SECTION 3.1

FOREST VEGETATION

I. INTRODUCTION

Effects to forest vegetation were identified as an analysis issue for this project. The issue indicators that were used to evaluate changes to the forest vegetation by alternative are:

• Canopy layers (ladder fuels) as measured by acres and the percent of canopy layer types (one layer, two layer and multi layer) across the ponderosa pine forested BCLMP landscape,
• Canopy cover as measured by acres and the percent of the total BCLMP area and the ponderosa pine forested area by canopy cover (no canopy cover, very low, low moderate and high),
• Understory (non tree) productivity as measured by the potential production by canopy cover,
• Large woody debris as measured by a qualitative discussion of forest health,
• Forest insect and disease as measured by a qualitative discussion of susceptibility and forest health.

The affected environment assesses vegetative system resiliency and sustainability for the ponderosa pine component of the landscape, and the effects analysis measures and/or discusses the effects of the action alternatives (Alternatives A, B, and C) and a No Action alternative (Alternative D) on forest resiliency and sustainability, including stand structure (canopy layers and canopy cover), and the risk for large stand replacement disturbance. A discussion of forest health in regards to understory vegetation, large woody debris and insect and disease potential as it relates to the Action Alternatives and a No Action is also included. The analysis presented in this section tiers to information in the Forest Vegetation Report, which is available for review in the Project Record.

A. FOREST VEGETATION REGULATORY FRAMEWORK

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

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

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

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

Time frames for adequate restocking within 5 years of final harvest are specific to lands to be managed for timber production as stated in Forest Service Handbook 2409.17, 2.2. When seed or shelter trees are carried through the rotation the initial seed cut is considered final cut.
Forest Service Handbook 2409.17, 2.2 states reforestation needs arising from disturbances such as fire, weather, insect, and disease shall have an analysis done to determine long-term objectives of the land based on the forest plan. Developing site-specific reforestation requirements is part of this analysis. The silvicultural prescriptions shall explicitly state time frames. Where reforestation is required, design treatments to achieve satisfactory stocking promptly.

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

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

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

Forest Service Manual 2471.1 states that the size of harvest openings created by even-aged silvicultural in the Northern Region is normally 40 acres or less. Creation of larger openings requires 60-day public review and Regional Forester approval.

For the BCLMP, openings are defined where even aged silvicultural treatments are proposed on forested ground that removes trees to an average residual overstory of less than 20% canopy cover with an objective to start a new stand of trees. This applies to the regeneration seed tree seed cuts (ST1) and the shelterwood establishment cuts (SH1). Natural regeneration is planned with the Custer’s stocking objectives (Tables 2.9 and 2.10) to be met within 5 years.

Disturbances (fire, insect, disease, weather, etc.) create mosaics of forest composition and structure within and among stands across landscapes (Ryan, 2010). These mosaics occur over relatively small spatial scales to rather large, exceeding hundreds of acres (Ryan, 2010). To effectively reduce the risk of wildland fires, fuel treatments need to be implemented on large areas (Ryan, 2010). Treatments that alter vegetation to favor low intensity fires must consider spatial arrangement of fuel structures to alter wildfire behavior. Treating small or isolated stands without regard to the broader landscape would most likely be ineffective in reducing the extent and severity of large disturbances such as wildfire (Graham et al., 2010). Openings created by
regeneration systems decreases spatial continuity of fuels (Graham et al., 2010). The Proposed Action was designed with several treatment types from various thinning intensities to openings created from regeneration treatments to no treatment areas to create mosaics across the landscape.

Seven openings (single treatment areas and combined treatment areas that are adjacent to each other) would be created from implementation of Alternative A that exceeds 40 acres (1 = 58 acres, 2 = 49 acres, 3 = 68 acres, 4 = 151 acres, 5 = 49 acres, 6 = 70 acres and 7 = 102 acres. Twenty-six other openings less than 40 acres would be created ranging in size from 2 to 39 acres. See Appendix A, Map 14.

Seven openings (single treatment areas and combined treatment areas that are adjacent to each other) would be created with both Alternative B and C that exceed 40 acres (1 = 58 acres, 2 = 49 acres, 3 = 68 acres, 4 = 74 acres, 5 = 49 acres, 6 = 70 acres and 7 = 102 acres. Additional openings would be created less than 40 acres. See Appendix A, Maps 15 and 16.

These openings create vegetation diversity on the landscape not only for fuel objectives and forest health but would replace and perpetuate wildlife habitat. Short-term habitat impacts are realized with long-term gains in vegetation diversity to enhance habitat across the landscape consistent with the Forest Plan (page 53). Fifteen to 20 years is the expected recovery period for wildlife habitat (Section 3.14 - Wildlife).

Table 3.1.1: Treatment Units Greater Than 40 Acres by Alternative

<table>
<thead>
<tr>
<th>Alt</th>
<th>EIS Unit Number</th>
<th>Opening Number</th>
<th>Acres¹</th>
<th>Treatment</th>
<th>FACTS_ID’s</th>
<th>Stocking Recovery Period</th>
<th>Wildlife Cover Recovery Period</th>
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<tbody>
<tr>
<td>12</td>
<td>1</td>
<td>58</td>
<td>Seed Tree</td>
<td>A140500102000, A140500126000</td>
<td>5 years</td>
<td>15-20 years</td>
<td></td>
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<tr>
<td>13</td>
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<td>49</td>
<td>Shelterwood</td>
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<td>5 years</td>
<td>15-20 years</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>3</td>
<td>68</td>
<td>Seed Tree</td>
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<td>5 years</td>
<td>15-20 years</td>
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<tr>
<td>42</td>
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<td>A110100012000</td>
<td>5 years</td>
<td>15-20 years</td>
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</tr>
<tr>
<td>44A</td>
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<tr>
<td>44B</td>
<td></td>
<td>5</td>
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<td>A140300002000</td>
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<td>15-20 years</td>
<td></td>
</tr>
<tr>
<td>44C</td>
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<td>15-20 years</td>
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<td>44E</td>
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<td>15-20 years</td>
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</tr>
<tr>
<td>45A</td>
<td></td>
<td>8</td>
<td>Shelterwood</td>
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<td>15-20 years</td>
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<tr>
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<td></td>
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<td>46</td>
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### B. Forest Vegetation Effects Analysis Methodology

The data used for this analysis was compiled from a timber compartment inventory done from 1986 to 1990 and field inventories done from 1981 to 2004. Individual inventoried stand summaries are in the project record.

The 1986 to 1990 timber compartment inventory was based on photo interpretation attributes of crown diameter, dominant species or cover type, height and canopy cover percent. With ground reconnaissance and the use of these attributes all the stands within the project area were assigned a stratum label. This stratum label defines the stand according to size, species, canopy cover and whether it is forested or non-forested. Acres by stratum within the BCLMP are found in Table 3 of the Forest Vegetation Report located in the Project Record. An attached copy of the defined stratum classification is in Appendix I of the Forest Vegetation Report (Project Record). Seventy-two stands in the project area have had actual ground sample data taken over the past 27 years. That’s about 61% percent of the ponderosa pine acres. This data can be found in the FSVEG database for the Custer National Forest.

In 2007, an average stand condition for each of the ponderosa pine stratum was developed using all the field-sampled data to date, across the district. A copy of this average stand attributes is in the project record (Sandbak, 2007). This is the data set used in the landscape effects analysis that follows for canopy cover and canopy layers.

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**Table: Forest Vegetation Effects Analysis**

<table>
<thead>
<tr>
<th>Alt</th>
<th>EIS Unit Number</th>
<th>Opening Number</th>
<th>Acres</th>
<th>Treatment</th>
<th>FACTS_ID’s</th>
<th>Stocking Recovery Period</th>
<th>Wildlife Cover Recovery Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>54</td>
<td>7</td>
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<td>15-20 years</td>
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<td>56</td>
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<td>Seed Tree</td>
<td>A140300010000</td>
<td>5 years</td>
<td>15-20 years</td>
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<td>57</td>
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<td>Seed Tree</td>
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<td>5 years</td>
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<td>58</td>
<td>Seed Tree</td>
<td>A140500102000, A140500126000</td>
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<td>13</td>
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<td>44D</td>
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<td>51</td>
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<td>15-20 years</td>
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1. These are approximate acres derived from Forest GIS coverage.

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Section 3.1 - Forest Vegetation
Summarized forested vegetation and insect and disease conditions are found in the Forest Vegetation Report (pg. 22 to 35 of the Project Record). Average stand conditions by proposed treatment type are found in Table 7 of the Forest Vegetation Report (Project Record).

The area considered for the forested vegetation indirect, direct and cumulative effects analysis is the project analysis area (See Maps in Appendix A). The time period for effects for past activities is 30 years and for reasonably foreseeable activities is 3 to 10 years. Additional effects to canopy layers, canopy cover, large woody debris, insect and disease, and understory productivity to the risk of large stand replacement fire or other disturbances from past, present and reasonably foreseeable activities were considered.

Past activities in the cumulative effects area have included intensive grazing management systems for domestic cattle, aggressive wildland fire suppression, incidental personal use fire wood cutting, recreational hunting for big game and upland game birds (primarily turkeys), past logging, fuels treatment and post sale and timber stand improvement activities. See list of Projects Considered in Cumulative Effects Assessment in the Project Record (Table 2.18) and past management activities and wildfire in Table 3.1.2.

Areas and acres that have been documented with past management or wildfire activities in the Forest Service Activity Tracking System (FACTS) are included in Table 3.1.2.

Table 3.1.2: Past Management Activities and Wildfire in BCLMP Area

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<th>ACTIVITY</th>
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<th></th>
<th></th>
<th></th>
<th></th>
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<td>Mechanical Site Preparation for</td>
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</table>

Section 3.1 - Forest Vegetation 3-7
### C. CANOPY LAYERS AND CANOPY COVER EFFECTS ANALYSIS

#### METHODOLOGY

Prior to Euro-Americans settlement, dry ponderosa pine forests, such as those in the BCLMP area, were burned by frequent low or mixed severity fires (Hessburg, Agee, Franklin, 2005, Brown, Sieg, 1996 and Sneed, 2005). These mostly surface fires maintained low and variable tree densities, light and patchy ground fuels, simplified forest structure, and favored a patchy cover of associated fire-tolerant shrubs and herbs (Hessburg, Agee, Franklin, 2005). Low severity fires maintained fire-resilient structures by elevating tree crown bases and scorching or consuming many seedlings, saplings, and pole-sized trees. Such fires cycled nutrients from branches and foliage to the soil, where they would be used by other plants, and promoted the growth and development of low and patchy understory shrub and herb vegetation. Finally, surface fires reduced the long-term threat of running crown fires by reducing the fuel bed and metering out individual tree and group torching, and they reduced competition for site resources (nutrients, light, and water) among surviving trees, shrubs and herbs. Rarely, dry forest landscapes were affected by more severe climate-driven events (Hessburg, Agee, Franklin, 2005) (See Table 3.1.3).

Dry forests no longer appear or function as they once did. Changes in disturbance processes (high frequency low severity to low frequency high severity) have resulted in large landscapes that are homogeneous in their compositions and structure, and these landscape are set up for severe, large fire and insect disturbance events (Hessburg, Agee, Franklin, 2005).

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#### Table: Year by Acres

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<td><strong>TOTALS</strong></td>
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<td><strong>125</strong></td>
<td><strong>41</strong></td>
<td><strong>56.9</strong></td>
<td><strong>2,479.9</strong></td>
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</tbody>
</table>

1. These are all past activities stored in the Forest Service Activity Tracking System (FACTS).  
2. These consist of control and treatment plots. Regional office direction is to protect the control plot from treatment. 
3. These are approximate acres derived from Forest GIS coverage.
Small fires, if they had been allowed to burn in the early 20th century, or were intentionally lit, would have broken up the dry forest thereby reducing the size of the area influenced by uncontrolled wildfires that we are experiencing today. Changes that have occurred and the effects of those changes from wildfire suppression (management) have been discussed in the literature (Hessburg, Agee and Franklin, 2005). Table 3.1.3 compares key changes and their effect on the landscape.

**Table 3.1.3: Key Changes In Dry Forest Landscapes**

<table>
<thead>
<tr>
<th>Change</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced grassland and shrubland area in forest potential vegetation settings and expanded forest area.</td>
<td>Increased homogeneity of the landscape vegetation and fuels mosaic.</td>
</tr>
<tr>
<td>Reduced old and new forest area.</td>
<td>Increased homogeneity of the landscape vegetation and fuels mosaic reduced spatial isolation of areas prone to high-severity fires.</td>
</tr>
<tr>
<td>Loss of grass and shrub understories. *</td>
<td>Reduced likelihood of low-severity fires with increasing flame length, fireline intensity, rate of spread, increased fuel ladders and likelihood of crown fire.</td>
</tr>
<tr>
<td>Increased tree canopy cover, and canopy layers. *</td>
<td>Increased fuel ladders, potential flame lengths, fireline intensity, rate of spread, and likelihood of crown fires.</td>
</tr>
<tr>
<td>Increased young multi-story forest area. *</td>
<td>Increased landscape homogeneity, reduced fire tolerance, increased fuel ladders, potential flame lengths, fireline intensity, rate of spread, and likelihood of crown fires.</td>
</tr>
</tbody>
</table>

*Indicates a strong correlation with current severe fire behavior.

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

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

There is little evidence that current patterns in dry forest today are sustainable and this has important ecological consequences (Hessburg, Agee, Franklin, 2005). The BCLMP area is increasing in homogeneity in its composition and structure, and the landscape is set up for severe, large fire and/or potential insect disturbance events. To date, some wildland fires alone have not created ecological outcomes that are desired by society or that are consistent with natural ecosystem functioning (See Table 3.1.3 and changes in disturbance processes above).

Not all fires are undesirable by society. The effects from severe and large wildfires are what some of society finds undesirable. These types of fire put a number of important values at risk as exemplified by the destruction of more than 3,600 homes in the wildfires that burned in southern
California in 2003 (Graham, McCaffrey, Jain 2004, p. 2). Homes are the most recognized value at risk, but there other values at risk including critical infrastructure (power grids, drinking water supplies), sensitive or protected fish and wildlife habitat, firefighter health and safety, public health and safety, soil productivity, aesthetics, clean air, and other important components of forest ecosystems (Graham, McCaffrey, Jain 2004, p. 2).

The Kraft Springs Fire in 2002 on the Custer National Forest resulted in the private sector sustaining a $2.5 million dollar impact to improvements, property and economic loss (Sandbak, 2003, Brewer Fire Revisited, slides 57-59). These types of impacts are not desired by the public and were voiced loudly during public meetings during and after the Kraft Springs Fire (Sandbak, 2003, Brewer Fire Revisited, slide 60).

The EIS identifies 75% of the project area as susceptible to stand replacement crown fire, which would destroy many of the values identified above as desired by society (Section 3.2 - Fuels, p.3-94 and 3-95). Additionally, the EIS identifies the need to conduct forest vegetation treatments in order to both enable firefighters to better contain wildfires and to increase the BCLMP area’s ability to withstand high frequency low severity wildfires (FEIS, Chapter 1, pg. 1-5).

Fire resilience and sustainability of dry forest landscapes can be improved by thinning from below (reducing ladder fuels) and/or applying regeneration harvest systems (Graham et al., 2010). Treatments should emphasize opening up the canopy to relatively wide spacing, reducing canopy layering and removal of the smaller size classes, coupled with prescribed burning and/or mechanical fuel treatment of the natural and activity surface fires. Many examples have been documented in the literature to support this.

Studies for evaluating effectiveness of pre-fire fuel treatments were done on the 2002, 2003 and 2004 large wildfires in the western United States (Omi, Martinson, Chong, 2006). In this study fuel treatment effectiveness was found to be dependent on the type of treatment. Treatments that included reduction of surface fuels were generally effective, with or without prior treatment of canopy fuels. Thinning followed by slash treatment produced the most impressive results. Thin-only treatments were generally ineffective and in some cases produced greater fire severity than adjacent untreated areas due to presence of elevated amounts of ground fuel.

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

Skinner, Ritchie, Hamilton, and Symons (2004) evaluated effects of thinning and prescribed fire on wildfire severity that they summarized for a 2002 wildfire. They reported there was a higher percent of mortality in untreated stands vs. treated stands. They noted that where ladder fuels had been treated but then those surface activity fuels were not treated, resulted in ineffective reduction in wildfire severity. However, when ladder and surface fuels had been sufficiently reduced, crown fire and severity of wildfire was reduced.

Cram, Faker and Boren (2006) studied 2002 and 2003 wildfires in New Mexico and Arizona and reviewed fire effects in silviculturally treated vs. untreated stands. They concluded similar
results: the more aggressive the treatment the less susceptible forest stands were to crown fire and mechanical treatment followed by prescribed fire had the greatest impact toward mitigating fire severity (i.e., aerial and surface fuels were reduced).

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

This too has been demonstrated on the Sioux Ranger District of the CNF. There are sale units in the Ward timber sale (1986-1988) and Pot Hole timber sale (late 1970’s) in the Long Pines land unit that had harvest systems implemented similar to those in the BCLMP Proposed Action. From photos post Kraft Springs fire (2002), one can clearly see in the Pot Hole sale that the large stand replacement fire in 1988 (Brewer) and then again in 2002 (Kraft Springs) that the overstory and the dense unthinned understory has remained relatively intact (Sandbak, Clark, 2005; slides 26 and 27). The wildfire was a crown fire and when it came to the treated stand it became a surface fire and burned in a mosaic pattern within the treated area. Once through the treated stand the fire became a crown fire in the nearby-untreated area. This fire behavior was also demonstrated in the Ward Timber Sale with the 2002 fire.

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

To evaluate the likelihood of a stand replacement wildfire and the resiliency to future wildland fires, an analysis was conducted in the BCLMP area on the acres of canopy layer types and canopy cover classes in the BCLMP area.

**Canopy Layer Types**

Each ponderosa pine forested polygon in the BCLMP area with the assigned forest strata label was classified into stand conditions having predominately one canopy layer (One Layer), two canopy layers (Two Layer) or multiple canopy layers (Multi Layer) for the existing (Alternative D) and post treatment (Action Alternatives A, B and C) conditions using the following methodology (Sandbak, 2011):

- **One Layer** - Predominately one ladder fuel layer; may have additional layers but in combination the additional layers generally total less than 100 trees per acre.
- **Two Layer** - Two distinct ladder fuel layers; may have additional layers, but there is a distinct break and in combination the additional trees per acre totals less than about 100
- **Multi Layer** – More than two layers; has a continual ladder of fuels.

**Canopy Cover Classes**

Each polygon in the BCLMP area using the forest strata label was classified into the following canopy cover classes (Sandbak, 2011) for the existing (Alternative D) and post treatment (Action Alternatives A, B and C) conditions:

- **No canopy cover** – includes grasslands.
• Very Low Canopy Cover - less than 10% canopy cover, includes grasslands with pine colonization.
• Low Canopy Cover - 10 to 39% canopy cover.
• Moderate Canopy Cover - 40 to 69% canopy cover.
• High Canopy Cover - 70% plus canopy cover.

D. UNDERSTORY PRODUCTION EFFECTS ANALYSIS METHODOLOGY

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

A study in the ponderosa pine has indicated the highest understory production (forbs, brush, graminoids) occurs with canopy cover of 0 to 20 percent (Shepperd and Battaglia, 2002). Thirty to sixty percent canopy cover had a 56 to 64 percent reduction in production, while the heavier canopy cover (>60%) exhibits an 83 to 86 percent reduction.

E. LARGE WOODY DEBRIS EFFECTS ANALYSIS METHODOLOGY

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

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

Large woody debris performs many physical, chemical, and biological functions in the forest ecosystems (ranging from soil protection to wildlife and microbial habitat). Large woody debris as defined by Graham et. al., (1994) is coarse woody debris (CWD) greater than 3 inches in diameter. The management of large woody debris helps maintain ecosystem function. Snag retention is a management tool that benefits this function. CWD protects the forest floor and mineral soil from erosion and mechanical disturbances and protects new seedlings from livestock damage. Large woody debris is a key habitat component (especially large logs) for wildlife. Large woody debris alters airflow and provides shade, insulation, and protection for new forest growth. Ponderosa pine studies in the southwestern United States, have recommended that
between 5 and 13 tons per acre of CWD be maintained (Graham, et. al, 1994). When large
woody debris decays, it retains water, making moisture available to vegetation during dry
periods. When buried in the forest floor, large woody debris is an excellent host for
ectomycorrhizal root tips. Even though this debris is a small portion of the forest soil, it contains
the majority of the ectomycorrhizae. Ectomycorrhizae help woody plants take up water and
nutrients, and their fruiting bodies play important roles in the food chains of many small rodents
and larger predators. Retaining large woody debris on the landscape is important for forest
health. The sizes amounts and continuity should be balanced with other needs such as reducing
the threat of wildfire burning off NFS lands and onto private lands. Strategic locations of fuel
loads on the landscape to aid in fire suppression operations and fire fighter safety should be a
consideration.

F. FOREST INSECT AND DISEASE SUSCEPTIBILITY EFFECTS
ANALYSIS METHODOLOGY

Since the last dry period (1930’s) climate in the western United States has been relatively moist,
promoting regeneration and development of large amounts of forested vegetation (Graham et al.,
2010). Prior to this period and historically, native insects and diseases infected and killed the
very old or stressed individuals, which tended to diversify vegetation on the landscapes. The
changes that have occurred in the vegetation in present forests have facilitated development of
unprecedented epidemic levels of insects and diseases in many areas. Epidemic levels of insects
have been observed in western and central Montana during the 2009 Forest Health Protection
(FHP) aerial detection flights (USDA, 2010). Endemic levels have been observed in 2007 to
2009 in the BCLMP (Table 3.1.8). Weather events, such as ice storms, windstorms and periodic
droughts can encourage further buildup of these agents.

Dry forests, like the ponderosa pine forests in the BCLMP area have developed dense conditions
exacerbated by fire exclusion, increasing the potential for insect and disease activity. Diseases
that have been documented in the BCLMP area include western gall rust and pine needle cast.
Prominent bark beetles documented in the BCLMP area that can create the most impact to the
ponderosa pine are the mountain pine beetle and the pine engraver beetle.

Mountain pine beetles generally occur at low levels in ponderosa pine killing weakened trees that
are struck by lightning or infected by disease or are too old to resist attack. Pine engraver beetles
generally attack young, densely stocked ponderosa pine, killing trees scorched by low-intensity
surface fires, recent wind/snow damaged trees and severely disease infected trees.

Forests that were once dominated by vegetative structures and compositions relatively resilient to
native insects and diseases, and fire regimes are now more prone to epidemic insect and disease
infestation/infections and uncharacteristically large and severe wildfires (Graham et al., 2010).
Today because of the change in forest conditions ponderosa pine continues to be susceptible to
the mountain pine beetle (Graham et al., 2010). The pine engraver beetle can be destructive with
some of the severest outbreaks occurring in the low elevation ponderosa pine forests.

Bark beetles are host specific and susceptibility is dependent on attributes like tree diameter,
density, latitude, longitude, elevation, and current beetle activity along with environmental
conditions (i.e. drought, wind events, snow breakage, lightening strikes) (Gibson, 2004). Tree size, density and host are variables that can be used for an assessment of potential risk of beetle susceptibility. Susceptibility can be compared against recent activity to further evaluate a potential population increase.

Pine engraver beetles are relatively non-aggressive beetles. Most pine engraver beetle (Ips, spp.) problems are associated with disturbances such as wind throw and snow breakage, drought in spring and early summer, logging, fires, road construction, housing development or other human activities (Livingston, 2004). Pine slash or weakened trees created by these disturbances attract beetles and provide ideal conditions for population buildup and subsequent tree killing.

Western gall rust is the most common rust found in the ponderosa pine. Western gall rust (Endocronartium harknessii) produces galls that infect and girdle tree branches and boles. This disease does not require an alternate host, so it spreads readily from tree to tree. Trees of all ages are affected. The seedlings, saplings and small pole timber become the most infected as spores rain down from the upper tree canopy. Cankers on stems of seedlings and saplings are generally lethal. Much of the saplings in the dense stands show stem and bole infection. Stem cankers on larger trees are prone to stem breakage, especially in wind and snow events. More frequent ground fire should have reduced stem densities and removed stressed seedlings and saplings, thus lowering the incidence of the rust.

Management is best achieved by removal of infected or most severely infected (stem galls or more than 6 branch galls) individual trees (USDA, 2004). Thinned stands with residual branch galls tend to become inactive within ten years due to increased vigor and growth and shading out of the lower infected branches (USDA, 2004).

Mountain pine beetle is the most aggressive, persistent and destructive bark beetle. Outbreaks generally occur in mature to overmature forests. The economic impact of beetle mortality is largely dependent on the effects of epidemics on allowable cut, regeneration of affected areas, and increased fire risk. For ponderosa pine high risk is associated to single storied stands, mean stand diameter exceeding 10 inches, and basal area per acre exceeds 150 in mean stand diameters of 5 inches or greater (Gibson, 2004).

As described by Gibson in 2004, there are three general stand characteristics that affect ponderosa pine susceptibility to attack: (1) stand structure, (2) average diameter at breast height (dbh) of ponderosa pine component, and (3) stand density as expressed by average basal area per acre.

Single-storied stands are most susceptible to severe damage. They are most likely to become attacked first and to suffer greatest mortality. Two-storied stands and multi-storied stands are generally not as susceptible. As mean stand diameter increases, stand susceptibility increases. Stands greater than a 10-inch average dbh are high hazard, those 6 to 10 inches are moderate, and those less than 6 inches are low (Gibson, 2004). However, more trees in the 6- to 12-inch dbh size classes would be killed once an infestation starts.
The denser the stand within a given average diameter, the more susceptible it would be to severe beetle caused mortality. Gibson (2004) states when stands have an average dbh greater than 5 inches and have more than 150 square feet per acre the stand would have a high hazard; those that have 80 to 150 square feet per acre would have a moderate hazard; and those with less than 80 square feet per acre would have a low hazard. This would vary with geographic area, with 120 BA/acre being high risk in some stands (Gibson, 2004).

A generalized assessment was done for the BCLMP areas for susceptibility for the mountain pine beetle using the Northern Region Vegetation Mapping Program (Vmap) GIS layer for the Ashland RD. The methodology was developed by this silviculturist and used for deriving the potential hazard for mountain pine beetle susceptibility follows. This Vmap GIS layer derived from Landsat imagery has classified the district’s land base into attributes useful for this analysis such as dominance type (species), tree canopy cover, and tree size class (DBH). As stated above, as stand diameter increases, bark beetle susceptibility increases. The denser a stand is, the more it is susceptible to severe beetle mortality. Stands over 5 inches DBH have a higher beetle susceptibility hazard the denser the stand is.

Tree canopy was used as a relative comparison of stand density (the higher the canopy cover the higher the stand density and/or basal area) and the tree size class was used for the dbh determination. Seven tree canopy classes and four tree diameter classes were used to give a general risk of beetle susceptibility ranging from to none to high (Table 3.1.4). These classes in combination or singly were given a susceptibility risk as indicated in Table 3.1.4.

<table>
<thead>
<tr>
<th>GIS Layer Used</th>
<th>Dominance Types</th>
<th>Tree Canopy %</th>
<th>Tree Size Class DBH</th>
<th>General Susceptibility Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMAP PIPO1</td>
<td>0%, 1-4%, 5-9%,</td>
<td>0-4.9&quot;, 5-9.9&quot;, 10-14.9&quot;, 15&quot;+</td>
<td>None to Very Low</td>
<td></td>
</tr>
<tr>
<td>VMAP PIPO1</td>
<td>26-40%</td>
<td>0-4.9&quot;, 5-9.9&quot;</td>
<td>None to Very Low</td>
<td></td>
</tr>
<tr>
<td>VMAP PIPO1</td>
<td>41-60%, 60%+</td>
<td>0-4.9&quot;</td>
<td>None to Very Low</td>
<td></td>
</tr>
<tr>
<td>VMAP PIPO1</td>
<td>26-40%</td>
<td>10-14.9&quot;, 15&quot;+</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>VMAP PIPO1</td>
<td>41-60%</td>
<td>5-9.9&quot;, 10-14.9&quot;, 15&quot;+</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>VMAP PIPO1</td>
<td>60%+</td>
<td>5-9.9&quot;</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>VMAP PIPO1</td>
<td>60%+</td>
<td>10-14.9&quot;, 15&quot;+</td>
<td>High</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.1.4: Generalized Assessment For Risk Of Bark Beetle Susceptibility For Ponderosa Pine

*PIPO = Pinus ponderosa
II. AFFECTED ENVIRONMENT FOR FOREST VEGETATION

The BCLMP area consists of approximately 14,053 acres. Based on the forest stratum label (Project Record; Forest Vegetation Report, pp. 23-25) approximately 68 percent of the BCLMP area has ponderosa pine forest canopy cover greater than 10%. About 1 percent of the BCLMP area is considered forested but has canopy cover less than 10%. About 32 percent is non-forested, and 18% of that has forest cover less than 10% or slightly above. Of this 68 percent forested cover, 99 percent is dominated by ponderosa pine and less than 1 percent is dominated by green ash. Juniper is scattered across the BCLMP area in the understories of ponderosa pine. Green ash, hawthorn, chokecherry and other woody shrub species are common in many of the moist draws but have been overtopped with ponderosa pine. Approximately 2 percent of the BCLMP area can be characterized in this state. Fifty three percent of the total acres occur on average stand slopes greater than 20 percent. Forty seven percent is on average stand slopes less than or equal to 20 percent. Ninety one percent is on average stand slopes less than or equal to 35 percent.

The forested stands of ponderosa pine are predominately multistory (Figure 3.1.1, Alt D) and higher canopy cover stands (Figure 3.1.2, Alt D). Seventy six percent of the ponderosa pine forested area has a canopy cover greater than or equal to 40%. Ninety seven percent of the forested area has multiple canopy layers. The average overstory ranges from 77 to less than 200 years old, 11 to 17 inches in diameter at breast height, and 10 to 82 trees per acre. The average mid-story ranges from 18 to 161 years old, 6 to 9 inches in diameter at breast height and 24 to 109 trees per acre. The average understory ranges from 0 to 4 inches in diameter at breast height and 760 to 4,571 trees per acre. Board feet per acre ranges from 400 to 7,030. The dryer sites and non-saw timber strata represent the lower end of the range. Average stand conditions are filed in the Project Record (Sandbak, 2007). Actual sampled stand data are stored in the national FSVEG (Field Sampled Vegetation) database. Average existing stand conditions for diameter ranges, trees per acre, canopy cover and canopy layers by proposed treatment type is summarized in the Project Record (Forest Vegetation Report, Table 7).

Currently the BCLMP area is dominated by late development closed canopy conditions. Early development (post disturbance), mid development closed, mid development open, and late development open conditions are limited on the landscape (see Section 3.2 - Fuels, pg. 3-64 for existing vs. historic reference). Without a diversity of these conditions on the landscape the risk of large stand replacement events is higher. There is a need for more early development condition, open and closed mid development and late development open conditions to promote low impact, naturally occurring disturbance regimes and processes on the landscape.

The health and condition of the ponderosa pine ecosystem varies across the BCLMP area (see Forest Vegetation Report, pp. 22-35, in the Project Record). The existing condition has resulted in part from long-term suppression of naturally occurring fire. Subsequent development of high tree densities promotes conditions conducive to increased infestations and disease infections, and results in tree growth reductions, physical deformities and more prone to snow, ice and wind damage. High tree densities increase competition, which reduces the health, vigor, and productivity of the ponderosa pine ecosystem.
Additionally, high tree densities increase tree mortality, natural fuel loading, and the risk of stand replacing wildfires. The lack of disturbance has fostered the development of multi-storied, dense, full-canopied ponderosa pine stands, which causes a decline in the understory shrub, herb, and grass species diversity. This decline, mainly due to shading, is demonstrated in some cases by the absence of the understory grass, forb, and shrub vegetative components in the very dense stands.

There is a need to reduce tree densities, canopy layers (ladder fuels) and crown canopy within forested stands to decrease the risk of fire reaching the overstory canopy and being sustained as a crown fire, resulting in large stand replacement events. Achieving these conditions reduce competition of light, nutrients and water and restore the diversity, vigor, composition and structure of the forested stands, while maintaining endemic levels of insect and disease. Additionally, there is a desire to reduce needle cast coverage to promote growth of the understory components.

Overall the desired condition is to reduce tree densities, canopy cover, canopy layers, and decrease the risk for large stand disturbance events (wildfire and widespread epidemic beetle activity). These desired conditions (See Appendix B: Forest Vegetation Report pp. 35-43 and Appendix II, in the Project Record) when applied across the project landscape at various intensities would promote a healthy, structurally diverse, productive, and vigorous growing ponderosa pine ecosystem that is resilient and sustainable.

A component of landscape ecology involves resiliency and sustainability. It is presumed that before human intervention, the structure, composition, and function within a forest, and the processes that affected forests, represented a dynamic equilibrium. While there is no definitive point in time or stand conditions that can be described as “the right answer”, there are relationships between forest conditions and processes, which interact and which may be described as resilient and sustainable. Management practices have interfered with some of the processes (such as wildland fire suppression) shifting forest composition, structure, and function.

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

The buildup of vegetation provides “ladders” for wildfire to climb into the treetops. In areas where trees are densely packed, the fires can spread rapidly from tree-to-tree in a phenomenon known as “crowning.” Crown fires are intense, fast moving and nearly impossible for fire fighters to contain. They threaten communities and can damage key resources, including timber, fish and wildlife habitat, soils and drinking water quality.
The forested stands in the BCLMP area are found on all aspects. Forested stands being defined as those forested sites where there exists 10 percent canopy cover or higher (or is capable of supporting). The tentatively suitable forested sites (6,729.18 acres, 70.1 percent of the ponderosa pine forested acres); by photo interpretation and ground examination are found predominately on the moist and slightly cooler northerly aspects and the easterly aspect of the larger size draws (Project Record; Forest Vegetation Report, Table 5). The tentatively unsuitable timber sites (2,872.62 acres, 29.91 percent of the ponderosa pine forested acres); by photo interpretation and ground examination are most common on the southerly, drier and slightly warmer aspects and represent the driest ponderosa pine habitat types (Project Record; Forest Vegetation Report, Table 6).

III. EFFECTS OF ALTERNATIVE A ON FOREST VEGETATION – PROPOSED ACTION

A. EFFECTS OF ALTERNATIVE A ON CANOPY LAYERS AND CANOPY COVER

Direct & Indirect Effects

Alternative A would use various commercial timber harvest treatments (regeneration type harvest prescriptions – ST1, SH1, STR, STR1, and intermediate type harvest prescriptions - CT, CT1, LIB, SC, STR1), non commercial thinning (timber stand improvement and fuels thinning – NC4, NC5, NC1, NC2, NC3, PCT, SCNC), prescribed fire treatments (RXB), and post treatment RXB in combination with portions of the CT, LIB, NC4, NC5, NC1, PCT, SC, SCNC SH1, ST1, STR, and STR1 treatments on the landscape to target reduction of ladder fuels, canopy cover and surface fuels. Prescribed fire would be used for preparing regeneration treatment sites for natural regeneration, and return fire as a process to the ecosystem. Openings as defined earlier (average post treatment overstory of less than 20% canopy cover) would be created by ST1 and the SH1 at various sizes including greater than 40 acres (Table 3.1.1 and Appendix A, Map 14). In addition, prescribed fire treatment objectives would be used to create small openings across the treatment types (FEIS, Appendix B and Table 2.8). These openings would create additional within stand age and size class diversity. Ponderosa pine would be managed to promote various densities, single and multi story (no treatments areas) stand structures across the landscape (FEIS, Appendix B). All of the proposed activity treatments would promote and manage for predominately single story stand conditions. A limited amount of the CT1 areas (5 to 15%) would be managed in areas less than 2 acres in size with an uneven aged structure. There would be 2 to 40 trees per acre (averaging 6 to 8) in the understory. The no treatment areas and the 30% unburned portions (the desired management objective for unburned area, Table 2.8) of the RXB treatment areas would maintain multi story stand conditions and have the same effects as described for the No Action alternative. Ponderosa pine average canopy cover in the BCLMP area, post implementation would vary from 5 to 70 percent plus.

The ST1 and SH1 would have the greatest reduction in canopy cover with a post treatment average canopy cover of 10 to 25 percent (low risk for sustaining a crown fire). The CT would
have a post canopy cover averaging 25 percent (low risk for sustaining a crown fire). The NC4, NC1, NC3 and PCT would have average post canopy cover ranges from 10 to less than or equal to 60 percent (low risk to high risk for sustaining a crown fire). The NC5 and NC2 would have areas of post treatment averaging 30 to 70 percent plus (moderate to high risk for sustaining a crown fire). The CT1 treatments would have post treatment canopy covers averaging 50%+ (high risk for sustaining a crown fire). The no treatments currently range from 10 to 70% average canopy cover and overtime with continued stand growth canopies would increase. Thirty five percent of the ponderosa pine no treatment acreage would have 40 to 69 % average canopy cover (high risk for sustaining a crown fire) and 51% would have average canopy covers ≥ 70% (high to very high risk for sustaining a crown fire). Appendix B, Table 2.8 and the Project Record (Tables 8, 9 and 10, Forest Vegetation Report, pp. 41-45) display desired stand conditions, treatment tool by treatment type and the percent of ponderosa pine area treated.

Implementation of Alternative A would result in a landscape that would have a lower risk and be more resilient to large stand replacement wildland fire than Alternative D. Long-term sustainability of the forested system would be higher than the No Action alternative. This in large part due to post treatment conditions of 77 percent (Table 3.1.5, Figure 3.1.1) of the ponderosa pine landscape having stand conditions with limited canopy layers that are less conducive to fire moving into the overstory canopy and 59 percent of the BLCMP landscape having low, very low or no canopy cover (Table 3.1.6a). Forty percent (Table 3.1.6b, Figure 3.1.2) of the ponderosa pine landscape post treatment would have very low and low canopy cover. These very low and low canopy covers scattered and intermingled across the landscape would reduce the risk for a wild fire to be sustained as a crown fire. About 22 percent (Table 3.1.5, Figure 3.1.1) of the Ponderosa pine landscape would still retain ladder fuels with a higher likelihood of large stand replacement wildland fire. The net change would be a 75 percent reduction in ponderosa pine stand conditions exhibiting ladder fuels or multi layer canopies (Table 3.1.5) and a 15 percent reduction in high ponderosa pine canopy cover (Table 3.1.6b). These reductions reduce the overall risk of large stand replacement wildfire in the BCLMP area. With the change from a dominated ladder fuel condition across the landscape and a 16% reduction (Table 3.1.6b) in moderate and high canopy cover sustainability and resiliency of the ponderosa pine systems in the BCLMP area would be improved.
### Table 3.1.5: Alternative Comparison of Canopy Layer Type (Acres and Percent) and Percent of Change From No Action (Alt D) - Ponderosa Pine Forested Area

<table>
<thead>
<tr>
<th>Canopy Layer Type</th>
<th>Alt A</th>
<th>Alt B</th>
<th>Alt C</th>
<th>Alt D</th>
<th>% Change From Alt D</th>
<th>Alt B</th>
<th>Alt C</th>
<th>Alt D</th>
<th>% Change From Alt D</th>
<th>Alt D</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Layer</td>
<td>7,456</td>
<td>7,456</td>
<td>5,211</td>
<td>144</td>
<td>77.64</td>
<td>77.64</td>
<td>77.64</td>
<td>54.27</td>
<td>52.77</td>
<td>1.50</td>
</tr>
<tr>
<td>Two Layer</td>
<td>15</td>
<td>15</td>
<td>19</td>
<td>94</td>
<td>0.16</td>
<td>-0.82</td>
<td>0.16</td>
<td>-0.82</td>
<td>0.20</td>
<td>-0.78</td>
</tr>
<tr>
<td>Multi Layer</td>
<td>2,131</td>
<td>2,131</td>
<td>4,372</td>
<td>9,364</td>
<td>22.20</td>
<td>-75.32</td>
<td>22.20</td>
<td>-75.32</td>
<td>45.53</td>
<td>-51.99</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>9,602</td>
<td>9,602</td>
<td>9,602</td>
<td>9,602</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

1 These are approximate acres derived from Forest GIS coverage's. This data is summarized from the forest strata, average stand conditions and inventory data.

### Table 3.1.6a: Alternative Comparison of Canopy Cover Classes (Acres and Percent) and Percent Change from the No Action (Alt D) - BCLMP Area

<table>
<thead>
<tr>
<th>Canopy Cover Class</th>
<th>Alt A</th>
<th>Alt B</th>
<th>Alt C</th>
<th>Alt D</th>
<th>% Change From Alt D</th>
<th>Alt B</th>
<th>Alt C</th>
<th>Alt D</th>
<th>% Change From Alt D</th>
<th>Alt D</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Canopy Cover</td>
<td>3,896</td>
<td>3,896</td>
<td>3,877</td>
<td>1,966</td>
<td>27.73</td>
<td>+13.74</td>
<td>27.73</td>
<td>+13.74</td>
<td>27.59</td>
<td>+13.60</td>
</tr>
<tr>
<td>Low Canopy Cover</td>
<td>3,775</td>
<td>3,614</td>
<td>3,311</td>
<td>2,207</td>
<td>26.86</td>
<td>+11.15</td>
<td>25.72</td>
<td>+10.01</td>
<td>23.56</td>
<td>+7.85</td>
</tr>
<tr>
<td>Moderate Canopy Cover</td>
<td>4,592</td>
<td>4,753</td>
<td>4,314</td>
<td>4,742</td>
<td>32.68</td>
<td>-1.06</td>
<td>33.82</td>
<td>+0.08</td>
<td>30.70</td>
<td>-3.04</td>
</tr>
<tr>
<td>High Canopy Cover</td>
<td>1,148</td>
<td>1,148</td>
<td>1,890</td>
<td>2,566</td>
<td>8.17</td>
<td>-10.09</td>
<td>8.17</td>
<td>-10.09</td>
<td>13.45</td>
<td>-4.81</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>14,052</td>
<td>14,052</td>
<td>14,052</td>
<td>14,052</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

1 These are approximate acres derived from Forest GIS coverage’s.
### Table 3.1.6b: Alternative Comparison of Canopy Cover Classes (Acres and Percent) and Percent Change from the No Action (Alt D) - Ponderosa Pine Forested Area

<table>
<thead>
<tr>
<th>Canopy Cover Class</th>
<th>Canopy Cover Comparison For Ponderosa Pine Forested BCLMP Area</th>
<th>Acres¹</th>
<th>% of Ponderosa Pine Canopy Cover and % Change From Alt D</th>
<th>% Change from Alt D</th>
<th>% Change from Alt D</th>
<th>% Change from Alt D</th>
<th>% Change from Alt D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alt A</td>
<td>Alt B</td>
<td>Alt C</td>
<td>Alt D</td>
<td>Alt A</td>
<td>Alt B</td>
<td>Alt C</td>
</tr>
<tr>
<td>No Canopy Cover</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Very Low Canopy Cover</td>
<td>110</td>
<td>110</td>
<td>110</td>
<td>110</td>
<td>1.15</td>
<td>0</td>
<td>1.15</td>
</tr>
<tr>
<td>Low Canopy Cover</td>
<td>3,752</td>
<td>3,590</td>
<td>3,288</td>
<td>2,188</td>
<td>39.07</td>
<td>+16.28</td>
<td>37.39</td>
</tr>
<tr>
<td>Moderate Canopy Cover</td>
<td>4,592</td>
<td>4,754</td>
<td>4,314</td>
<td>4,742</td>
<td>47.83</td>
<td>-1.55</td>
<td>49.51</td>
</tr>
<tr>
<td>High Canopy Cover</td>
<td>1,148</td>
<td>1,148</td>
<td>1,890</td>
<td>2,562</td>
<td>11.95</td>
<td>-14.73</td>
<td>11.95</td>
</tr>
<tr>
<td>Totals</td>
<td>9,602</td>
<td>9,602</td>
<td>9,602</td>
<td>9,602</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

¹ These are approximate acres derived from Forest GIS coverage’s.

### Figure 3.1.1: Canopy Layer Comparison – Alternatives A, B, C and D

[Canopy Layer Comparison Graph]
Reinhardt, Holsinger and Keane (2010) modeled similar treatments with the Fire and Fuels Extension to the Forest Vegetation Simulator (FFE_FVS) system for 60 years. After 10 years, potential tree mortality following a wildfire was shown to reduce tree mortality significantly following wildfire. The exception was commercial harvesting where there was limited activity fuels treatment, which contributed to potential tree mortality. The commercial harvest activities in Alternative A would be whole tree logged reducing the amount of activity fuels post treatment. Reinhardt, Holsinger and Keane found that postharvest slash treatment (mastication, whole tree yarding, or no treatment) were not as important as harvest and prescribed fire treatments. Thinning and prescribed fire, which change stand structure and composition, have much more lasting effects on fuels and fire potential. After 60 years, potential tree mortality was still lower than pretreatment (Reinhardt, Holsinger and Keane, 2010).

Other indirect effects include post treatment wind damage to treated stands. It is anticipated 5 to 10 percent of the residual trees in the ST1 and SH1 units could experience windsnap or windthrow in the first few years or until the trees become more windfirm after treatment due to canopy opening. To insure the success of natural regeneration in the ST1 and SH1 treatments, this effect was addressed in the design of the residual number of trees per acre (Appendix B). Standard marking guides on the CNF retain higher tree numbers in locations most susceptible to these effects (ridges and swales). These effects have been successfully demonstrated on similar treatments in ponderosa pine on the CNF post high wind events. Because the CT and the CT1 have much closer spacing and higher crown canopies these effects are expected to be minimal in those respective treatment types. Surface fuel accumulation from wind damage would be expected to slightly increase. The large wind snapped trees (snags) would be available to cavity dependent wildlife.

**Cumulative Effects**

The no treatment areas under this Action Alternative would have the same effects as described in Alternative D the No Action alternative.
**Past Activities**

The past Schiller fire acreage (457 acres) would be burned again in Alternative A, which would keep canopy cover low and promote single story canopy layers on the forested acreage. There is approximately 5 acres that have not fully restocked since the Schiller Fire. The cumulative effects of the proposed burning would be to maintain the low stocking conditions and potentially reduce it slightly.

Twenty-six acres of the 1988 Green Creek timber sale would not be treated in Alternative A; cumulative effect would be increased canopy cover and multi canopy layer development with forest succession and growth. Fifty-eight acres of past regeneration harvest (Pumpkin and Whitetail timber sale units) would have the seed trees removed and the regeneration thinned from below. Cumulatively this would improve stand resilience to wildfire by removing a canopy layer and decrease canopy cover. Thirteen acres on the Pumpkin timber sale had seed trees removed and is proposed for thinning from below that would have an added effect for resiliency by reducing canopy coverage from the existing. The remainder of the Green Creek, Redtail and Whitetail regeneration harvests (139 acres) would maintain a light scattered two story structure with seed trees (3 to 10 trees per acre) to remain after Alternative A. Thinning from below (NC5 and PCT) would occur on these sites having an additive effect on increasing resiliency by reducing existing canopy cover in the understory.

Past liberation harvest units in Pumpkin Creek and Green Creek timber sale units (69 acres) would have an additive effect to increasing resiliency to disturbance through thinning from below activities (NC5 and PCT) by reducing canopy cover and retaining single story structure.

Other past activities in Table 3.1.2 would have the same effects as described in the No Action alternative.

**Present Activities**

Present activities in the BCLMP area are similar to past activities, with the exception of logging (no active logging is occurring) and include intensive grazing management systems for domestic cattle, aggressive wildland fire suppression, limited personal use firewood cutting and seasonal recreational hunting for big game and upland game birds (primarily turkey). Except for wildland fire suppression as described in the No Action alternative, these activities in themselves would not alter canopy cover or canopy layers. However, a large disturbance (fire or epidemic beetle) would decrease canopy cover and canopy layers. See Projects Considered in Cumulative Effects Assessment Table 2.18, Chapter 2.

**Reasonably Foreseeable Future Activities**

Activities described above under present activities and in the projects considered in Cumulative Effects Assessment Table 2.18, Chapter 2 are planned to occur in the BCLMP area along with the Alternative A derived in this analysis. Except for wildland fire suppression as described in the No Action alternative, these present activities in themselves would not alter canopy cover or canopy layers. Effects of non wildland fire past activities (Table 3.1.2), when combined with effects of the action alternative, would have no discernable cumulative effects on overall forest vegetation or levels of insects and disease in the BCLMP area.


B. **EFFECTS OF ALTERNATIVE A ON UNDERSTORY (NON TREE) PRODUCTIVITY**

*Direct and Indirect Effects*

The proposed treatments of commercial harvest (regeneration and intermediate), non-commercial treatments (timber stand improvement thinning, fuels thinning, and aspen/green ash enhancement) and prescribed fire would result in increased sunlight, increased soil moisture, and decreased needle mat. All of these effects would stimulate understory plans. Overall, the effects of the proposed treatments would rejuvenate understory species (shrubs, grasses, and forbs). Prescribed fire would further promote small openings and canopy reduction to increase understory production and recycle nutrients.

The greatest immediate reductions in canopy cover and thus largest increase in understory production post treatment would occur on the commercial treatments of ST1, SH1, STR1, and CT (5 to 30% post treatment canopy cover – See Appendix B). These treatment areas would have a canopy cover less than 30 percent, which would approximate the highest understory production potential (Shepperd and Battaglis, 2002). Post treatment the ST1 and SH1 would maximize understory production.

Treatments LIB, SC, STR, CT1, PCT, RXB, SCNC, NT, NC1, NC3, and NC4 have canopy cover ranging from 10 to 60%. These treatments would have areas of maximum understory production (canopy less than 20%) to areas of a 56 to 64 percent reduction (Shepperd and Battaglis, 2002) in understory production potential (as compared to a 0 to 20 percent canopy cover).

Reductions of crown canopy on the commercial treatments of CT1 (where canopy exceeds 60%), non-commercial treatments NC2 and NC5, and the NT areas (where canopy exceeds 60%) would occur with increased understory production, especially where prescribed fire would also be applied (NC5). Because these treatments would be in excess of 60% canopy cover an 83 to 86 percent reduction (Shepperd and Battaglis, 2002) in understory production potential would be realized, as compared to a 0 to 20 percent canopy cover.

Prescribed fire treatment in combination with the commercial/non commercial treatments would have a benefit in increasing understory production due to a nutrient flush and the added overstory mortality and created openings (Table 2.8). The NT (no treatment areas) would have the same effects as described above for the No Action alternative.

Forbs, grasses and shrubs in the ponderosa pine systems recolonize post disturbances if seed source and rootstock is present. Promoting a healthy, vigorous, abundant understory would make them more resilient to disturbance.

Post treatment leave trees would continue to grow with increased crown development. New trees would establish in treated areas. Even though canopy cover would increase understory production would be better than pretreatment conditions for the next 10 to 60 years without any future disturbance (i.e. thinning, prescribed fire, wildfire).
**Cumulative Effects**

The no treatment areas under this action alternative would have the same effects as described in Alternative D the No Action alternative.

**Past Activities**

Past liberation harvest and regeneration harvests (305 acres) removed overstory and in the liberation harvest thinned out the sapling size component to open up the canopy and increase the understory production. These areas through forest succession, growth and structure development have increased canopy cover and decreased understory production post treatment. Wildland fire (high intensity and fuels benefit) had the greatest reductions in canopy cover that increased understory production on 457 acres. The proposed activities of STR, PCT and NC5 on the past harvest activities would all have an added effect for improving understory production through canopy cover reduction by removal of seed trees (60 acres) and thinning from below in the sapling sized trees (305 acres).

**Present Activities**

Effects are the same as those described above under effects of Alternative A on canopy layers and canopy cover.

**Reasonably Foreseeable Future Activities**

Effects are the same as those described above under effects of Alternative A on canopy layers and canopy cover.

**C. EFFECTS OF ALTERNATIVE A ON LARGE WOODY DEBRIS**

**Direct and Indirect**

Proposed treatments would reduce the competition for nutrients, light and water, initialize understory growth, and result in a forest structure that would be more resilient and sustainable. Treatment efficiency is expected for 10 to 60 years. This temporal period is based on the assumption of no other treatment occurring in this period. After this time period tree growth would continue and new seedlings will have established increasing competition again making them less resilient to disturbance.

Proposed treatments would create activity fuels and add additional tons per acre of woody debris to the forest floor. Appendix B describes the tonnage that would be left after each treatment to ensure resiliency to the system, by limiting the tonnage by size class while still maintaining long term soil productivity. Proposed non commercial thinning treatments that do not have prescribed burning proposed would have a 1 to 2 year period that there would be an increase in wildfire risk. This increased risk would be due to red needles that are highly flammable. When the needles have fallen off the slash and onto the ground the risk diminishes.

Post treatment stands would be more vigorous and healthy and be more resistant to endemic levels of insects and diseases, and tolerant to drought cycles. Following activity treatments (SC, LIB, STR, STR1, SH1, ST1, CT CT1, NC5, NC4, SCNC, PCT, NC3 NC2, NC1) that are not
adjacent to private ownership large woody debris would have a minimum of 4 tons per acre (low to low end of moderate hazard) where available. These same activity treatments that occur adjacent to private ownership would carry a minimum of 3 tons per acre (low hazard rating) where available. Post treatment NC5, NC1, NC2, NC3, SCNC, NC4, STR1, LIB and PCT would have higher tons per acre in the 3 to 7 inch class (moderate hazard). As small disturbance events occur such as endemic beetle activity and snow and wind damage large woody debris would be added to the forest floor.

Following prescribed fire in the NC5, NC1, SCNC, and PCT treatments, large woody debris could exceed 20 tons per acre and upwards of 30 tons within 7 to 10 years when fire killed trees deteriorate and fall down. This would occur on 5 to 10 percent of the treated acres and in areas up to 2 acres in size across these treatment units (Table 2.8). Following prescribe fire in treatments CT, ST1, STR, LIB and SC, large woody debris would have the same increases on less than 3 percent of the treated acres in areas from 0.5 to 2.0 (Table 2.8). No prescribed burning is proposed in NC2, NC3, CT1 and STR1.

Post treatment CWD desired tons per acre would be 1 to 2 tons per acre below recommended (Graham et. al, 1994). However, through FVS modeling of reducing canopy to less than 40% and CWD to 3 tons per acre it was demonstrated that 5 tons per acre would be met within 10 years from treatment through natural mortality and prescribe fire activities (Sandbak, 2004).

The NT (no treatment) areas would have the same effects as described above for the Alternative D the No Action alternative.

**Cumulative Effects**

The no treatment areas under this Action Alternative would have the same effects as described in Alternative D the No Action alternative.

**Past Activities**

Timber sale, post sale, and timber stand improvement activities in the BCLMP area have all occurred more than 17 to 31 years ago (755 acres – 5.4% of BCLMP area). These activities have increased surface fuels in treated areas. The Schiller fire area and the other wildland fire areas have increased surface fuels (518 acres – 3.7% of BCLMP area). Most of these fuels are old and are in various conditions of decomposition benefiting long-term soil productivity. During drought periods when these fuels are very dry they would increase fire behavior. The most recent treatment activity in 2002 and 2003 (18 acres) had activity fuels generated, but these were piled and burned.

**Present Activities**

Present activities are the same as described above in effects to canopy layers and canopy cover. These activities in themselves would not increase large woody debris significantly. However, a large disturbance (fire or epidemic beetle) would increase surface fuels and make them more susceptible to wildfire. See Projects Considered in Cumulative Effects Assessment Table 2.18, Chapter 2.
**Reasonably Foreseeable Future Activities**

Activities described above under present activities, are planned to occur in this BCLMP area along with the proposed activities derived in this alternative. These activities in themselves would not increase large woody debris significantly. However, a large disturbance (fire or epidemic beetle) would increase surface fuels and make them more susceptible to wildfire. Effects of past activities (Table 3.1.2), when combined with effects of the action alternative, would have no discernable cumulative effects on overall forest vegetation or levels of insects and disease in the BCLMP area. See Projects Considered in Cumulative Effects Assessment Table 2.18, Chapter 2.

Large woody debris would continue to be added to the forest floor from endemic beetle activity and wind and snow damage. This would have a cumulative effect for increased surface fuels that would increase wildland fire spread due to preheating the canopy fuels.

**D. Effects of Alternative A on Forest Insect and Disease Susceptibility**

**Direct and Indirect Effects**

Treatments of ST1, SH1, STR1, SC and CT would have the greatest reduction in ponderosa pine trees > 5 inches DBH post treatment. Implementation of these treatments would result in post treatment conditions in a very low-to-low risk, largely due to reducing average canopy cover to 30% or less. The ST1, SH1 and most of the STR1 has a desired condition with emphasis on managing a new stand with a low density overstory tree component and low basal area per acre (BA/ac) which would be less susceptible to beetle attack. For the SH1 and ST1 treatments seed trees would not be removed in the future and a two-story stand would develop and increase susceptibility of those trees to beetle attack with the increased competition. Post treatment stem density greater than 5 inches DBH class in the CT would be the highest for this group of treatments. With the CT’s desired average stand densities (Appendix B) and basal areas (Project Record; Forest Vegetation Report, Appendix II - Table 1 and 2) post treatment, stand and individual tree vigor would be expected to promote endemic beetle levels (lower risks of beetle susceptibility).

Of the proposed commercial treatments, the CT1 has the highest large tree (> 5” DBH) stem densities post treatment, with the objective to maintain high canopy cover conditions (>50%). With these stand conditions and the continued growth individual tree and stand competition for light, water and nutrients would increase. Ponderosa pine sites in eastern Montana are relatively dry and susceptible to periodic droughts, further exacerbating competition and low vigor. If future prescribed fire, thinning, wildfire or other stand treatment do not occur on these sites, pine understories are expected to develop to further stress trees due to limited water and nutrient availability, especially during drought conditions. The CT1 treatments would potentially have the highest risk for severe beetle mortality overtime for the commercially proposed treatments due to stress and competition.
The LIB and STR treatments would remove the current larger beetle prone overstory trees that had low beetle susceptibility prior to treatment and are expected to maintain that risk or reduce it post treatment. This is because after the overstory trees are removed the remaining stand to manage would be less than 5 inches DBH, which is less susceptible to beetle attack. Indirectly with the proposed tree densities in the target stand over the next 120 -130 years these treatment areas would remain at a low to moderate risk if treated to maintain target stand conditions. (Forest Vegetation Report, Appendix II, Project Record).

All of the noncommercial treatments propose thinning from below in the 0 to 7 inch diameter class with the exception of the SCNC, which would have most of the greater than 5 inch ponderosa pine diameter class removed (Appendix B). The SCNC would have beetle susceptibility lessened largely due to the proposed reductions of ponderosa pine in the green ash draws and aspen communities (Appendix B). Currently the PCT treatment areas are predominately less than 5 inches dbh with some areas having scattered large trees, which would remain post treatment. These treatment areas had a very low susceptibility before treatment and would have that after treatment. If managed to target stand conditions (Forest Vegetation Report, Appendix II, Project Record) till age 150 these would have a low to moderate susceptibility to beetle mortality.

The rest of the non commercial treatments (NC4, NC5, NC1, NC2, and NC3) would have competition reduced from the thinning from below activity, but overstory over 7 inches would remain intact. The NC5 and NC2 treatments on the average would be managed for and have the highest stand densities post treatment. Even though competition would be reduced which improves stand vigor, the remaining overstory would continue to grow and these would remain predominately at a moderate rating and trend to a high rating. The NC4, NC1, and NC3 would have varying densities of overstory (10 to 60% canopy) post treatment (Appendix B). The NC4 treatments occur predominately on dryer aspects with less canopy cover (10 to 39% - Appendix B). Post treatment these areas are expected to remain low to moderate. As forest succession, growth and structure development occurs, diameters would increase and susceptibility would trend to moderate and some high. The NC1 and NC3 both occur on both dry and moist sites and currently have low to high stem densities (10 to 70%+ crown canopy – Appendix B). With greater than 7-inch diameter remaining intact post treatment these would remain at low (canopy cover 26 – 40%) to high risk (canopy cover >60%) to beetle mortality. The treatment areas that would be managed with higher canopy covers would trend to high until a disturbance occurs or another vegetation treatment occurs.

The no treatment areas would have the same effects as alternative D, the No Action alternative, as no activity would occur in these areas.

Pine engraver beetle activity has been documented to increase post harvest in large whole tree logging piles. However, it has also been documented (Gibson, 2008b) beetles stay in these large piles and if burned within a year do not pose a problem. Damaged trees during logging can become hosts for engraver beetles and when large numbers of trees are damaged populations build and move into undamaged trees. When activity fuel larger than 3 inches in diameter is put on the ground between January and July and not scattered to allow it to dry out, it becomes a host for the engraver beetle and when multiple broods happen in one season, populations would build.
and move into live healthy trees. All of the treatment activities would create activity slash larger than 3 inches. If logging damage is kept to a minimum and activity slash post treatment is treated according to many of the methods described in the Forested Vegetation Report (pg. 27 - 28 of the Project Record) and Design Feature #6 (Chapter 2, p. 2-21) are adhered to tree killing from engraver beetle would be minimal.

The prescribed fire treatments proposed in combination with other treatments or alone would have two indirect effects. First, fire-damaged trees attract beetles (both mountain pine beetle and pine engraver) and second, fire killed trees individually or in small groups would increase stand size and age class diversity (promote a younger age class). The first could increase beetle levels that would move into other trees of susceptible size and a population could build leading to widespread mortality in the BCLMP area on the moderate and high risk areas. The second is a benefit, as further diversity on the landscape decreases potential for widespread beetle mortality.

Diseases (gall rust, needle scale) are at low levels in the BCLMP area and would not be anticipated to increase dramatically across the landscape as the result of the proposed activities in Alternative A; however there would continue to be small isolated high infection levels.

Implementation of the proposed activities can improve conditions where rust is currently active. Management of gall rust is best achieved by removal of infected or most severely infected (stem galls or more than 6 branch galls) individual trees (USDA, 2004). Thinned stands with residual branch galls tend to become inactive within ten years due to increased vigor and growth and shading out of the lower infected branches (USDA, 2004).

Cumulative Effects

The no treatment areas under this Action Alternative would have the same effects as described in Alternative D the No Action alternative.

Past Activities

Three hundred and five acres of past regeneration and liberation harvest removed or decreased the number of large trees in the treated areas that reduced the susceptibility to bark beetle. Seed trees in regeneration harvests are selected for being disease free and/or resistant to disease. These past harvest activities have made these treated areas more resilient to beetle susceptibility. The proposed activities of STR, PCT and NC5 would all have an added effect for improving beetle susceptibility/resiliency on these 305 acres of past treatment through removal of seed trees (60 acres) and thinning from below in the sapling sized trees (305 acres).

Present and Reasonably Foreseeable Future Activities

Present and reasonably foreseeable future activities are the same as those described under effects of Alternative A on canopy layers and canopy cover above. Wildland fire suppression would have the greatest additive effect on increasing stand density and decreasing vigor making stands over the next 10 to 60 years more susceptible to insect and disease further reducing resiliency in the BCLMP area. See Projects Considered in Cumulative Effects Assessment Table 2.18, Chapter 2.
IV. EFFECTS OF ALTERNATIVE B ON FOREST VEGETATION – PREFERRED ALTERNATIVE

A. EFFECTS OF ALTERNATIVE B ON CANOPY LAYERS AND CANOPY COVER

Direct & Indirect Effects

Alternative B has the same type of proposed treatments as in Alternative A (Tables 2.1, 2.2, 2.3, 2.4 and 2.5) and therefore similar direct and indirect effects. See discussion in Alternative A. The difference is a shift of 208 acres of commercial treatment to non-commercial treatments (Table 2.3). The no treatment acres remain the same in both Alternative A and B at 3,545 acres (Table 2.3). The LIB, STR, STR1, NC1, PCT, and the RXB treated acres remain unchanged in the two alternatives (Table 2.3). The reduced treated acres are in the following treatment types: 

CT = 48 acres, CT1 = 29 acres, SC = 9 acres, SH1 = 8 acres and ST1 = 114 acres. The increased treated acres are in the following non-commercial treatments: NC4, NC3 = 19 acres, NC5 = 160 acres, NC2 = 19 acres and SCNC = 10 acres.

Ladder fuels would still be treated in the 208 increased non-commercial treatment acres. Therefore, the percent of change from the existing BCLMP canopy layer types remains the same between Alternative A and B (Table 3.1.5, Figure 3.1.1). The majority of the reduction in treatment acres in Alternative B is in the ST1, SH1 and CT (170 acres). These types of treatments would have the greatest reduction in canopy cover (Appendix B). Not treating with these canopy reduction treatments the project level effect is exhibited in a small increase in moderate canopy cover (1.68 %) and reduction in low canopy cover (1.68 %) from Alternative A (Table 3.1.6b and Figure 3.1.2). These changed treatment acres are located throughout the project area. With the unchanged project wide ladder fuel condition and a slight increase in project wide moderate crown cover sustainability and resiliency of the ponderosa pine systems would be slightly less to the same as Alternative A. However an effect at the individual stand basis would be realized. Those areas that would remain in the moderate crown cover (>40%) and support a crown fire if a fire got into the crown, resulting in potential loss of the stand.

Implementation of Alternative B results in a landscape that would have a slightly higher risk and slightly less to the same resiliency to large stand replacement wildland fire effects. The sustainability of the forested landscape would be slightly lower to the same as Alternative A.

Cumulative Effects

Cumulative effects from past activities, present activities and reasonably foreseeable activities are the same as those described in Alternative A.
B. Effects of Alternative B on Understory (Non Tree) Productivity

Direct & Indirect Effects

The effects by treatments in Alternative B would be the same as described in Alternative A on understory production. The main difference between the two alternatives would be on the 170 acres of commercial treatments CT, SH1 and ST1 (post treatment low canopy cover) which maximize understory production in Alternative A that were changed to non commercial treatments (post treatment moderate and high canopy cover) in Alternative B that limit understory production potential. Of the 208 acres commercial acres from Alternative A (Table 2.3), 179 acres were changed to non-commercial treatments of NC5 and NC2 in Alternative B. These 170 acres would now be in excess of 60% canopy cover and would have an 83 to 86 percent reduction (Shepperd and Battaglis, 2002) in understory production potential as compared to a canopy cover less than 20%.

Post treatment leave trees would continue to grow with increased crown development. New trees would establish in treated areas. Even though canopy cover would increase understory production would be better than pretreatment conditions for the next 10 to 60 years without any future disturbance (i.e. thinning, prescribed fire, wildfire).

Cumulative Effects

Past, Present and Reasonably Foreseeable Activities

Cumulative effects from past activities, present activities and reasonably foreseeable activities are the same as those described in Alternative A.

C. Effects of Alternative B on Large Woody Debris

Direct & Indirect Effects

Effects are the same as those described in Alternative A.

Cumulative Effects

Cumulative effects from past activities, present activities and reasonably foreseeable activities are the same as those described in Alternative A.

D. Effects of Alternative B on Forest Insect and Disease Susceptibility

Direct & Indirect Effects

Effects would be very similar to those described in Alternative A. Difference in effects is in the amount of acres treated by treatment types. Alternative B has a small shift in acres treated in the
commercial treatments (208 acres) to non-commercial treatments. Of these 208, 178 acres are in the group of treatments that would have had the greatest reduction in ponderosa pine trees > 5 inches DBH post treatment. This is less than 2% of the forested acres. On the landscape this is a small effect but within the individual stands the shift to non commercial treatments that do not treat the overstory puts them at higher risk for beetle susceptibility over time as the stands continue to grow and remain predominately at the moderate rating and trend towards the high rating for susceptibility.

**Cumulative Effects**

Cumulative effects from past activities, present activities and reasonably foreseeable activities are the same as those described in Alternative A.

**V. EFFECTS OF ALTERNATIVE C ON FOREST VEGETATION - NO TREATMENT IN GOSHAWK PFA’S**

**A. EFFECTS OF ALTERNATIVE C ON CANOPY LAYERS AND CANOPY COVER**

**Direct & Indirect Effects**

Alternative C has the same type of proposed treatments as in Alternative A and B (Tables 2.1, 2.2, 2.3, 2.4 and 2.5) and therefore similar direct and indirect effects by treatment type. See discussion in Alternative A effects section. The difference in Alternative C from Alternative A and B is the shift of all of the commercial, non commercial and prescribed burn treatments acreage in the goshawk PFA’s to no treatment and some of the acreage in commercial treatment to non commercial treatments. The no treatment acreage increased 2,449 acres from Alternative A and B (Table 2.3). Forty five percent of the ponderosa pine no treatment acreage have 40 to 69 % average canopy cover (high risk for sustaining a crown fire) and 42% have average canopy covers > 70% (high to very high risk for sustaining a crown fire). The LIB is the only treatment acreage that remains the same across all alternatives (Table 2.3). The reduced treatment acreage as compared to Alternative A is in the following treatment types: CT = 72 acres, CT1 = 1,267 acres, SC = 14 acres, SH1 = 22 acres, ST1 = 302 acres, STR = 4, STR1 = 76 acres, NC4, NC3 = 73 acres, NC5 = 501 acres, NC2 = 105 acres, PCT = 120 acres, SCNC = 2 acres and RXB = 88 acres (Table 2.3). The non-commercial treatment NC1 is the only treatment that increased from Alternative A and B (198 acres). The net difference in commercial harvest acres is 1,757 acres from Alternative A and 1,549 acres from Alternative B (Table 2.3). Non commercial acres decreased by 603 acres from Alternative A and 811 acres from Alternative B (Table 2.3). Overall there would be 2,448 acres of less ladder fuel and canopy cover reduction treatments in this alternative.
Less treatment has a direct effect on the post treatment landscape level canopy layer and canopy cover acreage and the risk for stand replacement fire. Multi layer canopy type would be reduced by 52 percent, two-layer canopy type would be reduced by 1 percent and one layer canopy type would be increased by 53 percent from the existing condition (Table 3.1.5, Alt D). There would be approximately 23 percent more multi layer canopy conditions and 23 percent less one layer canopy conditions in this alternative versus Alternatives A and B. Alternative A and B have 8 percent less high canopy conditions than this alternative. This alternative has 7 percent less high canopy conditions than the existing condition. Higher crown covers (>40%) have an increased chance of sustaining a crown fire. This alternative reduces the amount of high canopy cover by 11 percent from the existing.

High canopy cover conditions and multi layer canopy cover conditions would be reduced on the landscape in this alternative from existing conditions; however there is an increased risk for stand replacement fire in the goshawk post fledgling areas (PFA’s) on the landscape. Ladder fuels are present across the PFA areas, with no treatment proposed to reduce ladder fuels there exists a ladder for fire to climb into the crown and become a running crown fire and potentially a stand replacement type fire. This can indirectly have an impact on adjacent stands outside the PFAs that have canopy cover greater than 40 percent to sustain a crown fire if started in the no treatment areas.

The reduced treatment across the landscape and the extent of the no treatment areas in this alternative puts the BCLMP forested landscape at a higher risk for large stand replacement wildfire over Alternative A and B that break up more of the multi layer canopy and higher canopy cover.

Implementation of Alternative C would result in a higher risk than Alternatives A and B and a lower risk than Alternative D to large stand replacement wildfire. Conversely, Alternative C would have a lower resiliency to wildland fire effects (largely due to the no treatment areas in the goshawk PFA’s) than Alternative A and B but higher than Alternative D. Sustainability of the forested areas would be lower in Alternative C over the other action alternatives, but higher than Alternative D.

**Cumulative Effects**

The no treatment areas under this Action Alternative would have the same effects as described in Alternative D the No Action alternative.

**Past Activities**

The past Schiller fire acreage (457 acres) would be burned again in Alternative C, which would keep canopy cover low and promote single story canopy layers on the forested acreage. There is approximately 5 acres that have not fully restocked since the Schiller Fire. The cumulative effects of the proposed burning would be to maintain the low stocking conditions and potentially reduce it slightly.

One hundred and forty three acres of the 1988 Green Creek timber sale liberation and regeneration units and sixty-six acres of past regeneration harvest units in the Whitetail (1984, 1986) and Redtail (1987) timber sale would not be treated in Alternative C. The cumulative
effect would be increased canopy cover and multi canopy layer development with forest succession and growth. One hundred and thirty nine of the regeneration acres would maintain a light scattered two-story structure with seed trees (3 to 10 trees per acre) to remain after Alternative C. Sixty acres of the regeneration acreage would maintain 10 to 25 trees per acre.

Twenty-four acres of past regeneration harvest (1987 Pumpkin timber sale units) would have the seed trees removed and the regeneration thinned from below. Cumulatively this would improve stand resilience to wildfire by removing a canopy layer and decrease canopy cover. Thirteen acres on the Pumpkin timber sale had seed trees removed and is proposed for thinning from below that would have an added effect for resiliency by reducing canopy coverage from the existing.

Past liberation harvest in Pumpkin Creek timber sale (25 acres) would have an additive effect to increasing resiliency to disturbance through thinning from below activities (NC5) by reducing canopy cover and retaining single story structure.

Present and Reasonably Foreseeable Future Activities

Effects are the same as those described in Alternative A

B. Effects of Alternative C on Understory (Non Tree) Productivity

Direct & Indirect Effects

The effects by treatment types in Alternative C would be the same as described in Alternative A on understory production. There are 1,757 acres less of commercial harvest and 603 acres less of non commercial treatments in this alternative than in Alternative A (Table 2.3). Two thousand three hundred and sixty five acres less forested acres would be treated in this alternative versus Alternatives B and C. With no canopy reduction proposed for these areas there would be no improvement opportunity in understory production on these acres in Alternative C through treatment activities. This effect would be greatest within the goshawk post-fledgling areas and would be similar to that described in the No Action alternative.

Like Alternative B prescribed fire would be applied again (Appendix B) in 10 to 15 years after initial treatment (4,056 acres). This second prescribed fire would have an added benefit of stimulating understory production due to a nutrient flush, created openings, and understory and overstory tree mortality.

Cumulative Effects

The no treatment areas under this Action Alternative would have the same effects as described in Alternative D the No Action alternative.

Past Effects

Past effects are the same as described in Alternative A and with similar effects on the past activities being treated identified in the direct and indirect effects above.
Present and Reasonably Foreseeable Activities

Effects are the same as described in Alternative A.

C. Effects of Alternative C on Large Woody Debris

Direct & Indirect Effects

Effects are similar to those described in Alternative B for similar treatment types. Twenty five percent less of the forested landscape is being treated in this alternative. The effects on this 25% would be similar to those described in the No Action alternative.

Cumulative Effects

Effects are the same as those described in Alternative A.

D. Effects of Alternative C on Forest Insect and Disease Susceptibility

Direct & Indirect Effects

Effects by treatment type would be similar to those described in Alternative A. Difference in effects is in the amount of acres treated by treatment types. Alternative C has a larger shift in acres treated in the commercial treatments (1,757 acres) to non-commercial and no treatments over Alternative A. Of these 1,757, 410 acres are in the group of treatments that would have had the greatest reduction in ponderosa pine trees > 5 inches DBH post treatment. This is about 4% of the forested acres. On the landscape this is a small effect but within the individual stands the shift to non commercial treatments that do not treat the overstory puts them at higher risk for beetle susceptibility over time as the stands continue to grow and remain predominately at the moderate rating and trend towards the high rating for susceptibility. Another effect is in the amount of forested area being treated under Alternative C (47%) compared to Alternative A and B (78%) and the extent of areas that would have no treatment occurring. Twenty five percent more of the forested acres would not be treated under Alternative C than Alternative A and B. These untreated areas would continue to grow and more of the BCLMP area would be at moderate and trend to high susceptibility. These non-treated areas would have the same effects as those in the No Action alternative. These no treatment areas would allow for beetle populations to grow and potentially spread to adjacent untreated areas and treated areas with higher large tree (>5 inches dbh) densities.

Cumulative Effects

The no treatment areas under this action alternative would have the same effects as described in Alternative D the No Action alternative.

Past Activities

Effects of past activities are the same as those described in Alternative A. Except that only 62 of the 305 acres past liberation and regeneration harvests would be treated with proposed activities
of STR and NC5. This would have an added effect for improving beetle susceptibility/resiliency through removal of seed trees and thinning from below on these 62 acres. The remaining 243 acres of these past activities would not be treated and have similar effects as described in the No Action alternative.

Present and Reasonably Foreseeable Future Activities

Effects are the same as described in Alternative A.

E. OTHER REQUIRED DISCLOSURES UNDER ALL ACTION ALTERNATIVES FOR EFFECTS TO FOREST VEGETATION

Implementation of the proposed action alternatives is consistent with numerous other laws, regulations, and policies (Table 3.1.7). Disclosures are based on rationale for the Proposed Action alternative in the above Forest Vegetation discussion and in the Forest Vegetation Report in the Project Record.

Table 3.1.7: Other Required Disclosures for the Proposed Action Alternative

<table>
<thead>
<tr>
<th>Act, CFR, Forest Service Policy</th>
<th>Consistency Disclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic Administration Act</td>
<td>Provides for a supply of timber for the use and necessities of citizens of the United States.</td>
</tr>
<tr>
<td>Knutson-Vandenberg Act</td>
<td>Timber harvest is proposed that would allow collection of funds from the timber purchaser to protect and improve the future productivity of the renewable resources of the forestland.</td>
</tr>
<tr>
<td>Anderson-Mansfield Reforestation and Revegetation Act</td>
<td>Proposed treatments on lands within BCLMP area would provide timber needs of local communities. There would be no denuded lands from proposed treatments within the BCLMP area.</td>
</tr>
<tr>
<td>Granger-Thye Act</td>
<td>Timber harvest is proposed. Deposits from the timber purchaser would be secured to cover the cost of disposing of brush and other debris resulting from their cutting operations.</td>
</tr>
<tr>
<td>Multiple-Use Sustained-Yield Act</td>
<td>National forests were established and are to be administered for many purposes one being timber. Multiple use means the management of all the various renewable surface resources of the national forest so they are utilized in the combination that would best meet the needs of the American people. Timber harvest is proposed to utilize the resource and provide timber products to the American people.</td>
</tr>
<tr>
<td>Forest and Rangeland Renewable Resources Planning Act</td>
<td>It is policy that all forested lands in the National Forest system be maintained in appropriate forest cover with the species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management. Target stand and desired conditions for the Proposed Action maintain forest cover to meet the multiple standards, goals and objectives in the Forest Plan. All regeneration harvests and small openings created during prescribed fire</td>
</tr>
<tr>
<td>Act, CFR, Forest Service Policy</td>
<td>Consistency Disclosure</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>implementation would be monitored (1\textsuperscript{st}, 3\textsuperscript{rd}, and 5\textsuperscript{th} year) to ensure forest cover reestablishment per the stocking objectives in the Proposed Action and monitoring item E2 in the Forest Plan (pg. 107).</td>
<td></td>
</tr>
<tr>
<td>National Forest Management Act</td>
<td>See Forest and Rangeland Renewable Resources Planning Act above. The Proposed Action would provide for a diversity of vegetation conditions in the ponderosa pine to meet multiple objectives in the Forest Plan overall goals and specific management area standards and objectives.</td>
</tr>
<tr>
<td>Reforestation Trust Fund, Title III – Reforestation, Recreation Boating Safety and Facilities Improvement Act</td>
<td>Forest management activities are proposed that would be eligible to utilize trust fund dollars for reforestation, timber stand improvement, and other forest stand improvement activities to enhance forest health and reduce hazardous fuel loads of forest stands in the BCLMP area.</td>
</tr>
<tr>
<td>Title 36 Code of Federal Regulations, Part 219 - Planning</td>
<td>The overall goal of managing the National Forest System is to sustain the multiple uses of its renewable resources in perpetuity while maintaining the long-term productivity of the land. Resources are to be managed so they are utilized in the combination that would best meet the needs of the American people. Maintaining or restoring the health of the land enables the National Forest System to provide a sustainable flow of uses, benefits, products, services, and visitor opportunities. The proposed action alternatives use timber harvest, prescribed burning, non-commercial treatments, and areas of no treatments to create a diversity of vegetation condition and age classes in the BCLMP area to provide multiple uses to meet the Forest Plan overall goals and management area objectives and standards.</td>
</tr>
<tr>
<td>Forest Service Handbook 2409.17, 2.2</td>
<td>Proposed regeneration seed tree and shelterwood seed tree harvests are proposed to be regenerated in 5 years (Appendix B, FEIS) with the minimum trees per acre and percent stocked area by suitability displayed in Tables 2.9 and 2.10. All regeneration harvest units would be monitored 1\textsuperscript{st}, 3\textsuperscript{rd}, and 5\textsuperscript{th} year after harvest (Forest Plan Monitoring Item E2, pg. 107) for adequate stocking. Seed trees would be protected as needed prior to prescribe burning by pulling fuel accumulation away from bole of tree (Design criteria #5, Chapter 2, pg. 2-21, FEIS). Large openings created by prescribed burning would be monitored on suitable lands to ensure adequate restocking (Tables 2.9 and 2.10). These time frames and stocking objectives would be documented in the detailed silvicultural prescription prior to implementation.</td>
</tr>
<tr>
<td>Forest Service Handbook 2409.33</td>
<td>Failure or regeneration post harvest from livestock grazing has not been documented on the Custer National Forest. If livestock grazing appears to be a problem, grazing would be deferred until restocked and seedlings can withstand the grazing pressure.</td>
</tr>
<tr>
<td>Forest Service Handbook</td>
<td>Prior to implementation of any treatment on forested areas a detailed silvicultural prescription would be prepared detailing the methods,</td>
</tr>
</tbody>
</table>
**Irreversible/Irretrievable Commitments for All Action Alternatives to Effects to Forest Vegetation**

None identified.

**Short-term Uses vs. Long-term Productivity for All Action Alternatives for Effects to Forest Vegetation**

The Action Alternatives have vegetation treatments that would increase vigor, create vegetation diversity in the BCLMP area making the forest vegetation more resilient to disturbances such as wildfire and bark beetle attack. Long-term productivity of the forest vegetation would be enhanced. The difference between the action alternatives is in the amount of proposed types of treatment acreage (Tables 2.1, 2.2, 2.3, 2.4 and 2.5).

**Unavoidable Adverse Effects for All Action Alternatives on Effects to Forest Vegetation**

Current conditions of the forest vegetation are less resilient to disturbances such as wildfire and epidemic bark beetle infestations. Proposed vegetation treatments would make forest vegetation more resilient to disturbance and reduce the potential to loss of the forest vegetation in the BCLMP area. The difference between the action alternatives is in the amount of proposed types of treatment acreage (Tables 2.1, 2.2, 2.3, 2.4 and 2.5).

**Forest Plan Consistency for All Action Alternatives for Effects to Forest Vegetation**

Implementation of the Action Alternatives is consistent with the Forest Plan goals, objectives, and management standards. See Consistency with the Custer Forest Plan in Chapter 2 (pg. 2-26 to 2-37).
F. CONCLUSIONS FOR ENVIRONMENTAL CONSEQUENCES OF PROPOSED ACTION ALTERNATIVES ON EFFECTS TO FOREST VEGETATION

Post treatment, Alternative A and B have approximately the same susceptibility to beetle 13.2% vs. 12.9% in the low to moderate, 11.2% vs. 10.0% in the very low, 52.8% vs. 54.7% in the very low to high, 4.7% vs. 4.2% in the very low to low, and 18% vs. 18.2% in the very low to moderate (Figure 3.1.3). Alternative C has no acres in the low to moderate and an increase of approximately 20% in very low to high susceptibility compared to Alternative A and B. These changes in Alternative C are due to no treatment areas in the goshawk PFA’s, which existing condition is predominately moderate to high susceptibility.

**Figure 3.1.3: Beetle Susceptibility Post Treatment by Action Alternative**

<table>
<thead>
<tr>
<th></th>
<th>Low to moderate susceptibility (Treatments - CT1)</th>
<th>Very low susceptibility (Treatments – SC, SH1, ST1)</th>
<th>Very low to high susceptibility (Treatments – NC5, NC1, NC2, NT)</th>
<th>Very low to low (Treatments - CT, LIB, PCT, STR, STR1)</th>
<th>Very low to moderate (Treatments – NC4, NC3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative A</td>
<td>13.2%</td>
<td>11.2%</td>
<td>52.8%</td>
<td>4.7%</td>
<td>18.0%</td>
</tr>
<tr>
<td>Alternative B</td>
<td>12.9%</td>
<td>10.0%</td>
<td>54.7%</td>
<td>4.2%</td>
<td>18.2%</td>
</tr>
<tr>
<td>Alternative C</td>
<td>0.0%</td>
<td>7.8%</td>
<td>73.2%</td>
<td>1.9%</td>
<td>17.1%</td>
</tr>
</tbody>
</table>

1 = Low to moderate susceptibility (Treatments - CT1). 2 = Very low susceptibility (Treatments – SC, SH1, ST1). 3 = Very low to high susceptibility (Treatments – NC5, NC1, NC2, NT). 4 = Very low to low (Treatments - CT, LIB, PCT, STR, STR1). 5 = Very low to moderate (Treatments – NC4, NC3). Post treatment stand characteristics of crown cover and size class (Appendix B) were used to determine beetle susceptibility. See Table 3.1.7 and page 3-15 for rational and Sandbak, 2011 excel spreadsheet for susceptibility by treatment type.

Implementation of the proposed activities can reduce beetle susceptibility if managed stand conditions meet those stand density conditions by age class in the 120 to 150 year rotation period (Project Record; Forest Vegetation Report, Appendix II Tables 1 – 6) described in the target stand conditions. Future vegetation treatments if done would maintain low to moderate levels of susceptibility or improve. Decreased risk of susceptibility would be the greatest on the proposed forested treatment acres of the ST1, SH1, STR, STR1, LIB, SC, SCNC, and CT (Alternative A = 1,476 acres – 15.4%, Alternative B = 1,307 acres – 13.6%, Alternative C = 984 acres – 10.2%). Some decrease would occur for the short term from understory thinning in the CT1 (Alternative A = 1,267 acres – 13.2%, Alternative B = 1,238 acres – 12.9%, Alternative C = 0 acres, 0%) and the non-commercial treatments due to reduced competition. However, in the non-commercial treatments (NC5, NC1, NC2, NC3, PCT, and NC4) the 7-inch and larger trees in these treatment areas would remain unthinned and that component is more susceptible to attack. This short-term
reduction would occur to varying levels across the action alternatives (Alternative A = 4,171 acres – 43.4%, Alternative B = 4,369 acres – 45.5%, Alternative C = 3,570 acres – 47.2%). Total commercial and non-commercial percent of treated acres in the forested area varies across the BCLMP (Alternative A and B = 72%, Alternative C = 47%). Prescribed fire application would have the potential to increase beetle activity in the fire damaged trees and also increase within stand diversity with individual tree mortality and small area mortality that can have a positive effect on reduced susceptibility of the treatment area as a whole.

An effect from the proposed treatments would be on the potential to alter fire behavior during a wildfire event (Section 3.2 - Fuels). Fire behavior is strongly influenced by stand and fuel structure (tree density, ladder fuels, surface fuels and crown canopy). Crown fires are dependent on the continuity of available fuels starting from the ground surface to the canopy. Limiting crown fire in the BCLMP area would be accomplished by the proposed individual treatments cumulatively through treatments of surface, ladder and crown fuels across this landscape. The proposed action alternatives can help produce diverse forest structures and fuels characteristics across the landscape that then reduce the likelihood that wildfires would cause large, rapid changes in biophysical conditions. The proposed treatments can modify fire behavior sufficiently so that some wildfires can be suppressed more easily. The amount and extent of these treatments on the BCLMP forested landscape varies by action alternatives as described in the effects sections above. It would take subsequent, sustained fuel treatments (ones that do not increase canopy layers, crown canopies or surface fuels) to maintain favorable stand and fuel conditions on the landscape.

The Action Alternatives would decrease tree densities, reduce tree competition, and promote healthy, vigorous trees and overall forest health. All of these treatments would have green trees remaining. Through natural processes large woody debris would be added to the forest floor over time. FFE-FVS was modeled with a thinning from below with 40% canopy cover and with no activity slash left to demonstrate what CWD would be accumulated from natural processes and 20 year prescribed fire for a 100-year period (Sandbak, 2004). The model showed over 19 tons per acre would be added to the forest floor (Sandbak, 2004). The proposed action alternatives would meet or exceed the recommended large woody debris, as mortality occurs to maintain long-term soil productivity on the treated areas.

Implementation of Alternative A would have the highest resiliency to wildland fire effects and provide for the highest potential for sustainability of the forested landscape on the BCLMP area. This would be followed by Alternative B, with Alternative C having the lowest resiliency to wildland fire effects and lowest potential for sustainability of the forested landscape.

The objective of fuel reduction within the BCLMP area cannot be to “fireproof” the environment, but rather to reduce the likelihood of stand-replacement crown fire, i.e., change fire behavior. Fires would still continue but the cumulative effects across the BCLMP area of regeneration harvest, thinning from below (commercially and non commercially), prescribed fire and woody draw enhancement combined with treating the resultant activity fuels would make the forested stands more resilient and reduce future fire effects.
VI. EFFECTS OF ALTERNATIVE D ON FOREST VEGETATION – NO ACTION

A. EFFECTS OF ALTERNATIVE D ON CANOPY LAYERS AND CANOPY COVER

Direct and Indirect Effects

No vegetation/fuels treatments would occur. Multiple canopy layer (ladder fuel) conditions across the landscape under a No Action scenario are expected to remain the same. Barring any major disturbance, canopy cover across the landscape is expected to move towards a continuous high canopy cover category. Until a future disturbance occurs stand conditions would increasingly become denser, and function with a high probability for large disturbances (i.e. large stand replacement wildland fire, epidemic insect, and disease). Currently over 97 percent (9,364 acres) of the existing ponderosa pine forested coverage has multiple canopy layers resulting in a continual ladder of fuels to the crown (Table 3.1.5, Figure 3.1.1). Seventy six percent of the current forested landscape has a canopy cover greater than 40 percent, which once the fire reaches the crown can sustain a crown fire (Table 3.1.6b, Figure 3.1.2). The forested landscape in this 76 percent is expected to increase average canopy coverage in the individual stands with continued fire suppression and no vegetation management under a No Action alternative. These conditions increase the risk or likelihood of large stand-replacement wildfire as detailed in Section 3.2 – Fuels. This landscape condition would have a low resiliency to large stand replacement wildland fire.

Cumulative Effects

Continued fire suppression, is expected to increase stand density, canopy cover, vertical fuel continuity (ladder fuels) and crown fire potential; and decrease tree vigor, shrub production, water availability, run off, and nutrient availability. Tree seedlings would continue to regenerate with resulting increases in tree densities. As these seedlings grow in size, canopy layers would continue to increase. This would result in more competition between trees for increasingly limited nutrients and moisture, resulting in a further decline in forest health. These conditions predispose the forest to large stand replacement fire or other large disturbance events. The long-term sustainability of the ponderosa pine forest ecosystem would be less under this alternative.

Past Effects

The BCLMP area experienced the largest amount of wildfire, timber salvage harvest and fuels treatment activity during the period of 1985 to 1990 (Table 3.1.2). The Schiller Fire (1988) occurred on approximately 457 acres (3.2% of BCLMP area). Approximately 243 (1.7% of BCLMP area) of these acres were salvage harvested (Deer Salvage) to remove the dead and dying trees post fire. These wildfire activities all occurred on the far west side of the BCLMP area. The Schiller fire has had the largest effect on current stand structure with current conditions of low canopy cover. For these past wildfire areas with continued no action, stand growth would increase to higher canopy cover and multiple canopy layers.
Regeneration harvests have occurred in the BCLMP area on 236 acres (1.7%) from 1979 to 1991 (Table 3.1.2). Thirty-four acres (.24% of BCLMP area) in 1991 and 99 acres (0.70% of BCLMP area) in 1988 were harvested under the Green Creek Timber Sale. In 1987 under the Pumpkin Divide Timber Sale and Redtail Timber Sale 73 acres (.52% of the BCLMP area) were harvested. The Whitetail Timber sale in 1984 and 1986 had an additional 30 acres (.21% of the BCLMP area) of regeneration harvest. These harvested units have all regenerated successfully with seed trees currently remaining on all but 13 acres. Past treatment has created two canopy layers (except for noted 13 acres); continued forest succession, growth and structural development would move these into high canopy cover and increase canopy layers with the No Action alternative.

Liberation harvests that removed overstory trees occurred in 1988 under the Green Creek Timber Sale on 44 acres (.31% of the BCLMP area). Another 25 acres (.18% of the BCLMP area) occurred under the Pumpkin Divide Timber sale in 1987. Past treatment on these units reduced canopy layers, but continued stand succession and growth would increase canopy cover and multi layers would develop with no action.

From 1979 to 1990 fuels treatments, timber stand improvement treatments, site preparation for natural regeneration, precommercial thinning and permanent growth plot installation occurred on 1,413 acres (10.0% of the BCLMP area). The majority (1,114 acres) of these acres occurred within harvest units and stand condition as a result of the harvest activity and post sale activity was considered in the analysis of the existing stand conditions.

All of the BCLMP area has had active fire suppression over the last 90 years. This along with the limited activities in the BCLMP area (less than 10% of the project acreage) has had the largest impact on the current stand conditions in the BCLMP area.

Since 1979 the BCLMP area has experienced vegetation management and wildfire on 17.6% or 2,479.9 acres of the total area (Table 3.1.2). One thousand one hundred and fourteen acres (9.7% of project acres) of these acres were post sale treatment acres on the harvested acres. These past activities have had little impact on the overall current stand conditions (canopy layers and canopy cover) in the BCLMP area. With limited past activities, forest succession, growth and structural development has led to less resiliency of the ponderosa pine systems in the BCLMP area. This is due to changes in this dry forest landscape identified in Table 3.1.3 and the associated changes in disturbance processes discussed on page 3-9.

**Present Effects**

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

Except for wildland fire suppression as described above, these activities in themselves would not alter canopy cover or canopy layers. However, a large disturbance (fire or epidemic beetle) would decrease canopy cover and canopy layers. See Projects Considered in Cumulative Effects Assessment Table 2.18, Chapter 2.
Reasonably Foreseeable Future Activities

Activities described above under present activities are planned to occur in this BCLMP area. Except for wildland fire suppression as described above, these activities in themselves would not alter canopy cover or canopy layers. However, a large disturbance (fire or epidemic beetle) would decrease canopy cover and canopy layers. See Projects Considered in Cumulative Effects Assessment Table 2.18, Chapter 2.

B. EFFECTS FROM ALTERNATIVE D ON UNDERSTORY (NON TREE) PRODUCTION

Direct and Indirect Effects

Currently 76 percent (Table 3.1.6b, Figure 3.1.2, Alt D) of the ponderosa pine forested landscape has a canopy cover greater than 40 percent, reducing potential understory production by approximately 56 to 86 percent. With continued fire suppression or lack of disturbance, the ponderosa pine needle cast and high crown canopy would continue to increase and progressively suppress understory vegetation. The root systems of many species of grasses, forbs and shrubs are alive under this needle mat and would sprout if the needles were removed. However, these root systems cannot survive indefinitely and would decline in vigor. This would result in reduced resiliency of the ecosystem to regain its historical composition, structure, and function when a disturbance occurs. This also reduces the amount of available nutrients in the nutrient cycle, and leads to forest stands that are unhealthy and prone to insects and disease epidemics. Continued forest succession, growth and structure development is expected into the future until a disturbance happens that would remove the needle mat and reduce canopy cover for understory plants to respond. Small-scale disturbances (i.e. endemic beetle mortality, snow and wind damage) would continue to reduce canopies and allow understory to respond in localized areas.

Cumulative Effects

Past Effects

Past liberation harvest and regeneration harvests (305 acres) removed overstory, and in the liberation harvest, thinned out the sapling size component to open up the canopy and increase the understory production. These treated areas through forest succession, growth and structure development have increased canopy cover and have decreased understory production. Wildland fire (high intensity and fuels benefit) had the greatest reductions in canopy cover that increased understory production on 457 acres. Forest succession, growth and structure development would continue on both the harvest and wildland fire areas and increasing canopy cover, decreasing understory production for the next 60 years plus or until a disturbance occurs.

Present Effects and Reasonably Foreseeable Future Activities

Present and reasonably foreseeable future activities are the same as those described under effects of Alternative D on canopy layers and canopy cover above. Except for wildland fire suppression as described above, these activities in themselves would not alter canopy cover. Continued forest succession would increase canopy cover, decreasing understory production. However, a large
disturbance (fire or epidemic beetle) would decrease canopy cover and then increase understory production. See Projects Considered in Cumulative Effects Assessment Table 2.18, Chapter 2.

C. **EFFECTS OF ALTERNATIVE D ON LARGE WOODY DEBRIS**

**Direct and Indirect Effects**

Currently surface fuels average 5 to 8 tons per acre across the landscape with small-scattered areas having 15 to 20 tons per acre (Section 3.2 - Fuels, II (D) Surface Fuel Loading, pg. 3-65 to 3-66). These levels of surface fuels meet or exceed the recommended 5 to 13 tons/ac of CWD by Graham et. al, (1994). Mortality from natural disturbance events such as endemic populations of beetles and/or other insects and damage from wind and snow events are expected to occur into the future. These events would continue to create areas of increased large woody tons per acre across the BCLMP area. With a No Action scenario surface fuels are expected to increase in localized areas, making those areas less resistant to wildland fire. These increased surface fuels, if ignited during wildfire, would create enough heat to move the fire into the upper canopy.

Without a change in the current structure of the forests in the BCLMP area forest health would decline creating conditions that would further increase fire behavior and intensity during wildland fires. These conditions would result in an increased probability of a large stand replacement event. Current stand conditions (dense, multi canopy layers and continuous canopy cover) are less resistant to disturbance. Loss of the existing ponderosa pine forest would be likely with increased probability of wildfire. Over the past 10 years, on the Ashland RD there have been 5 large fires (2000-Stag Tobin Complex = 69,872 acres; 2003 -Wiley Fire = 7,000 acres; 2005-Erickson Fire 2,700 acres; 2006-Watt Draw Fire = 15,797 acres; 2007-Lost Fire 10,773 acres) impacting broad landscapes of ponderosa pine forests. Stand conditions were similar in these fire areas as in the BCLMP. The 2000 and 2005 fire resulted in 95 to 100% ponderosa pine mortality on 70 to 80% of the fire area. The 2003, 2005 and 2007 fires resulted in 95 to 100% ponderosa pine mortality on 30 to 50% of the fire area. Large areas within these fire areas still remain unforested. Lack of seed source will keep these areas unforested for many decades.

**Cumulative Effects**

Although historically, insects played a role in the ponderosa pine stands, fire appears to have been the dominant disturbance agent. By maintaining the current stand conditions and suppressing wildland fire, insects and disease may become the major disturbance agent in the BCLMP area. A long-term effect of the No Action Alternative would be to perpetuate a trend toward a “boom and bust” cycle of larger scale disturbances between insects and disease and wildland fire in the ponderosa pine forest. This kind of disturbance regime, and the resulting landscape pattern (large patch size), would be much different from that occurring historically. Stand replacement fire in ponderosa pine types under a historical fire regime is estimated at about 10 to 15 percent (USDA, 1998) and Wright (1978) has indicated that vegetation patterns created from the historical fire regime occurred in 0.5 to 2 acre or larger even-aged patch size.
With a No Action scenario fuels are expected to increase. If a large wildfire were to occur an increase of surface fuels would be expected 10 to 13 years post fire after the fire-killed trees have fallen. This would result in a high hazard fuels load and risk for a reburn.

In 2002, that is what happened as a cumulative effect of the 1988 sixty two thousand acre large stand replacement wildfire on the Sioux Ranger District of the CNF. Up to 40 tons per acre of down dead fuels intermixed with flashy light fuels (grass, brush and tree regeneration) dominated the post 1988-pre 2002 burn area. In 2002 this fuel complex is what carried the Kraft Springs fire. As indicated by the fire behavior specialist the continuous large woody debris component was a major carrier of the fire and made suppression operations very difficult (Sandbak and Clark 2005). The end result of this reburn was a loss of the large woody debris component across much of the fire area (Sandbak, 2003; slides 27-33 and 42).

Another cumulative effect from the No Action and large stand replacement fire events is potential loss of the ponderosa pine forest (deforested) for long periods of time. Ponderosa pine has a thick bark that acts as an insulator and long needles that protect its buds to withstand effects from frequent low intensity fires. Ponderosa pine has a large heavy seed and does not have the ability to reseed large disturbance areas in short time frames like other small winged pine species like lodgepole pine. Ponderosa pines large seed and cone generally are destroyed and do not remain after stand replacement fire events. If all the trees have been killed no seed source is available to reforest the area. Ponderosa pine forests in eastern Montana have demonstrated this. Stand replacement fires on the Ashland RD from 2000 to 2006 are today predominately unforested primarily from lack of seed source. Left alone and not artificially regenerated these would take several decades to reforest. This loss of the forest has impacts to wildlife that are dependent on forested communities (Section 3.14, Wildlife). The Kraft Springs fire is an example of this (Sandbak, Clark, 2005). The forested landscape was reduced (deforested) by 69% (Sandbak and Clark 2005; Figure 3.1.4) from fire caused mortality from the 1988 Brewer Fire and the 2002 Kraft Springs Fire.
Under the No Action, a similar non-resilient forest would persist until disturbed by fire or insect and disease. Following such disturbance, such areas would be converted to non-forest types, dependent on location and type of disturbance.

**Past Effects**

Timber sale, post sale, and timber stand improvement activities in the BCLMP area have all occurred more than 17 to 31 years ago (755 acres – 5.4% of BCLMP area). Sale and post sale activity has increased surface fuels in treated areas. The Schiller fire area and the other wildland fire areas have increased surface fuels (518 acres – 3.7% of BCLMP area). However, most of these fuels are old and are in various conditions of decomposition adding to the soil productivity. The most recent fuels treatments (2002 and 2003 – 18 acres) had activity fuels generated, but was piled and burned. Under the No Action alternative further activity fuel would not be generated, but natural disturbances (large and small) would add large woody debris.

**Present Effects and Reasonably Foreseeable Future Activities**

Present and reasonably foreseeable future activities are the same as those described under effects of Alternative D on canopy layers and canopy cover above. These activities in themselves would not increase large woody debris significantly. However, a large disturbance (fire or epidemic beetle) would increase surface fuels and make them more susceptible to wildfire. See Projects Considered in Cumulative Effects Assessment Table 2.18, Chapter 2.
D. Effects from Alternative D on Forest Insect and Disease Susceptibility

Direct and Indirect Effects

Since mountain pine beetle is one of the most aggressive beetles an analysis was completed to determine the potential risk of beetle susceptibility in the BCLMP area. Other insects and diseases common to the area do not pose the threat to the forest resource as mountain pine beetle does. An analysis to show the amount of past 3 year bark beetle activity in the BCLMP area was done using the 2007, 2008 and 2009 yearly Aerial Detection Surveys done on the Ashland district by the Forest Health Protection group of the Northern Region (Gonzales, 2010). Table 3.1.8 shows the infested average trees per acre (TPA) and acres identified from the aerial survey for mountain pine beetle and pine engraver beetle within the BCLMP area. These numbers should only be viewed as estimates to give an indication of beetle activity in the BCLMP area.

Table 3.1.8: Estimated Beetle Infestation by Average Trees per Acres and Acres for Mountain Pine Beetle and Pine Engraver during the 2007, 2008, and 2009 Aerial Detection Surveys

<table>
<thead>
<tr>
<th>Beetle</th>
<th>2007 Average TPA</th>
<th>2007 Sum of Acres</th>
<th>2008 Average TPA</th>
<th>2008 Sum of Acres</th>
<th>2009 Average TPA</th>
<th>2009 Sum of Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountain Pine Beetle</td>
<td>17.77</td>
<td>15.13</td>
<td>10.21</td>
<td>25.05</td>
<td>3.95</td>
<td>12.04</td>
</tr>
<tr>
<td>Pine Engraver</td>
<td>4.94</td>
<td>4.05</td>
<td>4.45</td>
<td>8.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>22.71</strong></td>
<td><strong>19.18</strong></td>
<td><strong>14.66</strong></td>
<td><strong>33.93</strong></td>
<td><strong>3.95</strong></td>
<td><strong>12.04</strong></td>
</tr>
</tbody>
</table>

Note: Polygons that were identified on the aerial detection map indicate locations of tree mortality, defoliation, and/or other damage. Intensity of damage is variable, and not all trees and areas indicated are dead or damaged.

The general risk ranges from none to very low with the small dbh and large dbh with very low crown canopy coverage to a high general risk rating with large dbh’s and high canopy coverage. The summarized data from this analysis (Table 3.1.9 and Figure 3.1.5) shows that only 3 percent of the forested BCLMP area is at a high risk, 38% at a moderate risk and 59% are at a low or lower risk. This analysis is in line with the low levels of mountain pine beetle we have been experiencing and documented the past 3 years (Table 3.1.8). A map displaying these risks of susceptibility is in the Project Record (Gonzales, 2010).

Table 3.1.9: Mountain Pine Beetle Susceptibility in the BCLMP Area

<table>
<thead>
<tr>
<th>Susceptibility Risk</th>
<th>Total Acres(^1) by Risk Category</th>
<th>Percentage of BCLMP area</th>
<th>Percentage of Acres Risked</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>215.33</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>Low</td>
<td>1,932.32</td>
<td>14%</td>
<td>22%</td>
</tr>
<tr>
<td>Moderate</td>
<td>3,336.62</td>
<td>24%</td>
<td>38%</td>
</tr>
<tr>
<td>Very Low to None</td>
<td>3,249.63</td>
<td>23%</td>
<td>37%</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>8,733.89</strong></td>
<td><strong>62%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

\(^1\) These are approximate acres derived from Forest GIS coverage’s. \(^2\) These are approximate VMap classified forested acres. VMap minimum mapping polygon size is less than one acre vs. 5 acre minimum mapping standard for the Forest Stratum vegetation layer.
Under Alternative D, active management is not proposed, however fire suppression would still happen. Forest succession, growth and structure development would continue with increases in stand densities and basal area, moving more of the BCLMP area into moderate and trending towards and into the high risk category. In the short-term, mountain pine beetle activity is expected to be at current activity levels as seen in the past 3 years (Table 3.1.8).

Diseases (gall rust, needle scale) are at low levels in the BCLMP area and would not be anticipated to increase dramatically across the landscape; however there would continue to be small isolated high infection levels.

**Cumulative Effects**

Assuming fire suppression is successful and wildfires are kept small, stand conditions would be altered creating small-scale vegetation diversity on the landscape. This occurs when low intensity/severity wildfires underburn the stands reducing stand density from below and/or kill individuals or small groups of overstory trees reducing stem density as well. This would lead to lowering the general risk of mountain pine beetle susceptibility on these small areas; however the majority of the landscape would still be trending to higher risks.

Pine engraver beetles would continue to be seen on the landscape as natural events provide host material from disturbances such as damage to trees from lighting, snow, or wind damage or from old dying weakened trees. Drought or fire would increase activity levels.

**Past Effects**

Three hundred and five acres of past regeneration and liberation harvest have removed or decreased the number of large trees in the treated areas to reduce the susceptibility to bark beetle. Seed trees in the regeneration harvests are selected for being disease free and/or resistant to disease. These harvest activities have made these treated areas more resilient to beetle susceptibility. With no vegetation management or disturbance over the next 40 to 60 years these stands would grow into the size and density (BA/ac) that would make them more susceptible to beetle attack. These younger stands over the next 40 to 60 years would increase in density and vigor making them less resilient to disturbance.
**Present Effects and Reasonably Foreseeable Future Activities**

Present and reasonably foreseeable future activities are the same as those described under effects of Alternative D on canopy layers and canopy cover above. Wildland fire suppression would have the greatest additive effect on increasing stand density and decreasing vigor making stands over the next 10 to 60 years more susceptible to insect and disease further reducing resiliency in the BCLMP area. See Projects Considered in Cumulative Effects Assessment Table 2.18, Chapter 2.

**E. OTHER REQUIRED DISCLOSURES UNDER ALTERNATIVE D FOR FOREST VEGETATION**

Consistency of the Alternative D with numerous other laws, regulations, and policies is disclosed in Table 3.1.10. Disclosures are based on rationale for the No Action alternative in the above Forest Vegetation discussion and in the Forest Vegetation Report in the Project Record.

**Table 3.1.10: Other Required Disclosures Under Alternative D for Effects to Forest Vegetation**

<table>
<thead>
<tr>
<th>Act, CFR, Forest Service Policy</th>
<th>Consistency Disclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic Administration Act</td>
<td>No supply of timber for the use and necessities of citizens of the United States. There is a risk of a stand replacement fire with Alternative D that would severely limit the supply of timber from the BCLMP area over the next 80 to 100 years.</td>
</tr>
<tr>
<td>Knutson-Vandenberg Act</td>
<td>No harvest proposed to collect funds to protect and improve the future productivity of the renewable resources of the forestland.</td>
</tr>
<tr>
<td>Anderson-Mansfield Reforestation and Revegetation Act</td>
<td>No treatments are proposed on lands within BCLMP area capable of producing an important part of the timber needs of local communities. There are no denuded lands within the BCLMP area. There is a risk of stand replacement fire that would result in large areas needing reforested (denuded).</td>
</tr>
<tr>
<td>Granger-Thye Act</td>
<td>No harvest proposed.</td>
</tr>
<tr>
<td>Multiple-Use Sustained-Yield Act</td>
<td>National forests were established and are to be administered for many purposes one being timber. Multiple use means the management of all the various renewable surface resources of the national forest so they are utilized in the combination that would best meet the needs of the American people. No timber management is proposed. There is a risk of stand replacement fire that would result in the loss of the timber resource for 80 to 100 years.</td>
</tr>
<tr>
<td>Forest and Rangeland Renewable Resources Planning Act</td>
<td>It is policy that all forested lands in the National Forest system be maintained in appropriate forest cover with the species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management. No timber harvest is proposed. There is a risk for a stand replacement fire that would result in the loss of the timber resource in the BCLMP area for 80 to 100 years, impacting the multiple use and sustained yield outputs in the forest plan.</td>
</tr>
<tr>
<td>National Forest Management Act</td>
<td>It is policy that all forested lands in the National Forest system be maintained in appropriate forest cover with the species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management. No forest management is proposed. There is a risk for a stand replacement fire that would result in large areas of</td>
</tr>
<tr>
<td>Act, CFR, Forest Service Policy</td>
<td>Consistency Disclosure</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td></td>
<td>deforested land creating a backlog of reforestation needs. With no management the forested vegetation in the BCLMP area would continue to trend to homogeneous conditions barring any natural disturbances. The desired diversity of vegetation conditions in the ponderosa pine to meet multiple objectives in the Forest Plan overall goals and specific management area standards and objectives would be met as natural disturbances occur.</td>
</tr>
<tr>
<td>Reforestation Trust Fund, Title III – Reforestation, Recreation Boating Safety and Facilities Improvement Act</td>
<td>No forest management activities are proposed to utilize trust fund dollars for reforestation, timber stand improvement, and other forest stand improvement activities to enhance forest health and reduce hazardous fuel loads of forest stands in the BCLMP area.</td>
</tr>
<tr>
<td>Title 36 Code of Federal Regulations, Part 219 - Planning</td>
<td>The overall goal of managing the National Forest System is to sustain the multiple uses of its renewable resources in perpetuity while maintaining the long-term productivity of the land. Resources are to be managed so they are utilized in the combination that would best meet the needs of the American people. Maintaining or restoring the health of the land enables the National Forest System to provide a sustainable flow of uses, benefits, products, services, and visitor opportunities. No timber products would be provided. There is a risk for a large stand replacement fire that would impact the flow of timber products from the BCLMP area for 80 to 100 years.</td>
</tr>
</tbody>
</table>

**Irreversible/Irretrievable Commitments of Alternative D to Forest Vegetation**

None identified.

**Short-term Uses vs. Long-term Productivity of Alternative D for Forest Vegetation**

There are no proposed treatments in the forest vegetation in the Alternative D. Stands would continue to grow, increasing biomass (BA/ac), ladder fuels and canopy cover making them less resilient to disturbances such as wildfire or bark beetle attack. Long-term productivity of the forest vegetation is at risk.

**Unavoidable Adverse Effects of Alternative D to Forest Vegetation**

Current conditions of the forest vegetation are less resilient to disturbances such as wildfire and epidemic bark beetle infestations. Large stand replacement disturbance would result in loss of the current forest vegetation. Large stand replacement wildfire, like the 2000 Stag Fire Complex, results in loss of seed source that naturally would take several decades to reestablish the forest vegetation.
**Forest Plan Consistency of Alternative D for Forest Vegetation**

Consistency with Forest Plan goals, objectives, and management standards of Alternative D in terms of effects forest vegetation is disclosed in Table 3.1.11. Forest wide management direction and goals and individual management area objectives and standards are disclosed in Chapter 2.

**Table 3.1.11: Forest Plan Consistency of Alternative D for Effects to Forest Vegetation**

<table>
<thead>
<tr>
<th>FP MA</th>
<th>Alternative D Consistency to Forest Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>No forest management activities proposed; forested areas would continue to grow with declines in livestock forage and wildlife habitat values. No wood product removal. No opportunity to maintain forest health, vigor, productivity or provide vegetative diversity for wildlife. Risk to loss of the forest vegetation with continued fire suppression activities.</td>
</tr>
<tr>
<td>D</td>
<td>No forest management activities proposed; forested areas would continue to grow with declines in forest health, vigor, and productivity. Long term diversity and quality of habitat is at risk with increased risk for large disturbances. No wood product removal</td>
</tr>
<tr>
<td>F</td>
<td>No forest management activities proposed.</td>
</tr>
<tr>
<td>G</td>
<td>No forest management activities proposed; forested areas would continue to grow with declines in forest health, vigor, and productivity. With wildfire suppression, a healthy diverse forest and vegetation diversity for wildlife is at risk. No wood product removal for timber dependent communities.</td>
</tr>
<tr>
<td>N</td>
<td>No forest management activities proposed; forested woody draws with a ponderosa pine component would continue to establish and grow, reducing diversity of understory and overstory vegetation, thus reducing habitat values.</td>
</tr>
<tr>
<td>P</td>
<td>No forest management activities proposed; forested areas would continue to grow with declines in forest health, vigor, and productivity. Protection or maintenance of other values is at risk with increased risk for stand replacement disturbances.</td>
</tr>
</tbody>
</table>

**F. CONCLUSIONS FOR ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE D ON EFFECTS TO FOREST VEGETATION**

Twenty seven percent of the existing ponderosa pine coverage in the BCLMP area has been rated with a high canopy cover and 49 percent with a moderate canopy cover (Table 3.1.6b, Alt D). Some of these canopy cover estimates are based on the strata label that was determined about 15 - 20 years ago, through photo interpretation and field inventory. The amount of acres currently in the high canopy cover classes is believed to be 10 to 15 percent higher due to 15 to 20 years of in-growth. These higher canopy cover percents (>40% moderate and high) on the landscape increase the risk that once fire has moved into the crowns the fire can continue burning in the upper canopy level. This condition increases the probability for stand replacement wildfire events.

Currently over 97 percent of the ponderosa pine forested acreage in the BCLMP area has multiple layers (Table 3.1.5 and Figure 3.1.1, Alt D). This structure presents a ladder effect for fire to climb into the crowns and initiate crown fire resulting in stand replacement events where continuous canopy cover exists (Graham et al., 2010). Less than 1 percent of the BCLMP area has a two-story condition (Table 3.1.5 and Figure 3.1.1, Alt D). Less than 2 percent of the BCLMP area is in a single story condition (Table 3.1.5 and Figure 3.1.1, Alt D). This single
story and two-story condition is more conducive to fire being maintained as a surface fire with a lower probability of a stand replacement wildfire event. This is largely due to the fact when surface fires burn through areas with limited ladder fuels they are less likely to produce enough heat to ignite the overstory fuels (Graham et al., 2010). There is a need to move more of the ponderosa pine stands to a single story condition and lessen the ladder effect of fire moving to the crowns by removal of all or some of the small diameter understory tree components, making them more resilient to wildfire. This would lower the probability of stand replacement wildfire events.

Alternative D would not alter the BCLMP area landscape from existing to desired stand structures. The cumulative effect from past, present, and reasonably foreseeable future actions has created a downward trend in resiliency. Tree densities, crown layers, and crown canopies are expected to increase with continued fire suppression. This increases the risk for large stand replacement disturbances (wild fires, insects, diseases) reducing the ability to sustain the ponderosa pine forest (see fuels report in Project Record). Conversely, the proposed action alternatives decrease tree densities, canopy layers, and crown canopy at various levels and extent, which decrease the risk for large stand replacement events, thus increasing the ability to sustain the ponderosa pine forest.

For the Alternative D, forests would be less healthy and resilient as forest succession, growth and structure development continues and competition for limited water, nutrients, and light increases in the absence of disturbance (wildland fire, insect, disease, windthrow). This would result in decreased health and vigor of the trees with a negative trend in forest health and resiliency.

Risk for beetle caused mortality is a function of stand density and diameter. Alternative D does not effectively reduce stand density and over the next 10 to 60 years stand diameter and density is expected to increase. Forest succession, growth and structure development would increase competition for water, light and nutrients resulting in lower stand vigor increasing the potential for beetle attack susceptibility. Wildfire starts with effective suppression activities would increase vegetation diversity on a small scale with individual and small area fire mortality. However, continued stand growth and density on the landscape are expected to change the predominant existing landscape of very low to moderate risk to a moderate to high risk for beetle susceptibility under the Alternative D.