. Redband trout (*Oncorhynchus mykiss gibbsi*) is listed as a species of concern by the U.S. Fish and Wildlife Service. This species was also identified by the Forest Plan as a management indicator species (Project Record, Fisheries Specialist's Report).

Redband trout are the inland relative to the coastal rainbow trout with similar habitat requirements, however, it does not migrate to the ocean. Oregon Department of Fish and Wildlife and Umatilla National Forest fisheries biologists classify native resident rainbow trout in the Blue Mountains as redband trout. East Bologna Creek is the only stream within the Bologna Basin analysis area that supports populations of redband trout within the Forest boundary.

Resident redband trout select spawning sites on gravelly riffles[15], but generally seek shallower, slower water and gravels of smaller diameter than the anadromous rainbow trout. Successful reproduction by salmonids depends on an adequate supply of gravels with low sediment content (Everest et al. 1985). The temperature requirements for redband trout are similar to those for steelhead.

COLUMBIA SPOTTED FROG

The Columbia spotted frog (*Rana luteiventris*) is a candidate for listing as a Threatened and Endangered species by the U.S. Fish and Wildlife Service. It is also a listed species on the Regional Forester's Sensitive Species List. Although stream survey data for the Bologna Basin analysis area does not note the presence of this species, some spring habitat suitable for surviving the winter exists in East Bologna Creek within the analysis area.

Columbia spotted frogs are almost entirely aquatic in habit and use shallow, emergent wetlands associated with lakes, ponds, and slow-moving streams for

[15] Riffle: A shallow section of a stream or river with rapid current and a surface broken by gravel, rubble, or boulders.

rearing and clear cold springs for over-wintering.

RIPARIAN AND AQUATIC HABITAT

Healthy riparian areas are essential for maintaining quality fish habitat. Streamside vegetation stabilizes stream banks and channels and buffers the stream from sediment washed from upslope. Stream shade provided by the vegetation lessens solar heating of the stream. Vegetation also contributes large woody debris, which increases habitat diversity by creating pools, entrapping suspended sediment, and providing channel stability, organic nutrients, and cover.

Fish habitat condition is measured using a matrix of several important habitat components. Three condition levels are used in the matrix of important habitat components: "functioning appropriately", "functioning at risk", and "functioning at unacceptable risk." The three categories are defined for each component in the matrix. Components are "functioning appropriately" when they result in strong and significant populations that are interconnected. This level promotes recovery of a proposed or listed species or its critical habitat. When the components are "functioning at risk," they provide for persistence of the species, however, active or passive restoration efforts may be necessary to promote recovery. "Functioning at unacceptable risk" indicates absence or rarity of a proposed or listed species from historical habitat, and active restoration is necessary for species and habitat recovery.

Habitat parameters within the Bologna Basin subwatershed that are "functioning at unacceptable risk" are:

- Substrate embeddedness in West Bologna Creek
- Sediment
- Pool frequency and quality
- Refugia[16]

The indicators within the watershed that are "functioning at risk" are:

- Substrate embeddedness in East Bologna Creek
- Large woody debris in West Bologna Creek

The indicators within the watershed that are "functioning appropriately" are:

- Temperature
- Chemical contaminants/nutrients
- Physical Barriers
- Large woody debris in East Bologna Creek
- Wetted width/maximum depth ratio
- Road density and location

[16] Refugia: Locations within a stream system that allow a species or population to survive catastrophic events such as floods and fire.

- Riparian conservation areas

The habitat parameters for the Bologna Basin watershed indicate a subwatershed "functioning at risk." The aquatic habitat within the Bologna Basin subwatershed could provide for persistence of Endangered Species Act listed middle-Columbia steelhead. Several of these parameters would either not be affected by or are irrelevant to the proposed activities and would not be evaluated further in this analysis. These parameters include:

- Pool frequency and quality
- Refugia
- Large Woody Debris
- Chemical contaminants/nutrients
- Physical Barriers
- Wetted width/maximum depth ratio
- Riparian conservation areas

The habitat parameters that could be modified by the proposed activities and that would be tracked through this analysis include sediment, substrate embeddedness, temperature, and road density.

Factors that limit fish distribution and abundance within Bologna Basin include:

- Low summer flows
- Lack of connectivity between pools due to flows going subsurface
- Extreme fluctuations of flow due to intense, episodic thunderstorm events

Bologna Creek, (from its mouth to the headwaters) was not listed by the state of Oregon as a 303(d) stream for the parameters of flow modification.

SEDIMENT/SUBSTRATE EMBEDDEDNESS

Wolman pebble counts were taken in the spring of 2002 on West Bologna Creek and East Bologna Creek. These surveys indicate that the reaches in Bologna Basin are "functioning at unacceptable risk" for this component, because suitable sized spawning gravel for steelhead was lacking in all reaches measured. The percent of fines (pebbles less than 2 millimeters in size) ranged from 25 percent on East Bologna Creek, Reach 1, to 71 percent on West Bologna Creek, Reach 1. East Bologna Creek, Reach 2, had 67 percent fines (Table 43, page 144). For a reach to be "functioning appropriately," the reach should have less than 20 percent of surface fines less than 6 millimeters. However, fines could be overestimated because the Wolman pebble count assesses substrate distribution across both wet and dry sections of channel. The areas that were dry when the surveys were conducted may contain a higher proportion of fines.

TEMPERATURE

Water temperature data for both East Bologna Creek and West Bologna Creek indicate streams "functioning appropriately" for this parameter. For the past five years, the seven-day maximum temperature has not exceeded 64° F in East

Bologna Creek (Table 44, page 144), which is within the State of Oregon water quality standards for salmonids. Temperatures monitored in West Bologna Creek in 1992 and 1993 also did not exceed 64° F (Table 45, page 145). The temperature monitors were placed in deep pools in both streams. Since stream flow in both streams goes subsurface during the warm summer months, the contribution of cool ground water to pools plays a vital role in the survival of salmonids.

ROAD DENSITY

Road densities for the analysis area are shown in Table 47. Existing total road densities are below 1.5 miles of open road per square mile for both subwatersheds.

Table 47. National Forest Road Density in the Bologna Basin Analysis Area (miles per square mile)

	Road Miles			Subwatershed Area	Road
Subwatershed	Open	Closed	Total	(sq. mi.)	Density
West Bologna	7.82	15.91	23.73	16.71	1.42
East Bologna	8.80	8.50	17.30	11.75	1.47
Total	16.62	24.41	41.03	28.47	1.44

ENVIRONMENTAL EFFECTS

Stream sediment/substrate embeddedness, temperature, road density, and effects on aquatic populations, were used as indicators of the effects the alternatives. Table 48 summarizes the effects of the alternatives on aquatic populations.

Table 48. Summary of Effects of Alternatives on Threatened, Endangered, and Sensitive Fish and Aquatic Species

		Alternative		
Species	Status	1	2	3
Redband Trout	Sensitive	NI	NI	NI
Columbia Spotted Frog	Sensitive	NI	NI	NI
Middle Columbia Steelhead Trout	Threatened	NE	NE	NE

NI = No Impact

NE = No Effect

ALTERNATIVE 1: *NO ACTION*

AQUATIC POPULATIONS

This alternative would have no short-term effect on individual steelhead or redband trout and presently occupied habitat. This alternative would also have no short-term effect on potential habitat for the Columbia spotted frog. Long-term

impacts would result from the increased risk of high severity wildfire. If such an event were to occur, redband trout in the analysis area would likely be impacted by sediment mobilization, loss of stream shade, increased stream temperatures, and large wood input into the system. Such changes would also affect steelhead downstream of the project area in the main stem of Bologna Creek.

SEDIMENT/SUBSTRATE EMBEDDEDNESS

Landings and skid roads from past harvest activities have re-vegetated and are not contributing sediment to the streams. There are no on-going activities on private lands that are visibly contributing sediment to the system.

Under this alternative, ongoing activities such as livestock grazing, road maintenance, and road use would continue. Road use and maintenance, particularly of the ford on Forest Road 2400140 at the crossing of East Bologna Creek, would continue to send sediment into the stream. Grazing would continue to create some bank disturbance on portions of East Bologna Creek. This is contributing sediment into the stream. Fuel loads would continue to increase and stands in a densely stocked state would continue to increase in density with an increased risk of high severity wildfire.

TEMPERATURE

The stream surveys for West Bologna Creek (1991) and East Bologna Creek (1993) noted evidence of past logging in the riparian areas of Reach 1 of West Bologna Creek and Reach 2 of East Bologna Creek. The timber harvests removed some of the overstory trees. However, the overstory in the riparian areas is currently intact showing no effects to shade from these old harvest entries. These stands would continue to provide shade, unless a stand-replacement fire or insect outbreak occurs.

Grazing impacts were also noted in these stream surveys, with evidence of bank disturbance in the lower portion of Reach 1 in West Bologna Creek and in portions of Reach 1 of East Bologna Creek. The steelhead surveys conducted by Forest Service personnel in 2002 noted very little evidence of bank disturbance in portions of Reach 1 of East Bologna Creek, with some suppression of streamside vegetation from grazing. The pastures are in an upward trend, and the grazing impacts to the stream are diminishing. While there is private land adjacent to East Bologna Creek, as well as some private land adjacent to both East and West Bologna Creeks next to the Forest boundary, grazing on these lands is taking place on the uplands with no impact to streamside vegetation.

ALTERNATIVE 2: *PROPOSED ACTION*

AQUATIC POPULATIONS

The distance from occupied habitat and the lack of connectivity of proposed actions to occupied habitat would protect it from the proposed actions.

Therefore, salvage, thinning, juniper removal, and fuels treatments as proposed under Alternative 2 would have no effect on Threatened Middle Columbia steelhead trout, and no impact on Sensitive redband trout or Sensitive Columbia spotted frog (see Fish and Aquatic Species Biological Evaluation in Project Record).

SEDIMENT/SUBSTRATE EMBEDDEDNESS

The primary risk to fish or aquatic habitat in this alternative would be via effects to soils or hydrologic characteristics of the watershed, such as increased erosion and delivery of additional fine sediment to stream channels. Distance of the disturbance to the stream channel is the primary factor in how much sediment would reach the stream. Harvest would result in some soil disturbance, soil compaction, and removal of debris to the landing sites, which would cause some overland sediment transport. However, since PACFISH buffers (300 feet for Class 1 and Class 2 streams, 150 feet for Class 3 streams, and 100 feet for Class 4 streams) would be incorporated into unit layout and harvest would occur on slopes averaging less than 35 percent, no increase in sedimentation is expected.

Harvest would not require construction of new roads, reconstruction of existing roads, or culvert placement. Hauling of logs would only occur on established roads (State Highway 207, Forest Road 2400, and Forest Road 2408) when the roads are not saturated to reduce rutting and mobilization of sediment. Field review has indicated that all drainage ditches are functioning as designed. Forest Road 2408030 (currently closed) and Forest Road 2408020 (currently open) are the only roads proposed for log hauling that would cross a perennial stream (West Bologna Creek), and there would be no crossings of Class 1 (anadromous fish-bearing) streams. Forest Road 2408030 crosses West Bologna Creek in a non-fish bearing area, approximately 3 miles upstream from redband habitat and 5.5 miles upstream from steelhead habitat in Bologna Creek. Forest Road 2408020 is approximately 0.5 miles upstream from Forest Road 2408030. Forest Road 2408031 (a closed road that parallels West Bologna Creek) is outside of the Riparian Habitat Conservation Area. The riparian vegetation at these crossings is intact, and the distance upstream from occupied habitats is sufficient to negate any contribution of sediment to these areas.

Of the 0.3 mile of forwarder trail proposed to access unit 13, only 0.1 mile occurs within a Riparian Habitat Conservation Area paralleling a Class 4 stream (4 miles upstream from redband habitat and 6.5 miles upstream from steelhead habitat in Bologna Creek). This trail would make use of an old skid trail that is located as close as approximately 75 feet and as far as 200 feet upslope from the stream. Using this old skid trail as a forwarder trail would require the removal of an earth berm at the junction of Forest Road 2408020 and removal of waterbars. Logs would be yarded down this forwarder trail using a full tree suspension yarding method to a landing adjacent to Forest Road 2408020 with no impact to occupied habitat.

The closest units to East Bologna Creek (Class 1) are units 17, 18, 19, 20, and 33. These units are more than one river mile upstream from East Bologna Creek at the upper ends of Class 4 streams. Unit 8 is the closest unit to West Bologna Creek (a Class 3 stream on National Forest lands). It is upslope from a Class 4 stream and approximately 0.5 river mile from West Bologna Creek and 0.9 river miles from the Forest boundary. Unit 12 is 1.1 river miles upstream from the Forest boundary and upslope from a closed road (Forest Road 2408031) that is outside the Riparian Habitat Conservation Area for West Bologna Creek. Forest Road 2408031 would be opened to access the unit and it connects to Forest Road 2408030 (also to be opened for access). Road 2408030 crosses West Bologna Creek approximately 2.5 river miles upstream from the Forest boundary. Units 1, 2, 3, 4, 5, 6, 7, and 32, which are outside the C3 – Big Game Winter Range boundary, are upslope of Road 2408 and Road 2408010. These units would be accessible for winter harvest, with a permit from the District Ranger to use the roads. They are also above the headwaters of West Bologna Creek. Winter access to these units would involve no snowplowing or stream crossings within the Bologna Basin subwatershed. Non-commercial thinning would involve cutting and leaving the trees on site without using heavy equipment. There would be no effects to soil, so there should be no sediment yield increase, or resultant stress to fish from this activity.

Effects of fuel treatment could vary with proximity to streams and severity of the underburn. Prescribed burn parameters would be designed to produce low fire intensities.

Prescribed fires would likely expose small patches of bare soil outside of riparian areas, which could be subject to erosion at isolated locations. However, sufficient intact vegetation and duff layer would remain to effectively filter any mobilization of sediment before it could reach a stream channel, so there would be no effect to fish or fish habitat. Where debris would be piled and burned at the landings (whole tree yarding units), an erosion control plan (in the timber sale contract) would be implemented to prevent sediment mobilization. All landings would be outside of Riparian Habitat Conservation Areas and debris pile burn sites would be rehabilitated.

TEMPERATURE

No vegetation within the Riparian Habitat Conservation Areas of the subwatersheds would be disturbed during non-commercial thinning, juniper removal, commercial thinning, or salvage harvest activities. With no loss of shade trees expected, no increase in stream temperature would occur. Prescribed fire would not be ignited in Riparian Habitat Conservation Areas. Fire lines would be placed adjacent to Riparian Habitat Conservation Areas to keep fire within treatment units and protect shade providing streamside vegetation. Reducing the risk of a high severity wildfire would lower the risk losing shade and increasing stream temperatures.

ROAD DENSITY

Although this alternative proposes adding 0.9 mile of temporary road, resulting road densities would remain within Forest Plan standards and would not affect aquatic habitat.

ALTERNATIVE 3

The effects on aquatic species would be similar to those described in Alternative 2. There would be no effect on Threatened or Endangered species and no impact to Sensitive aquatic species or their habitat. Alternative 3 would have slightly less risk of affecting sediment and substrate embeddedness due to the sole use of full tree suspension yarding (or a system of equal or less soil impact). This alternative would also delete Unit 13 (associated with 8 acres of harvest, pile burning, and juniper release). As a result, the use of the 0.1-mile forwarder trail in the Riparian Habitat Conservation Area accessing Unit 13 would not occur, eliminating the potential for sediment input into the nearby unnamed tributary of East Bologna Creek. Alternative 3 would have the same effects on stream temperatures and road density as Alternative 2.

CUMULATIVE EFFECTS OF ALTERNATIVES 2 AND 3

The overstory in the riparian areas is intact, showing no effects to shade from the earlier entries for harvest. Effects to streamside cover from on-going activities of grazing, road maintenance, fire suppression, noxious weed treatment and fire suppression would remain the same. Foreseeable future activities would follow forest standards and guidelines and would have no effect to streamside shade. Proposed activities would not alter stream shade and so would not incrementally increase stream temperatures.

Existing roads in the analysis area would still contribute sediment (from road maintenance and use) to the stream systems. Effects from on-going grazing, noxious weed treatment, and fire suppression would remain the same. Landings and skid roads from past harvest activities have revegetated and are not contributing sediment to the streams. Therefore, these areas would not contribute to cumulative effects of this project. Since proposed activities would take place outside of Riparian Habitat Conservation Areas, these areas would remain intact and would effectively filter out any sediment that might result from those proposed activities before it could reach the stream channel. Activities on private in-holdings within the analysis area are not contributing sediment to the stream systems and would not contribute to the cumulative effects of this project. Since the proposed activities would not increase sediment input to the streams, sediment input and substrate embeddedness resulting from past or present activities would remain the same. The risk of a high intensity wildfire and resulting damage to stream systems would be reduced. Foreseeable future activities would follow forest standards and guidelines and would result in no increase in sediment input to the streams.

Because the proposed activities would have no effect on sensitive aquatic habitat elements, there would be no cumulative effects on Proposed, Endangered,

Threatened, or Sensitive aquatic species as a result of either action alternative.

NOXIOUS WEEDS

This Environmental Assessment hereby incorporates by reference the *Noxious Weeds Specialist Report* in the Project Record (40 CFR §1502.21). The *Noxious Weeds Specialist Report* is located in the *Project Analysis* section of the Project Record and contains the detailed data, methodologies, analyses, conclusions, maps, references, and technical documentation that the Noxious Weeds specialist relied upon to reach the conclusions in this Environmental Assessment. This Environmental Assessment is also tiered to the 1989 Mediated Agreement for the Final Environmental Impact Statement for the Management of Competing and Unwanted Vegetation. The analysis area for the Noxious Weeds section includes only the 9,184 acres of National Forest land within the Bologna Basin subwatershed.

EXISTING CONDITIONS

Disturbance (whether management induced or not) of soil and vegetation creates habitat for, and often a vector of, dispersal for noxious weeds. Noxious weed infestation and expansion has the potential to profoundly alter ecosystem functions and processes (Hann, et al. 1997, pp. 784-785). Dry forests representative of the type in which the project area occurs are particularly susceptible to noxious weed infestation. Existing inventories indicate that the following high priority noxious weed species occur within the Bologna Basin analysis area (Figure 17):

- Diffuse knapweed (*Centaurea diffusa*)
- Scotch thistle (*Onopordum acanthium*)
- Klamath weed (*Hyupericum perforatum*)

These species are rated as high priority weeds because they are invasive, persistent, and prolific reproducers. They displace desirable vegetation, and presently occur in infestations at scales that are feasible to treat. It is assumed that more infestations actually occur than are inventoried. These high priority sites, treated on an annual basis, are either decreasing or are remaining static. Primary mechanisms of dispersal appear to be road vehicles, bird excrement, recreationists, wind, logging equipment, and water.

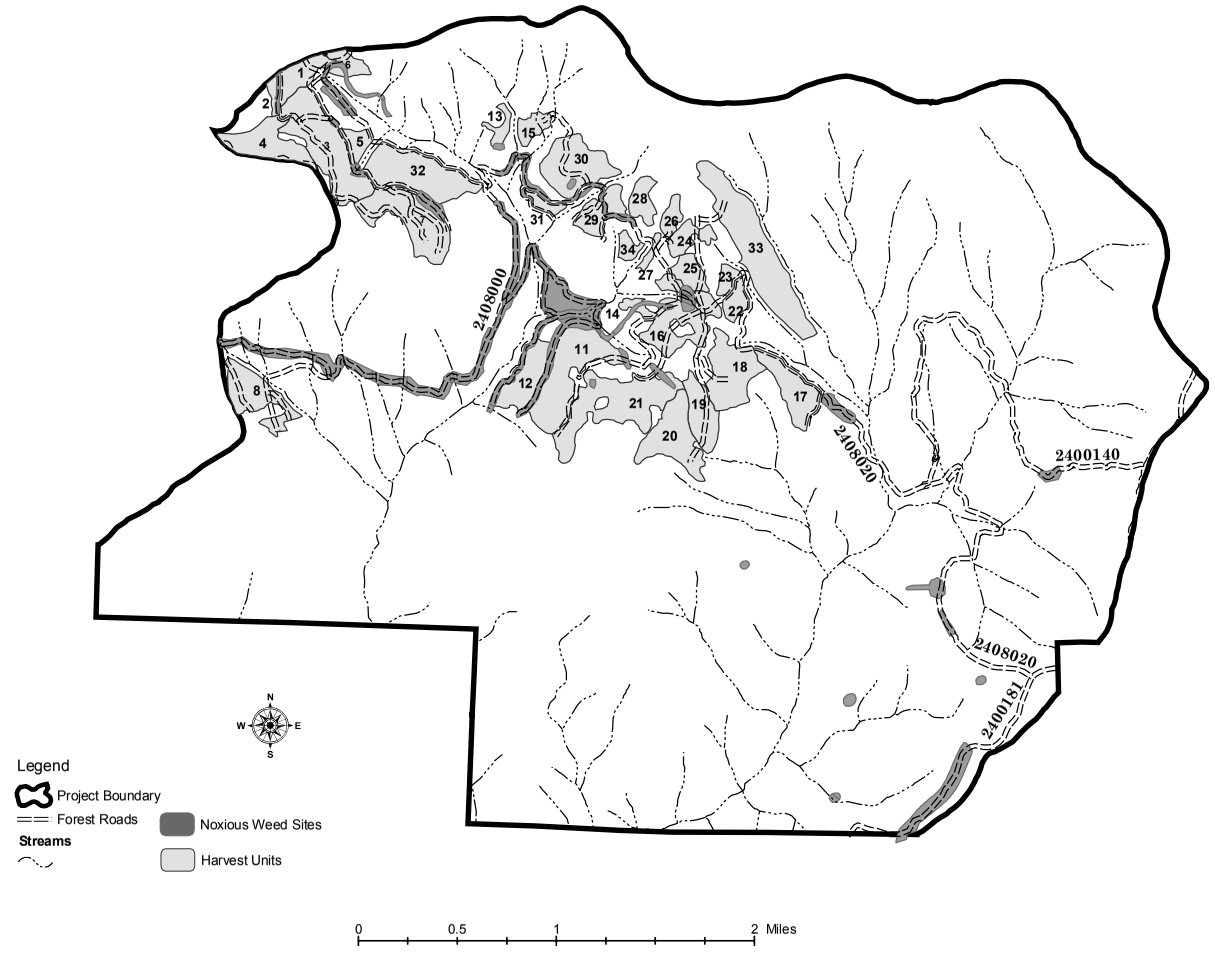

Figure 17. Areas of Inventoried Noxious Weed Infestation

Transportation corridors and recreation sites are the focal points of noxious weed infestations on the Heppner Ranger District. Distribution of diffuse knapweed is along well-traveled roads, particularly the Heppner-Monument Road (Forest Road 2200). Scotch thistle is becoming increasingly abundant on the District, especially along main roads (Forest Roads 2200, 2400, and 2406) entering the Forest from adjacent private agriculture lands. Klamath weed, also located mostly along roads, is on a downward trend. However, the potential for the introduction and establishment of any of the high priority noxious weeds species is considerable. Due to their mobility, the currently occurring noxious weed species can be transported great distances.

Some other noxious weed species that occur within a relatively short transport radius of the project area include:

- Russian knapweed (*Centaurea repens*)
- Dalmation toadflax (*Liniara dalmatica*)
- Yellow star thistle (*Centaurea solstitialis*)
- Yellow toadflax (*Linaria vulgaris*)
- Spotted knapweed (*Centaurea maculosa*)

District records do not provide information in sufficient detail to identify specific weed sites by species.

ENVIRONMENTAL EFFECTS

Effects of the alternatives on the spread of noxious weeds were estimated by reviewing district records that provide information on the expansion of weed sites and past trends. The risk of noxious weed infestation was estimated by how existing noxious weed infestations would be deterred under these projects and the potential for the introduction of new noxious weed populations.

ALTERNATIVE 1: NO ACTION

Alternative 1 would not create any new disturbance. Existing vegetation would continue to cover the soil, blocking invasion by noxious weeds and competing with existing weeds for nutrients, water, and space. Known populations would be treated as described in the 1995 Umatilla National Forest Noxious Weed Management Plan. Spread of noxious weeds would be limited to currently open roads. No changes in vehicular use or abundance would occur, so spread of noxious weeds would continue at the current rates.

ALTERNATIVES 2 AND 3

Commercial thinning and salvage harvest would cause soil disturbance and compaction on an estimated 8.6 percent of the area treated by Alternative 2, and 6 percent of the area of Alternative 3. This would result in a moderate to high potential for the introduction of off-site noxious weed seed and its establishment. Quantitative estimates of the effect of these actions would depend upon the level of soil disturbance caused by the actions and the availability of seed source at

the times and places these disturbances would occur. Other things equal, the lower the level of soil disturbance, the less risk of establishment of weed populations. Therefore, Alternative 3 would have less risk of noxious weed population establishment.

Non-commercial thinning would cause low to negligible intensity of site disturbance, and a moderate potential for the introduction of off site noxious weeds. This moderate potential exists because of the risk of contractors bringing in noxious weed seeds to treatment areas. The incorporation of mitigation measures in Chapter 2 of this document would greatly reduce the potential for the introduction of off-site noxious weeds and therefore, reduce the risk of noxious weed infestation associated with this activity to negligible levels.

Implementation of all the activities would increase vehicular use within the analysis area and off-road machinery would be more likely to pick up noxious weed seed from off-site sources. Road reconstruction, maintenance activities, and construction of temporary access involves high-intensity ground disturbance, and would pose a moderate to high potential for the introduction of off-site noxious weeds. Under the action alternatives, about 9.9 miles of closed road would be temporarily re-opened and 0.9 miles of temporary access would be constructed and used for the duration of implementation (up to 5 years). The resulting ground disturbance would increase the potential for the importation of off-site weeds.

Both action alternatives would incorporate the mitigation measures listed in Chapter 2 (page 44) of this document. The identified mitigation measures include:

- Pre-implementation treatment of known weed populations
- Increased recognition of noxious weed species by contractors and administrators
- Early treatment strategies (manual methods) for new infestations as defined in the Umatilla National Forest Noxious Weed Management Plan
- Annual monitoring for noxious weed infestations

These mitigation measures would limit both the intensity and amount of ground disturbance and dramatically reduce the amount of time until vegetative recovery occurs to provide deterrence to noxious weed infestation. Even with the incorporation of an extensive prevention strategy, there would still be some small risk of noxious weed infestation associated with these proposals.

CUMULATIVE EFFECTS

The effects of past and present management activities including logging, grazing, and recreation were considered in the above analysis of direct and indirect effects of the action alternatives. This is true as the effects of past and present management activities have resulted in the current condition of the project area. The above analysis of effects estimates the result of further activity as defined by the action alternative. Reasonably foreseeable future activities within the project

area under analysis would include further grazing by domestic livestock, dispersed recreational activities, and firewood cutting.

The primary risk of foreseeable future activities is the high potential of introduction of noxious weed seed to areas of ground disturbance associated with Bologna Basin Planning Area activities. The incorporation of the mitigation measures which provide for inspection, improved recognition of noxious weed species and early treatment of noxious weed infestations would be expected to dramatically reduce the possibility of project-induced establishment of new noxious weed populations within the project area.

ECONOMICS

This Environmental Assessment hereby incorporates by reference the *Economics Specialist Report* in the Project Record (40 CFR §1502.21). The *Economics Specialist Report* is located in the *Project Analysis* section of the Project Record and contains the detailed data, methodologies, analyses, conclusions, maps, references, and technical documentation that the Economics specialist relied upon to reach the conclusions in this Environmental Assessment.

EXISTING CONDITIONS

The affected economic area or impact zone for the Umatilla National Forest consists of Grant, Morrow, Umatilla, Union, Wallowa, and Wheeler counties in Oregon, and Asotin, Garfield, Columbia, and Walla Walla counties in Washington. These counties are encompassed within the Pendleton and Spokane Bureau of Economic Analysis regions. Agriculture, manufacturing (particularly wood products), and food processing are important sources of employment and income in this region. Grant County, where the project is located, is one of several counties in the impact zone that has a low level of economic diversity, a high dependence on federal timber and forage, and a low resiliency for change (Haynes et al. 1997).

Many communities in the impact zone are closely tied to the Forest in both work activities and recreation. Several communities such as Heppner, Ukiah, Fossil, Canyon City, and Enterprise are geographically isolated from the closest larger cities such as Pendleton, Walla Walla, and La Grande (Reyna et al. 1998). This isolation limits options for local workforces. Refer to the *Umatilla National Forest, Land and Resource Management Plan, Final Environmental Impact Statement*, Appendix B, for further detailed description of the main social and economic characteristics of the area (USDA 1990).

ENVIRONMENTAL EFFECTS

The social and economic effects of the various proposed management alternatives were assessed in terms of viability of timber harvest, employment and local income created, economic efficiency as measured by present net value

(Table 49).

Viability of timber harvest was determined using the tentative advertised bid rates per hundred cubic feet (dollars per Ccf)[17]. This estimate was based on estimates of volume, species, amount of sawtimber and nonsaw material, logging systems costs, haul costs, road maintenance costs, contractual costs, erosion control and other developmental costs, temporary road costs, and the value of timber proposed for removal. The preliminary value of the timber was based on the prices for the same species and material of all sales actually sold within Appraisal Zone 3 (primarily Blue Mountain forests) within the last 12 months. An initial bid rate was determined by subtracting the costs associated with logging from the base period prices adjusted for the quality of the material and current market conditions. This rate was further reduced per current appraisal methods (Transaction Evidence Appraisal) to allow for competition between bidders to determine the tentative advertised bid rate. The computer software program, TEA_ECON was used for this analysis.

Employment and income effects were derived from response coefficients from the input-output model, IMPLAN (Impact Analysis for Planning), for the Umatilla National Forest impact zone and from the forest-level Timber Sale Program Information Reporting System (TSPIRS) analysis in fiscal years 1996 to 1998 (USDA 1998, USDA 2000). The analysis assumed that all harvesting would occur over the next two years. Job estimates are based upon a linear proportional relationship between harvest volumes and manufactured output, assume no substitution, price, or output elasticities, and include temporary, permanent full-time, and part-time employment. Employment effects from recreation and domestic-livestock grazing activities were not analyzed because the level of use was not expected to change by alternative. The estimates also do not include unpaid family workers or sole-proprietors. The estimates provide a relative comparison of jobs supported by the alternatives to communities and counties in the regional impact zone and not necessarily to any one county. Table 49 summarizes the employment and income effects from timber harvesting by alternative.

Economic efficiency was determined following direction in Forest Service Handbook 2409.18. An economic efficiency analysis was completed that focused on identifiable and quantifiable ecosystem benefits and costs for each alternative in terms of the present net value (benefits minus costs) to assess which alternative comes nearest to maximizing net public benefits (36 CFR §219.3). Measurable and quantifiable costs at the project level included costs to the Forest Service for preparing and administering the salvage and commercial thinning, and implementing the other activities as listed in Chapter 2 of this document. All dollar values were discounted in terms of the present net value (2003 dollars) and the real (exclusive of inflation) discount rate of 4 percent over the planning period was used. This method provides only a partial measure of

[17] Volumes in board feet are converted from thousan board feet to hundred cubic feet at the regional conversion factor of 1 Mbf / 0.52 = 1.923 Ccf.

the full range of ecosystem values in equal terms for assessing economic tradeoffs. Non-economic values (such as clean water or native forest stands) are necessarily assessed in terms relevant to other disciplines such as ecology or ethics. Changes in ecosystem services must be measurable and quantifiable in like terms, preferably monetary measures, in order to assess a relevant change in economic value (Bergstrom and Loomis 1999). Refer also to the Umatilla National Forest, FEIS, Appendix B, for a comprehensive quantification of the net public benefits for the Forest Plan (USDA 1990).

Table 49. Projected Employment Effects, Income Effects, and Present Net Value of the Bologna Basin Salvage

		Alternative		
	Coefficient	**1**	**2**	**3**
Volume (Ccf)		0	11,512	11,358
Direct Employment	0.0029 jobs/Ccf	0	33	33
Indirect Employment	0.0018 jobs/Ccf	0	21	20
Total Employment		0	54	53
Direct Income	$83.48/Ccf	0	$961,000	$948,000
Indirect & Induced Income	$54.12/Ccf	0	$623,000	$615,000
Total Income		0	$1,584,000	$1,563,000
Present Net Value		0	-$43,000	-$76,000

ALTERNATIVE 1: *NO ACTION*

No contribution to direct, indirect, or induced employment and income associated with timber harvesting would result from the project. Alternative 1 would not produce any revenue or benefits to wood products industries. The public would incur no costs, nor realize any benefits of timber harvest in this area. However, ongoing costs associated with management of the area, including the continuation of economic losses in stand values from recurring forest health problems, would continue.

Declining trends in timber harvesting from National Forest lands would continue in the future and contribute to declines in wood products employment over the next two decades. Changes in the economic base and wood products infrastructure for the impact area would also continue to be influenced by fluctuations in market prices, international market conditions, changes in technology, and industry restructuring.

Alternative 1 would yield a present net value of zero. However, this value ignores the risk of wildfire and the resulting losses in timber values and nonmarket benefits. Data limitations do not allow for the quantification of this risk. However, this risk would negatively affect present net value.

ALTERNATIVES 2 AND 3

VIABILITY OF HARVEST

Both action alternatives would produce positive bid rates indicating that the project would provide a viable harvest proposal. Based on this analysis, Alternative 2 would provide $550,014 (or $47.79 per Ccf). The bid for Alternative 3 is 7 percent lower than Alternative 2 at $509,141 ($44.81 or 9 percent lower per Ccf). This lower value is primarily due to the exclusive use of the higher-cost harvester/forwarder logging system required in Alternative 3. Estimates for tentative advertised bid rates for alternatives 2 and 3 are within the range of rates experienced by the three Blue Mountain forests (Malheur, Umatilla, and Wallowa-Whitman) within the last two years (Hancock 2003). Advertised bid rates have fluctuated over the last few years reflecting the volatility of the market for timber.

EMPLOYMENT AND INCOME

The primary effect on timber harvest-related employment would occur from commercial harvesting associated with the alternatives over the next two years. Financially viable sales would be necessary to provide opportunities for timber-harvest related employment. Levels of harvest volume by alternative would affect employment and income in several ways:

- directly - (employment associated with harvesting, logging, mills and processing plants for sawtimber, pulp, chips, veneer and plywood)
- indirectly - (industries that supply materials, equipment, and services to these businesses)
- induced - (personal spending by the business owners, employees, and related industries)

Alternative 2 would support 54 jobs over the 2-year period, while Alternative 3 would support 53 jobs during the same time. Direct, indirect, and induced income provided to the target area by Alternative 2 would total $1.58 million and $1.56 million by Alternative 3. The overall employment and income effect from the action alternatives would continue to support the wood products manufacturing component of the economic base of the impact area. Any individual county or community in the impact area could experience greater benefits in the short-term (2 to 3 years), particularly the communities very highly specialized in wood products manufacturing.

ECONOMIC EFFICIENCY

Both action alternatives illustrate a negative present net value based on discounted revenue received from the project compared to the discounted total dollar-quantified costs for the project. Planning costs associated with the project have already been incurred regardless of the alternative and are not included in the calculation. Alternative 2 would produce a net present value of -$43,000. This is due primarily to the lower cost harvest system (whole tree yarding) on 42

percent of the project area. Alternative 3 would produce a lower net present value of -$76,000. Costs for restoration and mitigation projects associated with the action alternatives would be similar under both alternatives (approximately $212,000).

Market benefits that may occur as a result of the proposed activities include increases in forest productivity and value for the remaining trees by eliminating competitive stress and reducing the risk of growth-limiting insect attack.

Non-market benefits include reductions in wildfire risk to federal and adjacent private lands, lowered risk of watershed damage from wildfire, and increases in forage to grazing animals and wildlife species. In addition to use values, existence values otherwise referred to as passive, nonuse, or preservation values may capture important economic value to the public (Swanson and Loomis 1996). Although these benefits are important components of the ecosystem services provided to humans, the production relationship between ecosystem functions and ecosystem services (such as changes in recreation visitor days, fishing days, animal unit months, or fish population) is not well defined or measurable at the project level in terms that provide meaningful comparisons of equal dollar values.

CUMULATIVE EFFECTS

Several factors would influence the ability of any one county or community to experience the largest extent of the harvest-related employment and income effects. The financial viability of the timber sale proposals would influence whether potential purchasers closest to the project area could be competitive with other purchasers to acquire the majority of the supply of wood. Changes to bid rates would likely occur during appraisal depending on actual market conditions at that time. Employment projections would depend on other factors such as market conditions, quality and quantity of the volume offered for sale, timing of the offerings, and financial conditions of local firms.

The distribution of economic impacts would depend on the location of the timber purchaser awarded the contracts at the time of the sale, the availability of equipment and skills in the impact area, and the location and availability of the wood processing facilities and related infrastructure. Given the size of the potential volume compared to offerings in the last year from National Forest System lands across the Blue Mountains, several mills located in other counties in Northeast Oregon would be potentially interested in the supply of wood offered. Processors outside of Northeast Oregon would potentially bid on the sales and distribute the jobs and income effect to other counties in the Blue Mountains or outside of the area entirely.

Annual timber-related employment supported by timber harvested from the Umatilla National Forest for the years 1995 to 1997 averaged 394 jobs. Employment supported by harvest activities in both action alternatives would support approximately 14 percent toward this level of annual employment. Other employment would continue to occur as a result of other timber sales in progress, domestic livestock grazing, and recreation activities, and other special use

receipts across the Forest. Commercial collection of nontimber forest products such as mushrooms could continue to occur although the quantity of harvest is unknown. In addition, other employment opportunities would also be provided by the other proposed activities and would depend on the level of funded projects.

Potential cumulative economic effects were not quantified in economic terms due to the limitations of measuring the production relationship between ecosystem functions and ecosystem services at the project level. However these effects would result from the following:

- An increase in forest productivity resulting from improved forest composition, structure and function
- A reduction in the risk of insect attack that would kill trees or limit their growth
- A reduction in the risk of wildfire and its effects (decreased water quality, increased erosion, losses of terrestrial and aquatic habitat)
- A reduction in wildfire risk to adjacent private lands

Other potential qualitative economic benefits or costs from the alternatives include changes to the diversity, quality, and quantity of wildlife habitat for both game and nongame terrestrial species. Closing Forest Road 2400140 all year under Alternative 3 would inconvenience hunters and other forest users, since it is a drivable loop now. However, vehicle access would still be possible by using other routes, and pedestrian access would remain intact. With respect to big-game populations, the economic value of hunting would depend on how changes in population levels and spatial distribution of game animals affect either the quality or intensity of the hunting experience. Consequently, the overall level of hunting would change with corresponding economic impacts from hunting-related expenditures. Changes in nongame population levels and diversity would affect wildlife viewing, photography, and other nonconsumptive uses of the area. Refer to the *Terrestrial Wildlife* section of this Environmental Assessment for further discussion of effects to these resources.

VISUALS

EXISTING CONDITIONS

People see virtually all National Forest Lands from somewhere at some time. Therefore, all National Forest landscapes have value as scenery (USDA 1995). In the Bologna Basin subwatershed, the emphasis is on maintaining big game winter range (C3) or producing wood fiber (E1). The Forest Plan has designated no A3 or A4 viewsheds in the analysis area. Visual quality objectives within the C3 management area allow a range from Retention[18] to Maximum Modification[19]

[18] Retention: *"Landscapes where the valued landscape character "appears" intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the*

(Forest Plan page 4-152) and within the E1 management area require management to attain at least Maximum Modification (Forest Plan page 4-179).

ENVIRONMENTAL EFFECTS

ALTERNATIVE 1: *NO ACTION*

The "No Action" alternative would not measurably alter the scenic character of present viewsheds or their visual quality objectives because fully-stocked stands would remain after the project. Changes would be shaped by natural events. Scenic character would be subject to cyclical natural disturbance processes such as insects and disease, fire, wind, drought, and vegetation succession. The current state of the forest vegetation and its related density and species composition could contribute towards insect and disease susceptibility, to a scale that would be out of proportion with a natural appearance of tree mortality. This could ultimately alter the scenic quality of the area.

ALTERNATIVES 2 AND 3

There is little to no difference between action alternatives regarding management activities affect on visual attributes. Both management areas within Bologna Basin allow for a complete range of visual quality objectives with various resources being the driving force behind the management strategy. Disturbances caused by the construction of temporary roads and the associated harvest of trees would have the largest impact on visual quality. This impact would be caused by contrasts created between the current landscape and the managed landscape. This contrast involves changes in form, line, color, and texture of soil and vegetation.

Timber harvesting and associated road changes could modify the existing landscape to varying degrees, which would be more or less apparent at different distances. The visual effect of these actions would be dependent on the viewing distance. The longest lasting visual disturbance is typically caused by exposing soil from road construction. Harvested treatment units over time would recover to a less noticeable visual condition, while low standard roads can remain noticeable for years.

Any temporary road construction within the Bologna Basin Project area would be rehabilitated after salvage and thinning is completed, and visual impacts from change in form and line would remain visible for many years to follow. These

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landscape character so completely and at such scale that they are not evident" (USDA Forest Service, 1995, page 2-4).

[19] Maximum Modification: *"Landscapes where the valued landscape character "appears heavily altered." Deviations may strongly dominate the valued landscape character. . . However deviations must be shaped and blended with the natural terrain (landforms) so that elements such as unnatural edges, roads, landings, and structures do not dominate the composition"* (USDA Forest Service, 1995, page 2-4).

impacts would be small and localized.

The selective nature of the proposed thinning would minimize the impact to visuals, leaving a fully stocked forest of live trees as well as snags and large debris on the forest floor. Post-harvest reforestation of salvage units would accelerate the vegetative recovery process. The duration of recovery is directly related to the extent of disturbance. In a year or so, herbaceous vegetation should cover most disturbed sites.

Opportunities to minimize visual effects are greater on ground with slopes less than 30 percent. This is because the size and shape of a harvest unit can be manipulated on the gentler slopes more effectively to screen disturbance. In Alternative 3, harvest activities would occur using a forwarder rather than a tractor, thus reduced soil disturbance results in a more desirable contrast of color, line, form and texture between soil and vegetation.

CUMULATIVE EFFECTS

Past forest management practices have left much of the Bologna Basin project area with less desirable visuals of dense stands, resulting in the lack of texture and line. All action alternatives would distribute vegetation manipulation over an extended period resulting in various visual contrast and scenic character. Periodic prescribed fire in the future would create temporary changes within all areas of scenic integrity. All proposed activities comply with the forest-wide (page 4-51) and management area standards and guides for Visual Resource Management.

Contrasts created from roads are viewed as undesirable. Past roading has left a long-term effect upon visuals. The action alternatives would temporarily add to the visual effects of unnaturally appearing line, texture, form, etc. already caused by management in the area. Approximately 9.9 miles of closed roads would be reopened and 0.9 miles of temporary roads would be built in both action alternatives. After salvage and thinning activities are completed and these roads would be once again closed, and would blend with the surrounding landscape. No other road changes are planned within the reasonably foreseeable future.

COMPLIANCE WITH OTHER LAWS, REGULATIONS, AND POLICIES

ENDANGERED SPECIES ACT

Threatened and Endangered wildlife and fish species were discussed under the associated sections above. A botanical survey was completed for this project in 2002. This Environmental Assessment hereby incorporates by reference the *Biological Evaluation for Plants Listed as "Sensitive" on the Regional Foresters Sensitive Plant List Dated May 1999, and the Biological Assessment for* Silene Spaldingii. This document is filed in the *Clearances* section of the Project

Record.

The Biological Evaluation for Endangered, Threatened, Proposed, and Sensitive plant species found that the proposed projects would have no impact on Spalding's catchfly (*Silene spaldingii*), a species listed as Threatened under the Endangered Species Act. *Carex interior* and *Carex crawfordii* are two species of sedge listed on the Regional Forester's Sensitive Species List for Oregon. Both species are suspected to occur on the Heppner Ranger District. However, because these species grow in perennially wet areas with surface water present for the majority of the year, and because the project has been designed to avoid work in such areas, this project should have no impact on these regionally Sensitive plant species.

NATIONAL HISTORIC PRESERVATION ACT

This Environmental Assessment hereby incorporates by reference the letter of compliance with the 1995 Programmatic Agreement between the Advisory Council on Historic Preservation, the Oregon State Historic Preservation Officer, and Region 6 of the USDA Forest Service. This letter is filed in the *Clearances* section of the Project Record.

Historical uses of the analysis area have been primarily for recreation, timber, and range resources. Access into the analysis area is fairly limited. In accordance with the National Historic Preservation Act as amended (NHPA) and its implementing regulations (36 CFR §800), two cultural resource inventories have been completed that cover the current project area. These surveys were conducted in an effort to identify and gather sufficient information to evaluate historic properties listed on or determined eligible for listing on the National Register of Historic Places (NRHP) that may be affected by the proposed project. In 1994, Mount Emily Archaeological Services conducted the *22A Subwatershed Planning Area Cultural Resource Inventory Survey Report* (Jaehnig 1994) and in 1999, Baseline Data conducted the *Bologna Basin Phase I inventory* (DeWitt 1999). Both of these inventories conform to Umatilla National Forest inventory standards developed by the Forest Archaeologist Tommy Fulgham (Fulgham 1989) and approved by the State Historic Preservation Officer.

As a result of the above inventories, a total of 37 historic properties have been documented. These include three Euro-American, two American Indian, two rock cairns of unknown cultural affiliation, and 30 isolated finds. A review of *A Partial Traditional Use Area Inventory of the Umatilla National Forest and the Wallowa-Whitman National Forest* (Minthorn 1994) indicates that this is one of the many areas within the forest that was utilized to some degree by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and neighboring tribes.

These inventories were conducted in accordance with the National Historic Preservation Act, as amended, and its implementing regulations (36 CFR §800).

The Bologna Basin Salvage project has met the conditions of the 1995 *Programmatic Agreement between the Advisory Council of Historic Preservation,*

the State Historic Preservation Office, and Region 6 of the Forest Service, and complies with Section 106 of the National Historic Preservation Act.

CLEAN AIR ACT

ASSESSMENT OF THE NEED TO USE PRESCRIBED BURNING

Methods considered for treating activity fuels that would be generated included mechanical treatments such as grapple piling and lopping and scattering. These treatments could be needed for reducing fire hazards and for preparing the site for tree planting. Underburning and pile burning would also be utilized as treatments on some units.

Low-intensity prescribed burning with a short interval between returns would most closely mimic historic fire behaviors and fuel loads, maintaining more manageable fuel loads in the long term. In order to use underburning as a maintenance tool in several of the units, heavier fuel accumulation and understory vegetation would need to be removed, primarily through harvest, pre-commercial thinning, broadcast and pile burning, and in some cases hand piling.

MEASURES TO REDUCE EMISSIONS

Smoke emissions would be managed to minimize the amount of smoke that is generated through any of the proposed treatments. Burning would take place under conditions favorable to effective mixing and dispersion of the smoke generated to the greatest extent possible.

REGULATORY AND/OR PERMIT REQUIREMENTS

All prescribed burning operations conducted within the project areas would comply with the State of Oregon Smoke Management Implementation Plan, and would be implemented within guidelines of the Smoke Management Program.

The State of Oregon would implement restrictions on burning when wind predictions indicate smoke could be carried into sensitive areas. A listing of additional requirements is available in the Oregon Smoke Management Plan. The State of Oregon Smoke Management Plan also has certain areas that are being monitored by detection devices. Bend, Oregon, (100 miles southwest of the proposed project) is the closest designated sensitive area and current regulations only require that we document smoke emissions within a 60 air-mile radius of the city. Class 1 Wilderness areas are also provided protections from visibility impairment under Section 169 of the Clean Air Act. Class 2 Wilderness areas are not directly protected under the Oregon Visibility Protections Program (OAR 340-20-047, §5.2). The nearest Class 1 wilderness is the Eagle Cap Wilderness on the Wallowa-Whitman National Forest, approximately 105 air miles away.

AIR QUALITY IMPACTS

The emissions associated with planned burn treatments are shown in Table 50.

The effect of the prescribed burning proposed under alternatives 2 and 3 would be short term and have little impact on surrounding communities and Class 1 Wilderness areas due to the location of the project area. The project area is more then 100 air miles from the nearest Class 1 Wilderness area and 50 air miles from a Class 2 Wilderness (North Fork John Day Wilderness). The towns of Kimberly, Spray, and Monument are all located downslope from the anaylsis area and could experience a slight level of smoke for short periods of time.

Table 50. Emissions Associated with Planned Burn Treatments (tons)

Burn Type	Alternative 2		Alternative 3	
	PM 10	PM 2.5	PM 10	PM 2.5
Underburn Burn	38	34	38	34
Pile Burning	20	17	20	17
Total	58	52	58	52

CLEAN WATER ACT

The Clean Water Act of 1972 focuses on the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters. Water quality standards include the general requirement to maintain and improve water quality. This act was amended in 1987 to protect waters against pollution from both point and non-point sources. Non-point sources of pollutants are caused by dispersed human-caused or natural disturbances. With non-point sources, the effect of each individual action may be small, but the cumulative effect of these activities can affect water quality. Roads and timber management activities have been identified as contributing to non-point sources of pollution in the Bologna Basin analysis area. The strategy to protect water from non-point source pollution includes implementation of best management practices, watershed and riparian area restoration and enhancement, and improved monitoring for detection and validation of water quality concerns. The Forest Plan states that the Forest would implement best management practices to meet water quality standards.

As part of the implementation of the Clean Water Act, the State of Oregon maintains an inventory of water quality limited streams, based on standards developed by the Oregon Department of Environmental Quality. Identification of the total maximum daily load for the North Fork John Day Subbasin (which contains the Bologna analysis area) is scheduled by the State of Oregon for 2005-2006. A Water Quality Restoration Plan will be developed as part of the total maximum daily load study to address water quality problems in the basin.

Table 51 lists the beneficial water uses for the Bologna analysis area as defined by the State of Oregon for the John Day River Basin, as well as the water quality parameters associated with these beneficial uses. Beneficial uses most likely to be affected by actions proposed under alternatives 2 and 3 are (1) salmonid fish rearing, (2) salmonid fish spawning, and (3) aquatic life. Water quality standards most likely to be affected by the proposed actions are temperature and sedimentation.

Table 51. Beneficial Uses and Associated Water Quality Parameters for the North Fork John Day Subbasin

Beneficial Use	**Associated Water Quality Parameter**
Public Domestic Water Supply	Turbidity, Chlorophyll a
Private Domestic Water Supply	Turbidity, Chlorophyll a
Industrial Water Supply	Turbidity, Chlorophyll a
Irrigation	None
Livestock Watering	None
Anadromous Fish Passage	Biological Criteria, Dissolved Oxygen, Flow Modification, Habitat Modification, pH, Sedimentation Temperature, Total Dissolved Gas, Toxics, Turbidity
Salmonid Fish Rearing	Dissolved Oxygen, Flow Modification, Habitat Modification, Sedimentation Temperature
Salmonid Fish Spawning	Same as Salmonid Fish Rearing
Resident Fish and Aquatic Life	Same as Anadromous Fish Passage
Fishing	Aquatic Weeds or Algae, Chlorophyll a, Nutrients
Water Contact Recreation	Aquatic Weeds or Algae, Bacteria, Chlorophyll a, Nutrients, pH
Aesthetic Quality	Aquatic Weeds or Algae, Chlorophyll a, Nutrients, Turbidity

Standards for individual parameters are established by the State. For example, the standard for water temperature is as follows:

"Seven (7) day average of the daily maximum shall not exceed the following values unless specifically allowed under a Department-approved basin surface water temperature management plan:

1) *64º F*
2) *55º F during times and in waters that support salmon spawning, egg incubation, and fry emergence from the egg and from the gravels*
3) *50º F in waters that support Oregon Bull Trout*

{except when the air temperature exceeds the 90th percentile of the 7-day average daily maximum air temperature for the warmest 7-day period of the year.}"

Water temperatures have been monitored within the Bologna Basin analysis area (see Table 44 and Table 45, pages 144 and 145), and they are meeting the Oregon water quality standard of 64° F during the summer months. Project activities were designed to avoid any increases in temperature and sediment or degradation of aquatic habitat. This would be accomplished by project design, best management practices (Appendix A), and mitigations (page 44). Also, Alternative 3 proposes to close 1.1 miles of road 2400140 that would improve watershed conditions. For these reasons, the projects proposed under the action alternatives would be consistent with the water quality requirements of the Clean Water Act.

NATIONAL FOREST MANAGEMENT ACT

Proposed salvage, commercial thinning, non-commercial thinning, and juniper removal would increase the rate of growth of remaining trees and would favor species or age classes that are most valuable for wildlife. The resultant reduced stress on residual trees would make treated stands less susceptible to pest-caused damage. The prescribed burning of natural and activity fuels would reduce long-lasting hazards from wildfire, while air quality would be maintained at a level that would meet or exceed applicable Federal, State, and local standards. All proposed activities would provide sufficient habitat to maintain viable populations of fish and wildlife and critical habitat for Threatened or Endangered species would be protected. Proposed harvest would occur on land suitable for timber production. Thinned stands would remain fully stocked after thinning is completed. Salvaged stands would be replanted to attain full stocking levels. Uneven-aged management would be used in the commercial thinning units, and even-aged management would be used in the salvage units where planting is needed to restore stocking levels. Mitigation has been identified to protect site productivity, soils, and water quality. Proposed activities are designed to accelerate development of forest habitats that are currently deficient within the analysis area, enhancing the diversity of plant and animal communities in the long-term. See discussions under the applicable resource sections above for further support that proposed activities would comply with the seven requirements associated with vegetative manipulation (36 CFR §219.27(b)), riparian areas (36 CFR §219.27(e)), and soil and water (36 CFR §219.27(f)).

EXECUTIVE ORDERS 11988 AND 11990: FLOODPLAINS AND WETLANDS

Executive Order 11988 provides for the protection of flood plains, while Executive Order 11990 protects wetlands. This project would comply with these orders because activities would not be implemented within these areas and mitigation measures would prevent direct and indirect impacts to these areas.

EXECUTIVE ORDER 12898: ENVIRONMENTAL JUSTICE

Executive Order 12898 requires that federal agencies adopt strategies to

address environmental justice concerns within the context of agency operations. With implementation of any of the three alternatives, there would be no disproportionately high and adverse human health or environmental effects on minority or low-income populations. The actions would occur in a remote area and nearby communities would mainly be affected by economic impacts as related to timber harvest or contractors implementing non-commercial thinning, prescribed burning, and tree planting. Racial and cultural minority groups could also be prevalent in the work forces that implement prescribed fire, tree planting, or thinning activities. Contracts contain clauses that address worker safety.

EXECUTIVE ORDER 13186: MIGRATORY BIRD PROTECTION

Section 3(e) of this Order states:

> *"Pursuant to its [Memorandum of Understanding with the U.S. Fish and Wildlife Service], each agency shall, to the extent permitted by law and subject to the availability of appropriations and within Administration budgetary limits, and in harmony with agency missions:*
>
> *(3) prevent or abate the pollution or detrimental alteration of the Environment for the benefit of migratory birds, as practicable;*
>
> *(4) design migratory bird habitat and population conservation principles, measures, and practices, into agency plans and planning processes (natural resource, land management, and environmental quality planning, including, but not limited to, forest and rangeland planning, coastal management planning, watershed planning, etc.) as practicable, and coordinate with other agencies and nonfederal partners in planning efforts;*
>
> *(5) within established authorities and in conjunction with the adoption, amendment, or revision of agency management plans and guidance, ensure that agency plans and actions promote programs and recommendations of comprehensive migratory bird planning efforts such as Partners-in-Flight, U.S. National Shorebird Plan, North American Waterfowl Management Plan, North American Colonial Waterbird Plan, and other planning efforts, as well as guidance from other sources, including the Food and Agricultural Organization's International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries;*
>
> *(6) ensure that environmental analyses of Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern;*
>
> *(7) provide notice to the [U.S. Fish and Wildlife] Service in advance of conducting an action that is intended to take migratory birds, or annually report to the Service on the number of individuals of each species of migratory birds intentionally taken during the conduct of any agency action,*

including but not limited to banding or marking, scientific collecting, taxidermy, and depredation control;

(8) minimize the intentional take of species of concern by: (i) delineating standards and procedures for such take; and (ii) developing procedures for the review and evaluation of take actions. With respect to intentional take, the [Memorandum Of Understanding] shall be consistent with the appropriate sections of 50 C.F.R. parts 10, 21, and 22;

(9) identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors. With respect to those actions so identified, the agency shall develop and use principles, standards, and practices that would lessen the amount of unintentional take, developing any such conservation efforts in cooperation with the [U.S. Fish and Wildlife] Service. These principles, standards, and practices shall be regularly evaluated and revised to ensure that they are effective in lessening the detrimental effect of agency actions on migratory bird populations. The agency also shall inventory and monitor bird habitat and populations within the agency's capabilities and authorities to the extent feasible to facilitate decisions about the need for, and effectiveness of, conservation efforts;"

The effects of this action on neotropical migratory birds are analyzed in the *Terrestrial Wildlife* section (page 84) of this Environmental Assessment. The project does not conflict with any of the desired conditions outlined in the *Conservation Strategy for Landbirds* (Altman 2000).

ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

Some form of energy would be necessary for proposed projects requiring use of mechanized equipment such as temporary road construction, barricade of roads, subsoiling, prescribed fire, harvest, non-commercial thinning, and juniper removal. Alternatives that harvest trees would create supplies of firewood as a by-product, which would contribute to the local supply of energy for home space heating.

PRIME FARMLAND, FORESTLAND, AND RANGELAND

No prime farmland, rangeland, or forestland occurs within the analysis area.

INVENTORIED ROADLESS AREAS, WILDERNESS, AND WILD & SCENIC RIVERS

There are no inventoried roadless areas, Wilderness, or Wild and Scenic rivers in proximity to or within the analysis area; therefore no measurable effects are anticipated. Resource characteristics of undeveloped lands within the Bologna

Basin analysis area were considered within the context of the analysis, and impacts of alternative implementation on those resource characteristics were disclosed in Chapter 3 of this Environmental Assessment.

The Bologna Basin project was developed based on Forest Plan allocations for land use (as amended). Activities were only proposed in the C3 – Big Game Winter Range and E1 –Timber and Forage allocations, both of which are defined as a managed landscape. Changes in the developed verses undeveloped nature of these resource characteristics or features across the Bologna Basin landscape are expected to be fully consistent with management direction and land allocation decisions (goals, desired conditions, management area prescriptions) already made for this area in the Forest Plan, as amended.

FOREST PLAN CONSISTENCY

The Umatilla National Forest produced the Forest Plan in accordance with the National Forest Management Act of 1976. This plan provides guidelines for all natural resource management activities and establishes management standards.

The Forest Plan was amended in 1995 to incorporate PACFISH. PACFISH defines Riparian Habitat Conservation Areas surrounding streams and other riparian features, and identifies associated Riparian Management Objectives. Within the Bologna Basin analysis area, Riparian Habitat Conservation Area boundaries extend 300 feet from anadromous fish-bearing (Class 1) and resident fish-bearing (Class 2) perennial streams; 150 feet from perennial, non-fish bearing (Class 3) streams and ponds, lakes, and wetlands larger than one acre; and 100 feet from intermittent (Class 4) streams or wetlands smaller than one acre. Alternative 2 proposes 0.1 mile of forwarder trail within a Riparian Habitat Conservation Area, but mitigation measures would ensure compliance with PACFISH.

Guidelines developed to provide and maintain riparian and fish habitat (Forest Plan 4-59 to 4-62) are presented in Table 52. Because no harvest would occur within Riparian Habitat Conservation Areas and no changes would be made to key habitat quality measures under Alternative 2 or 3, qualities of fish habitat would be maintained over the long term or improved, so projects would be consistent with the goals for riparian and fish habitat (USDA 1990). Alternatives 2 and 3 would have no effect on stream temperature, stream bank stability, or stream shade and dispersion of created openings would be less than the stated guideline, so activities would be consistent with the Forest Plan.

The Forest Plan standards and guidelines for C3 – Big Game Winter Range require the management of elk habitat to achieve a habitat effectiveness index of no less than 70. Due to the site capability and its influence on the potential to attain a habitat effectiveness index consistent with the forest plan, and due to the level of defoliation in the project area, the existing condition within the Big Game Winter Range of the analysis area yields a habitat effectiveness index of only 67. Although the action alternatives would result in no change to the habitat effectiveness index, the action alternatives include a Forest Plan amendment

(see page 9) to waive the Forest Plan standard for this project . However, proposed activities would increase the amount of forage in the near future and forest canopy in the long-term, so this index would improve over time.

Table 52. Forest Plan Standards and Guidelines for Riparian and Fish Habitat

Resource Parameter	**Standard and Guideline**
Stream Bank Stability	80 percent of length in stable condition
Stream shade for class 1,2,and 3 streams	Ecological potential if known, else 80 percent
Water Temperature	Meet state standards
Dispersion (0-10 year age class)	<30 percent of subwatershed area

The non-commercial thinning, juniper reduction, commercial thinning, and salvage treatments included in alternatives 2 and 3 would not create any new forest openings. Openings were created during the tussock moth defoliation in the salvage units and would be replanted. Forest plan standards allow openings created by even-aged silviculture to exceed 40 acres *"[w]hen natural catastrophic situations such as fires, windstorms, or insect or disease attacks occur"* (Forest Plan page 4-73.) Therefore unit size would be within the Forest Plan standards. Uneven-aged management would be used in the commercial thinning units, and even-aged management would be used in the salvage units where planting is needed to restore stocking levels.

These activities also meet the specifications described in the Forest Plan Amendment #11 (Eastside Screens) and are, thereby, exempt from the interim ecosystem standard. However, they must meet the interim wildlife standard, which contains two scenarios, and it was decided to meet the more restrictive of the two – Scenario A. Therefore, the treatment proposals would be consistent with items 1 through 5 of Scenario A, as described below.

- **Item 1** allows timber sale activities within late/old structure habitat in order to maintain or enhance that structure. Although some of the thinning and salvage treatments included in the proposed action would occur in late/old structure stands, this is allowable because they would occur in a structural stage (Old Forest Multi-Strata) that is within or above the Historical Range of Variability. The activities have been designed to manipulate this type of structure to create another late/old structure type (Old Forest Single-Stratum) that is currently deficient or at the low end of the Historical Range of Variability within the analysis area.
- **Item 2** states that many types of timber sale activities are permissible outside of late/old structure, but that "remnant late and old seral and/or structural live trees greater than or equal to 21 inches in diameter" must be maintained; that manipulation of vegetative structure not meeting late/old structure standards should occur in such a way that conditions are moved toward late/old structure; and that maintenance or restoration of open, park-like structure should be emphasized whenever appropriate.

The salvage and commercial thinning treatments proposed under alternatives 2 and 3 would not result in harvest of live trees that are greater than or equal to 21 inches in diameter. The thinning would increase growth rates, thereby producing future large trees more quickly than would have occurred without thinning. Although an open, park-like structure is not an explicit objective of the Bologna Basin purpose and need, a combination of thinning and low-intensity fire could eventually produce an open, park-like structure.

- **Item 3** involves maintenance of connectivity between late/old structure stands, and reducing fragmentation of existing late/old structure stands. The stands being proposed for commercial thinning are not currently providing connectivity between late/old structure stands or designated Forest Plan old-growth areas. After commercial thinning is complete, affected old-forest stands would still be classed as old forest and there would be no fragmentation of late/old structure stands.
- **Item 4** involves snags, green-tree replacements, and down logs. Snags and green-tree replacements, if available, would be retained in all timber harvest units (both salvage and commercial thinning) at a rate designed to meet the 100 percent potential population level of primary cavity excavators. This snag-retention rate is quantified in the Umatilla National Forest's interim snag guidance for salvage operations (USDA Forest Service 1993). In the commercial thinning units, dead trees would only be harvested if they exceed the snag requirements; no large live trees (greater than or equal to 21 inches diameter breast height) would be removed. Since thinning increases the growth rates of residual trees, future large trees would be provided more quickly than if thinning does not occur. Down logs would not be removed in either the commercial thinning or the salvage logging – existing levels of downed wood, as supplemented by the harvest activities, would remain on-site following both treatments. The majority of the down logs would be green material and, although charred, would remain after the prescribed burning.
- **Item 5** involves goshawk habitat. No known goshawk nests occur in the project area. If nests are discovered during project layout, 30 acres of the most-suitable nesting habitat would be excluded from timber harvest around the nest site.

CONSUMERS, MINORITY GROUPS, AND WOMEN

The effects on civil rights, including those of minorities and women, are expected to be minimal. Activities associated with alternatives 2 and 3 would be governed by Forest Service contracts, which are awarded to qualified purchasers regardless of race, color, sex, religion, etc. Such contracts contain nondiscrimination requirements. While the activities identified here would create jobs and the timber harvest would provide consumer goods, no quantitative output, lack of output, or timing of output associated with these projects would affect the civil rights, privileges, or status quo of consumers, minority groups, and

women.

UNAVOIDABLE ADVERSE EFFECTS

Implementation of any of the alternatives, including the *No Action* alternative, would inevitably result in some adverse environmental effects. The severity of the effects would be minimized by adhering to the direction in the management prescriptions and Standards and Guidelines in Chapter IV of the Forest Plan and additional mitigation proposed in Chapter 2 of this document. These adverse environmental effects are discussed at length under each resource section.

SHORT-TERM USE AND LONG-TERM PRODUCTIVITY

Short-term uses are generally those that determine the present quality of life for the public. In the Pacific Northwest, this typically includes (1) timber harvest, (2) livestock grazing, (3) recreation, (4) transportation, (4) utility corridors, and (6) wildlife habitat. Long-term productivity refers to the land's capability to support sound ecosystems producing a continuous supply of resources and values for future generations.

ALTERNATIVE 1 ENVIRONMENTAL CONSEQUENCES

There would be no change in short-term uses within the analysis area. However, there would be a risk of reducing long-term productivity because trees in densely stocked stands would experience increasing stress as they grow and would become more susceptible to an insect infestation and disease. Fuels would also continue to accumulate, risking a loss of long-term productivity due to increase wildfire severity.

ALTERNATIVES 2 AND 3 ENVIRONMENTAL CONSEQUENCES

Proposed harvest activities would temporarily disturb livestock and wildlife grazing within the immediate project area. Roads in the area would experience a temporary increase in traffic associated with the proposed activities and the transport of logs. Closure of Forest Road 2400140 in Alternative 3 would reduce public road accessibility to a small area. However, the closure would improve the long-term productivity in nearby streams by reducing recurring sediment, though the improvement would be small and localized.

Conclusive evidence relative to short-term impacts of timber harvest and prescribed fire adversely affecting long-term site productivity does not exist. Considerable research suggests, however, that nitrogen reserves, organic residues, and soil physical properties are critical elements of the ecosystem that must be carefully managed to ensure long-term productivity (Little and Klock 1985; Sachs and Sollens 1986; Harvey et. al. 1987; Powers and Weatherspoon 1984; and Amaranthus and Perry 1987 cited in the Tower Fire Recovery Projects Environmental Impact Statement). Removal of wood fiber and disposal of related debris, as designed and mitigated, would have little effect on long-term productivity.

The predominant structural stage in Bologna Basin is Old Forest Multi Strata, followed by the two stem exclusion structural classes and an old forest single stratum. Proposed thinning would shift more acres from the stem exclusion structural stages to the old forest structural stage. This would shorten the time that dependent wildlife species are extirpated from the area or are stressed due to less ideal habitats. In effect, this would transform some of the multi-layer old forest into single-layer old forest. Stress on trees would also be reduced in treated stands, reducing the incidence of insects and disease and improving growth and productivity of remaining trees.

Unnatural fuel accumulations have developed due to dense stocking, moisture stress, and insect infestation and could result in unacceptable impacts on air quality, as witnessed during the large fires of 1996. Harvest, thinning, and prescribed fire can be utilized both effectively and efficiently to reduce fuel loadings and otherwise manipulate the various fuel complexes in the analysis area. This would greatly reduce the consequences of a wildfire within and adjacent to the manipulated fuel complexes. It would also enhance the long-term productivity of wildlife habitat, provide more visual diversity, and provide the disturbance necessary for the perpetuation of important plant species.

The temporary impacts of smoke from prescribed fire under alternatives 2 and 3 would have minor effects on the short-term use of Forest resources such as recreation sites and visual resources. The use of prescribed fire to reduce the flammability within treatment units would affect long-term forest productivity by reducing the risks and consequences of a major wildfire. The long-term benefits of prescribed fire in natural fuels more than outweigh the short-term impact to air quality.

IRREVERSIBLE AND IRRETRIEVABLE EFFECTS

An **"Irreversible"** commitment of resources refers to a loss of future options with nonrenewable resources. An **"Irretrievable"** commitment of resources refers to loss of opportunity due to a particular choice of resource uses.

ALTERNATIVE 1 ENVIRONMENTAL CONSEQUENCES

Among trees killed by the infestation, there would be an irretrievable loss of growth within the untreated, densely stocked forest. Potentially, the ability to protect forest within the analysis area from wildfire could be irretrievably lost, as well.

ALTERNATIVES 2 AND 3 ENVIRONMENTAL CONSEQUENCES

Log landings would produce irreversible changes in the natural appearance of the landscape. The visual effects of log landings would be somewhat reduced by mitigation designed to reduce soil compaction and erosion (such as subsoiling and seeding). Little irreversible loss of soil should occur due to extensive mitigation associated with timber harvest and prescribed fire (page 44). There would be an irretrievable loss of growth and fuels reduction within untreated,

densely stocked forest outside of treatment units.