EXISTING CONDITION OF VEGETATION

INTRODUCTION AND METHODS

Vegetation assessments of the Basin Creek watershed were conducted using aerial photo interpretation, GIS mapping, stand exams and stand walkthroughs. Vegetation was characterized using standard Region 1 stand delineation and stratification methods. Walkthrough exams were conducted within the proposed treatment areas.

FOREST VEGETATION

Forest vegetation is the dominant vegetative type in the Basin Creek watershed analysis area. A variety of forest types occur in the area. Lower elevations form the transition zone between grasslands and forested settings dominated by Douglas-fir with some scattered patches of quaking aspen. As elevation increases, the Douglas-fir zone is eventually replaced by lodgepole pine and subalpine fir. Minor portions of the project area include the high elevations that are dominated by a mixture of lodgepole pine, subalpine fir and whitebark pine. Stands dominated by Engelmann spruce and aspen occur throughout the area in minor amounts.

Douglas-fir Dominated Sites

Logging associated with the mining activities of the late 1800s and the early 1900s has resulted in even-aged stands of Douglas-fir and lodgepole pine as the dominant vegetation type. These stands occur across most of the lower elevation forested sites within the Basin Creek watershed. Lodgepole pine is a component within these Douglas-fir dominated stands, ranging from scattered trees to nearly pure patches of several acres. Habitat types include dry grass habitats (Fire Group 0), warm and dry Douglas-fir (Fire Group 4) and some cool and dry Douglas-fir (Fire Group 5) (Fischer and Clayton 1983). The majority of these stands occur in the urban interface portion of the analysis area.

Fairly dense conditions occur in many of the Douglas-fir dominated stands. In many cases, former open shrub and grasslands are now dominated by scattered patches of pole and sapling-sized Douglas-fir (Joy and Hutton, 1990). Open Douglas-fir stands on gentle slopes are suitable for livestock grazing and have been grazed in the past. Aspen clones occur throughout in both upland and riparian settings.

The major difference between historic patterns and current conditions in the lower elevation Douglas-fir sites is higher stand density, more of a lodgepole pine component and the lack of large diameter Douglas-fir. The suppression of repetitive fires has led to more canopy layers and a higher proportion of sapling and pole sized timber present in these stands. Open-grown stands of old-growth Douglas-fir are nearly non-existent due to both an increase in understory components and the elimination of many large diameter trees during the mining era. Young sapling sized stands of Douglas-fir do occur but they occupy sites that were formerly open shrublands. Lodgepole seedling or sapling sized stands are extremely limited.

Stands were delineated on aerial photos based upon similar aspect and vegetative characteristics using Forest Service Northern Region protocol. A strata was assigned based upon tree species, canopy coverage and tree size. For this analysis, the following strata have been assigned:

Mature Douglas-fir: These stands generally occur on the lower elevations and southerly slopes throughout the project area. These stands are dominated by larger diameter (9" DBH and greater) mature Douglas-fir often with mature lodgepole pine as a lesser component. Canopy conditions are fairly dense, generally in excess of 70 percent. Understory vegetation is dominated by pine grass with scattered shrubs such as common juniper and buffalo berry.

Douglas-fir Pole: These stands are dominated by smaller diameter (less than 9"DBH) pole and sapling sized trees. Canopy conditions are variable, ranging from 50 to greater than 70 percent canopy coverage. Fire suppression has in some cases allowed an understory of sapling and pole sized Douglas-fir regeneration to develop in stands that were formerly open-grown large diameter trees. In some areas, usually adjacent to open sagebrush parks, sapling sized trees are extremely dense (1000+ stems per acre). In other stands, the pole sized trees are fairly open and lack extensive canopy cover due to the extremely rocky nature of the terrain. These sites consist basically of trees scattered across piles of boulders. Lodgepole pine is found as a lesser component of these stands comprising less than 50 percent of the trees. Understory vegetation is dominated by pine grass with scattered shrubs such as common juniper and buffalo berry.

Lodgepole Pine Dominated Sites

These sites comprise most of the project area. Lodgepole pine dominates many of the middle elevation forested sites in the Basin Creek watershed. These sites tend to be warm and moist Douglas-fir habitats and are classified as Fire Group 6 (Fischer and Clayton 1983). Most of this area was logged in relation to mining activities in the late 1800s and early 1900s.

Aspen occurs throughout this area. Past logging activity liberated many of the clones at the turn of the century. These clones are now losing vigor as they age and are becoming suppressed by conifers.

Douglas-fir is not well represented across much of this portion of the analysis area. Large diameter Douglas-fir stumps are found throughout the area as remnants. In some cases, sites that were formerly occupied by Douglas-fir are now occupied by open-grown lodgepole pine. Spruce and subalpine fir occupies a minor portion of these sites.

These stands were assigned the following strata:

Mature Lodgepole: These stands tend to be nearly pure, even-aged mature lodgepole pine with individual scattered Douglas-fir trees or small patches of trees. Canopy coverage exceeds 7) percent. The average diameter of the stand exceeds 9 inches and stand age in most cases is less than 120 years. Some exceptions occur at the upper reaches of the drainage in stands that have been identified as old growth. Understory vegetation consists of scattered clumps of pinegrass, grouse whortleberry, twinflower and shrubs such as common juniper and buffalo berry.

Lodgepole Pole: These stands are also nearly pure and even aged. Stand diameter is less than 9 inches and as in the mature lodgepole, stand age is usually less than 120 years. Canopy coverage is greater than 70 percent. Douglas-fir is not often found as a component of these stands. Understory vegetation is similar to the mature lodgepole stands.

Current conditions vary from historic patterns in terms of stand density and stand age. Fire suppression has led to increased stand density in some of the mature stands and a lack of sapling sized stands.

Higher Elevation Spruce and Subalpine Fir

These sites are located at the upper reaches of the drainage and constitute a relatively minor portion of the area. The higher elevation forested sites across the majority of the project area are characterized as cool subalpine fir habitats of Fire Group 7 and 8 (Fischer and Clayton, 1983). Occasional individual whitebark pine may occur, but much of the cooler subalpine habitat is dominated by subalpine fir, spruce and mature lodgepole pine.

These stands were assigned a spruce/ fir strata.

Spruce/fir: Past logging has had less impact upon these sites than those of the lower lodgepole pine and Douglas fir- habitats. Stands of old growth lodgepole and spruce / subalpine fir are represented in these habitats. Lodgepole pine old growth ranges from 150 to 240+ years old and is found at the upper reaches of Basin creek. Old growth stands of large diameter spruce and alpine fir occur on a more limited basis and generally occupies the wetter sites. These spruce / subalpine fir stands range in age from 175 to 250+ years old.

On these sites, as the stand age increases, the species composition changes to include more subalpine fir and spruce in the understory. Canopy conditions are dense exceeding 80 percent canopy coverage. Canopy layering occurs as sapling sized subalpine fir grows into the crowns of the mature trees. Dead trees are present in these stands and are falling to the ground contributing to fuel loading.

Colonized Parks

These stands are scattered throughout the analysis area generally occurring on southerly exposures. They were assigned the following strata.

Colonized Parks: Upland parks capable of supporting tree and shrub and grass species are scattered throughout the Basin Creek area. Due to past fire suppression, conifers, mostly Douglas-fir, are beginning to dominate the site (Joy and Hutton 1990). Shrubs, mostly sagebrush and grasses such as Idaho fescue are decreasing in both size and vigor. Comparisons of aerial photos beginning in the late 1940s to the present show a marked increase in conifer dominance in these former shrub and grasslands. In most cases sapling sized trees are most dense next to mature stands of timber. Additionally sapling sized trees are scattered in varying densities throughout the parks.

Table 3.25. Existing Vegetative Types, Acres Occupied by Each Type and Percentage of the Project Area Occupied by Each Type.

Vegetative Type	PI Strata	Total Acres
Aspen[1]	83	43
Douglas-fir Pole [2]	24,26	645
Mature Douglas-fir	21,22,25	1515
Lodgepole Pole [2]	14,16	3063
Mature Lodgepole	11,12,15	5822
Spruce / Subalpine Fir Timber	31,32,34,35,36	246
Colonized Parks	94	879
Private Land	PVT	2106
Total		14319

[1] This acreage includes only those patches of aspen large enough to be mapped from aerial photos. Smaller aspen patches are included in other vegetative classifications.

Mountain Pine Beetle

Mountain pine beetle has been present in the South Butte area for several years. In the early 1980s elevated population levels were detected in the Homestake and Delmoe lake areas. Populations were beginning to reach epidemic levels when extreme winter weather is thought to have reduced the population. During this time patches of trees were killed along Highway I-90 between Butte and Whitehall, along the Delmoe Lake road and in the Limekiln Creek area of the Highlands. Elevated populations were again detected in the fall of 1999 in the Thompson Park area south of Butte and along the East Ridge.

Typically in lodgepole pine, mountain pine beetle attacks the largest lodgepole pine trees in the stand, and other species such as Douglas-fir and spruce are not affected. The beetle lays eggs in the cambium and as the larvae mature, they feed upon the cambium eventually girdling the tree (Amman and Cole 1983). Thinning dense stands of lodgepole has been shown to reduce beetle mortality in a stand. As a result of thinning, stand conditions become less favorable for beetle populations. In stands on the Flathead National Forest, as basal area was reduced, beetle caused mortality was also reduced. Basal areas of around 90 sq. ft. per acre showed very limited mortality while adjacent unthinned stands experienced severe mountain beetle mortality. In stands where more trees were left, the pine beetle caused mortality increased. For example, stands that retained 112 sq. ft. per acre had around 5 percent mortality following treatment and stands with a basal area of 143 sq. ft. per acre experienced a beetle caused mortality of around 16 percent (Gibson 1989).

Mountain pine beetle surveys were conducted in the area south of Butte during the fall and winter of 2001-2002. These surveys were then used to predict beetle mortality in the Basin Creek area using the FINDIT model. FINDIT predicts the number of trees by diameter size class that will be killed by pine beetle. The predictions of this model have been shown to be within about 25 percent of actual mortality (Bentz 2000). Modeling runs for the area south of Butte show that for pure lodgepole stands, about 60-75 percent mortality for the trees over 5 inches in diameter is expected. Because of site specific factors such as stand composition, topography and elevation, within the next ten years about 70 percent of the Basin Creek

analysis area is expected to be affected by mountain pine beetle if cold weather does not limit their populations as it has in the past (Gibson personal communication 2002).

Mountain pine beetle is occurring throughout the area in epidemic proportions. Infestation rates vary from several trees where the beetle infestation is just starting, to stands of several acres where 90 percent of the 6-inch+ diameter lodgepole pine is killed. Typically the beetle has been attacking the larger diameter trees, spreading from the wet areas along the draw bottoms to the upland areas. As more of the larger trees are killed the beetle has been moving into smaller diameter trees and to new areas. Beetles are infesting lodgepole pine in stands mixed with Douglas-fir, pure dense stands of lodgepole and even fairly open stands where the branches of the individual trees reach to the ground. As of July 2002, mountain pine beetle is active in approximately 70 percent of the project area.

During the fall and winter of 2001-2002, the Forest Service regional entomologist established survey transects throughout the more heavily infested areas of the Basin Creek and Blacktail Creek watersheds. The information gathered from these surveys was incorporated in the FINDIT model that predicts expected tree mortality (Bentz 2000). Results of this modeling show varying expected mortality based upon the diameter of the trees and the amount of lodgepole in a stand.

Large diameter stands are expected to fare the worst. Pure lodgepole stands are expected to lose 60-75 percent of their trees with nearly all of the 8 inch and larger diameter classes being lost. Current mountain pine beetle caused tree mortality occurs in situations ranging from pockets of 5-10 trees to stands of 10-15 acres where the majority (60-75 percent) of the stand is killed.

Old Growth

Old growth inventories were conducted in the project area and the associated timber compartments during the summer of 2002 (see project file). Timber stands were assessed based upon old growth forest types developed by the Northern Region in 1992 (Green, et. al. 1992). Stands within the project area were ground-truthed to assess their suitability as old growth.

Generally, old growth stands were only found at the upper reaches of drainages and the most remote areas of the project area and the adjacent timber compartments. The more accessible areas were harvested during the early mining era. Lodgepole pine is the most prevalent old growth type with lesser amounts of spruce / subalpine fir old growth generally occupying the wetter sites.

Douglas-fir old growth stands are the most limited throughout the area. While individual old growth Douglas-fir trees do occur, the majority of the Douglas-fir found throughout the project area is second growth originating from the turn of the century. Old large diameter Douglas-fir stumps are found throughout the lower reaches of the project area suggesting Douglas-fir old growth types were found more frequently before logging activities of the mining era began.

The Forest Plan states that five percent of each timber compartment shall be retained as old growth (FP II-26). The project area contains all or portions of three timber compartments, 414, 415 and 416. Refer to Appendix B, Map 14. Compartment 416 comprises the majority of the project area. Both compartments 415 and 416 meet or exceed the forest plan standards for old growth. Compartment 414 is below forest plan standards due to the extensive timber harvest in the late 1800s and early 1900s. See Table 3.26 below.

Table 3.26. Acres of Old Growth by Timber Compartment

Timber Compartment	Compartment Acres	Acres of Old Growth	Old Growth Percent of Compartment
414	10,950	262	2.3
415	4,880	1,430	29.3
416	10,804	1,116	10.3

Aspen

Aspen occurs across much of the project area in both upland and riparian settings. Stands tend to be fairly small in size, ranging from just a few trees to clones of one half to one acre in size. Most of the aspen is declining in both size and vigor.

Many of the aspen clones in the Basin Creek watershed show mortality due to their age and seral nature. Competition with conifers for available light and water has reduced aspen to a minor component within stands of conifer in many areas. Clone ages vary but the majority of the clones are estimated to be 80-100 years old. Mortality from various causes is beginning to affect the stand structure. This deterioration is evident in clones growing in both riparian areas and upland situations. Two storied aspen stands in riparian settings are rare in this area. In most cases the effects of canopy shading and browse combine to suppress aspen suckers. Although many deteriorating clones have suckers present, most suckering is spotty and less than 18 inches tall even though the sprouts may be as old as seven years. Browse is generally heavy.

Clones that are poorly stocked initially will produce fewer suckers after treatment and height growth will also be reduced (Renkin 1994, Perala 1991). Aspen stands will need protection from browse (wildlife fences) in the initial phases of sprouting (Bartos 1994, Shepperd 1996).

Non-Forest Vegetation

Non-forest vegetation consists of big sagebrush/Idaho fescue communities and some Idaho fescue/bluebunch wheatgrass communities (Mueggler and Stewart, 1980). See Table 3.25 above for colonized parks. The majority of the big sagebrush/Idaho fescue community is in late seral stage. Past livestock grazing has prevented communities from reaching potential seral stage. These portions of the project area have received consecutive years of rest from livestock grazing and light use from big game, allowing vegetation conditions to improve.

Rangeland Vegetation

The project area includes portions of three grazing allotments that are open and suitable for livestock grazing. About two-thirds of the project area is closed to livestock grazing and not included in an allotment. This includes much of the project area west of Basin Creek.

The Blacktail Allotment is located from the eastside of Basin Creek to Blacktail Creek. The Twin Calf, Decker and China Gulch pastures occupy the lands in the project area. The Twin Calf pasture is the only

pasture in the Basin Creek Municipal Watershed. Due to steep slopes and dense timber stands only about 1,000 acres are suitable for livestock grazing.

The allotment is managed under a rest-rotation grazing system where each pasture is rested from grazing once every 5 years. The permitted use is for 92 cow/calf pairs from June 16 to September 30. Starting in 1999, Blacktail has had three consecutive years of nonuse. It was grazed during 2002.

The Highland Pasture of the Moose Camp Allotment occupies a very small portion of the southern edge of the project area. Only about 20 acres are suitable for livestock grazing. The headwaters of Basin Creek are used as a water source for the northern portion of the Highland Pasture. The Moose Camp Allotment is managed under a rest rotation grazing system. Pastures receive rest from livestock grazing once every four years.

The Granite Pasture of the Curley Allotment occupies a small portion of the western edge of the project area. Suitable range in the project is less than 50 acres and is generally not used by livestock. The Curley Allotment is managed under a rest rotation grazing system where one of four pastures is rested from livestock grazing each year. The allotment has received nonuse during two of the last 10 years.

Noxious Weeds

Spotted knapweed, Centaurea maculosa, is the major noxious weed or invasive species known to exist in the project area. Total knapweed infested area is estimated at 30 acres, located along existing and old roads (Roads 9305 and 8493). Knapweed infestations are monitored and treated on an annual basis.

Common toadflax is present. Until recently, common toadflax was not on the state weed list and was not managed. It is estimated to occupy 10 acres or less in the project area.

Threatened, Endangered and Sensitive Plant Species

A pre-field and a field reconnaissance were conducted for threatened, endangered and sensitive plant species within the Basin Creek project area. The lands proposed for treatment have been virtually undisturbed for nearly a century. A review of the Nature Conservancy Element Occurrence Database indicates no known element occurrences of threatened or endangered plant species in the project area. Federal listing refers to threatened and endangered species on record by the U.S. Fish and Wildlife Service. One sensitive plant species, Lemhi penstemon (*Penstemon lemhiensis*) is known to occur in the very upper reaches of Basin Creek.

The lands within the project area were surveyed by contract botanists, Montana Natural Heritage Program botanists, and Forest Service personnel, and checked against the Northern Region sensitive species database. No sensitive species were found in the project area, either on the ground or reported in the database. A Lemhi penstemon site is located south of the project area, and is not located anywhere near proposed treatment units in any action alternative.

ENVIRONMENTAL EFFECTS TO VEGETATION

ANALYSIS AREA

The analysis area boundary for disclosing the effects to vegetation includes the Basin Creek watershed and extends approximately 1.5 miles east to include the Roosevelt Drive subdivision. The area is bordered on the south and west by the Continental Divide and on the north by private ownership (Appendix B, Map 7). The Basin Creek watershed contains Butte's municipal watershed, consisting of two reservoirs located on Basin Creek. The project file provides detailed documentation of individual stand conditions and the process used for selection of representative stands used in analyzing the project area. Information sources included stand records and field surveys conducted in the 1980s as well as field review conducted in 2002 and 2003.

The analysis area for direct and indirect effects to old growth is the three timber compartments (414, 415 and 416) where treatment is proposed.

The analysis area for cumulative effects to forested vegetation other than old growth is the project area. The analysis area for cumulative effects to old growth is the Beaverhead-Deerlodge National Forest. The analysis area for cumulative effects to non-forest vegetation, range, noxious weeds, and sensitive plants is the project area.

DIRECT AND INDIRECT EFFECTS

Alternative 1 (No Action)

Mature Douglas-fir

Douglas-fir components of these stands would continue to increase in density and canopy layering. Mountain pine beetle is present and, barring severe winter weather, is likely to continue to kill the large-diameter lodgepole pine within these stands until severe winter weather reduces populations or the only lodgepole component that is left is small diameter trees that would not support beetle populations (Gibson 2002). Shrub and grass components may somewhat increase in the portions of these stands affected by mountain pine beetle but would continue to decrease in the dense Douglas-fir portions. Eventually seedling and sapling sized lodgepole understories would develop in areas of beetle kill. Aspen clones, shrubs, and herbaceous vegetation would continue to decline in vigor in the Douglas-fir and live lodgepole dominated understories but would increase in vigor and sprouting in the portions of those stands killed by pine beetle. Ground fuel accumulations would increase with litter-fall and as a result of falling snags that were killed by mountain pine beetle. Ladder fuels would continue to increase as sapling sized trees continue to develop in the understory.

Douglas-fir Pole

These stands consist of mainly smaller diameter (<9 inches) Douglas-fir with a small component of lodgepole pine of various sizes. Generally these stands are fairly open grown, but some have various sizes of patches of dense sapling sized material. Understories may contain juniper, some remnants of sage and

minor amounts of bunch grasses. As these stands age, canopies would continue to fill in as trees grow but because of the rocky, dry nature of the sites growth would be a slow process. The understory, where present, would continue to decline as light becomes less available. Sage and grass would continue to die out. The dense patches of sapling sized Douglas-fir would stagnate and would remain sapling sized. Tree crowns within these patches would decline and tree vigor would continue to be reduced. Some lodgepole pine would be killed as a result of mountain pine beetle and would eventually fall. As trees age, die and fall, ground fuels would accumulate. In many cases the amount of rock in these stands would prevent the canopies from filling in to the full potential of a less harsh site. Species composition would move to a higher percentage of Douglas-fir as the lodgepole pine dies out. Eventually some of the Douglas-fir would attain old growth characteristics.

Mature Lodgepole

Mountain pine beetle-caused mortality is not new to the Beaverhead-Deerlodge NF, or the Butte Ranger District. In the early 1980s, an outbreak occurred on the Jefferson and Philipsburg Ranger Districts, with much of the mortality occurring in the vicinity of Homestake Pass. By 1986 the Forest-wide infestation had declined to just over 2,800 acres. In 1988, although beetle populations continued to decline, an EIS was prepared to analyze preventive treatments to protect lodgepole pines from beetle attack in several campgrounds on the Forest. In 1991, a private contractor prepared a hazard analysis report for the Forest. That report noted an estimated 8,900 acres of lodgepole pine on the Forest were at “high hazard” for beetle infestation; another 21,300 acres were rated “medium hazard.” (Gibson 2002).

Throughout most of the 1990s, little beetle activity was observed on the Forest. Then in 1999, small and widely scattered groups were observed in the vicinity of Butte—especially in Hail Columbia Gulch, Brookside Canyon, Thompson Park and the Basin Creek drainage. Aerial beetle survey data for 2000 are not available, but ground surveys confirmed those infestations continued to increase. Now, numerous groups of beetle-killed trees are evident in many lodgepole pine stands near Butte. One of the more noticeable groups is near Brookside Canyon, east of Butte. That infestation has grown from one beetle infested tree to several thousand beetle-killed trees within the last two years. Similar, but generally smaller, groups can now be seen south and east of Butte—particularly in the vicinity of Thompson Park and Basin Creek drainage and its tributaries (Gibson 2002).

Typically in lodgepole pine, mountain pine beetle attacks the largest lodgepole pine trees in the stand, other species such as Douglas-fir and spruce are not affected. The beetle lays eggs in the cambium and as the larvae mature, they feed upon the cambium eventually girdling the tree (Amman and Cole 1983). Thinning dense stands of lodgepole has been shown to reduce beetle mortality in a stand. As a result of thinning, stand conditions become less favorable for beetle populations. In stands on the Flathead National Forest, as basal area was reduced, beetle caused mortality was also reduced. Basal areas of around 90 showed very limited mortality while adjacent unthinned stands experienced severe mountain beetle mortality. In stands where more trees were left, the pine beetle caused mortality increased. For example, stands that retained 112 sq. ft per acre had around 5 percent mortality following treatment and stands with a basal area of 143 experienced a beetle caused mortality of around 16 percent (Gibson 1989).

Forest Service District and Regional office personnel conducted mountain beetle surveys in the area south of Butte during the fall and winter of 2000-2001. These surveys were used to predict beetle mortality in the Basin Creek area using the FINDIT model. The results of this model display how many trees for each diameter class would be lost within a stand. The predictions of this model have been shown to be within about 25 percent of actual mortality (Bentz 2000). Modeling runs for the area south of Butte show that for

pure lodgepole stands, we can expect about 60-75 percent mortality for the trees over 5 inches in diameter. Because of factors such as stand composition, topography and elevation, we expect about 70 percent of the Basin Creek analysis area to be affected by mountain pine beetle if cold weather does not limit their populations as it has in the past (Gibson personal communication 2002).

A period of severe cold winter weather could reduce beetle numbers enough to slow down or stop the epidemic in any year. However, if relatively mild winters continue, mountain pine beetle infestations will likely remain active in epidemic proportions in stands that are currently infested and spread to other stands of lodgepole pine. First, the large diameter trees would be attacked and die. The beetles would then move to smaller and smaller diameter trees until most of the 8-inch and larger trees have been killed. As mountain pine beetle populations continue to increase, the beetles would hit smaller trees until they begin to infest the small 4 and 5-inch classes. The beetle populations would begin to decrease when the smaller diameter trees are used as hosts. Winter mortality would increase due to the reduced phloem thickness of these trees and the epidemic would begin its decline. (Gibson 2002, Amman and Cole 1983).

Stand characteristics would change in varying degrees as the beetle epidemic progresses. Currently in stands that are severely affected, beetle mortality is in excess of 75 percent of the trees 8 inches and larger. This trend is expected to continue throughout the area in the stands of larger diameter lodgepole. Aerial photo interpretation indicates that most of the lodgepole pine saw timber in the project area is comprised of diameter size classes that are susceptible to stand replacing beetle infestation. In stands of predominantly small diameter post and pole sized material, mortality would not be as severe simply because there are not enough large diameter trees to support beetle populations (Amman and Cole 1983).

Canopy gaps would increase as a result of tree mortality following a severe mountain pine beetle epidemic. Ground fuels would increase substantially as the dead trees begin to fall over. The FINDITS model predicts tree mortality of approximately 200 trees per acre in the 7inch+ diameter classes on stands currently infested with beetle in the Basin Creek watershed within the next ten years. The loss of these trees would result in 35-70 tons of downed fuel accumulations in the decades following the beetle epidemic. As the canopy opens, patches of sapling-sized regeneration would occur, leading to a substantial increase in ladder fuels growing up through the heavy downed materials. Shrub and grass understories would also increase as a result of increased sunlight. Most of the increased herbaceous vegetation is not palatable for herbivores so benefits to herbivores are minimal. Aspen would increase in vigor and sprouting due to the increase in available sunlight and water as the lodgepole overstory dies.

Lodgepole Pole

Lodgepole pine stands that remain largely unaffected by mountain pine beetle due to small average stand diameter would continue to grow. Minor amounts of mountain pine beetle mortality would be present but most of the trees would remain alive. Competition between trees would cause additional mortality in some of the smaller diameter trees. Canopy density would continue to increase until the available growing space is occupied. As the trees age, mortality resulting from insect and disease and competition would increase. In several decades, barring any disturbance such as fire or mountain pine beetle infestation, tree growth would decrease and canopy gaps would begin to appear. Douglas-fir, lodgepole and subalpine fir regeneration would begin to fill in these gaps. Large diameter fuels (generally lodgepole pine) would increase as a result of tree mortality. As these stands continue to age, ladder fuels would develop as sapling sized regeneration and ground fuels would continue to increase. Shrub and herbaceous vegetation would continue to decrease as conifer cover increases.

Spruce/fir

In the absence of disturbance, stands that are dominated by spruce and subalpine fir would continue to progress toward old growth. Lodgepole pine components in these stands would begin to die as a result of insects and disease. Spruce and subalpine fir saplings would persist in the understory and begin to grow into the canopy. Canopy gaps resulting from tree mortality would support spruce and subalpine fir seedlings. Large down woody material would increase as a result of large tree mortality as the stand continues to age. Snags would be more prevalent in the overstory. Some alder would likely persist in the understory but shade resulting from canopy layering would suppress most of the grass and shrub species.

Colonized Parks

Trees, mainly Douglas-fir would dominate the site. Stand density would continue to increase until the growing space is occupied. As the stand matures, sapling and pole sized trees would begin to die as a result of competition. Larger trees would dominate the canopy and understory species would be reduced or eliminated. Sagebrush would be eliminated as a result of shading. Dense patches of sapling sized trees would occur in clumps. Canopy layering would increase at the edges of these stands as the conifers occupy the open areas. Openings would decrease as these parks are lost to conifer.

Effects to Vegetation from a Stand Replacing Fire

If a stand replacement fire were to occur, the immediate effects to the vegetation would be dramatic. Forested stands would change to open areas dominated by grasses and shrubs. Dead snags would occur throughout these areas in varying densities and would begin to fall and accumulate as ground fuels. For much of the affected area, the dominant vegetation would initially be pine grass. However in the years following fire, lodgepole pine and minor amounts of Douglas-fir seedlings would become established. Initially more seedlings would occur on the northerly slopes and fewer on the south slopes. As decades pass, these seedlings would develop into saplings and eventually mature trees. As the stand develops, trees would again dominate the site. Grasses and shrubs would again become understory components and the cycle would continue (Pfister et al 1977, Fisher and Clayton 1983).

Non-forest Vegetation

Without treatment (burning), grass/shrublands that were once maintained by a natural fire cycle will continue to become dominated by Douglas-fir, juniper and other conifers. As years pass, herbaceous vegetation and shrubs will continue to decrease in abundance and production until they are almost gone from dense stands of pole sized timber (Gruel et al 1986).

A stand replacing fire would likely burn forested sites, non-forested sites, and sites that were once open grass/shrublands but now dominated by conifers. This would be a positive effect on grass/shrubland vegetation. If fire intensity is too hot and wildfires burn thoroughly, shrub recovery could be slow (Wright et al 1979).

Lands Suitable for Livestock Grazing

In the short run, trees will continue to become more dominant in areas suitable for livestock grazing, decreasing the amount of forage for big game and livestock.

In the long run, if a wildfire occurs on lands suitable for livestock grazing, forage production will be doubled and possibly tripled, depending on severity of burn and amount of suitable range burned. Travel for livestock in and between suitable ranges would be less restricted due to the loss of down and standing timber.

Noxious Weeds

For the short term, noxious weeds management will be at a low level because infestations are minimal and easily accessible. If one assumes that a large fire is inevitable, then this alternative will produce the most challenges to noxious weed management. In general, the more severe the fire, the more ground is disturbed, and the greater chance for noxious weeds to become established.

Sensitive Plants

It has been determined after pre-field and field reconnaissance that this project will not conflict with threatened, endangered, or known sensitive plant species or their habitats.

Action Alternatives

The following treatment descriptions and their effects are common to each action alternative. At the end of this section is a table that lists the acres affected for each alternative.

Mature Douglas-fir

These stands would be thinned from below to a basal area of approximately 40-80 sq. ft. per acre (approximately 80 – 120 trees per acre). Following treatment, these stands would be fairly open and consist mainly of larger diameter Douglas-fir and an occasional lodgepole pine. The arrangement of trees would be fairly patchy in nature. Canopies of a few trees in clumps may touch but generally space would exist between tree crowns to reduce the likelihood of crown fire.

The largest diameter and oldest trees would be retained with Douglas-fir and aspen favored for retention over other species. Existing Douglas-fir snags would remain or snags would be created. Minor amounts of sapling-sized Douglas-fir would be present in patches. These stand conditions would accelerate the development of large diameter Douglas-fir trees which is a vital component of old growth. Increased sunlight would stimulate understory vegetation. Grasses and shrubs would become more vigorous and would be more significant components of the understory. Aspen clones would increase in vigor with the increased sunlight.

Following treatment, canopy conditions would change from continuous, dense, layered canopies to a more open condition. Canopy coverage would generally average 40-50 percent. Small diameter tree density would decrease and canopy layering would be reduced. Patches of unthinned areas may occur on

inoperable sites or in areas retained for wildlife considerations such as goshawk nesting habitat. Small openings generally less than 2 acres would be created for landings and as a result of slash disposal.

Figure 3.17: Mature Douglas-fir stand thinned to approximately 60 sq. ft. per acre of basal area.

Douglas-fir Pole

Treatments in these stands would include removing the lodgepole pine and thinning the Douglas-fir from below to a general basal area of 40-80 square ft. per acre (generally 200-300 trees per acre). Canopy conditions would become more open. Generally crowns would not touch. The stand would be thinned to retain trees in clusters. Following treatment, more sunlight would be available to promote understory growth. Grass and shrub components would increase. Maintaining these stands in an open condition would promote diameter growth allowing trees to eventually attain old growth characteristics.

Mature Lodgepole

Stands would be clearcut due to mountain pine beetle mortality. FINDITS modeling within these stands shows that up to 75 percent of the larger trees would be killed by beetles. Within these stands, patches of small diameter trees that are not significantly affected by mountain pine beetle would remain. These patches would vary from ¼ to five acres in size. Douglas-fir, aspen, spruce and subalpine fir would not be affected by mountain pine beetle and would remain where they occur.

The general stand characteristics would change from stands with high percentages of dead trees and dense small diameter trees to open seedling and sapling sized stands with reserve patches of fairly dense pole-sized material. Open grown trees that would resist blowdown and dead snags would also be scattered throughout the area. Canopy characteristics would change from dense continuous canopies to open conditions with small patches of dense canopy. Some large diameter dead trees would remain to provide snags in accordance with forest plan standards. Douglas-fir, aspen, subalpine fir and spruce would remain

where these species occur. Vigor would generally increase in aspen clones due to less competition for available light and water (Shepperd 1996).

Removing the lodgepole would reduce the fuel loadings and as the regenerated stand develops, seedling and sapling sized trees would likely remain unaffected by the mountain pine beetle in the early years because this size class of tree is not preferred by pine beetles (Amman and Cole 1983).

Shrub and grass understories would increase as a result of more available sunlight. Treatments would reduce trees and woody debris making travel for livestock and big game through treatment areas easier. In most areas, grasses would dominate the site until trees become established. Regeneration would likely be patchy and would consist mainly of lodgepole pine.

Figure 3.18: Mature lodgepole pine stand with reserve trees and islands following treatment.

Lodgepole Pole

These stands would be thinned from below to a basal area of 80-120 (approximately 300 – 425 trees per acre). Most of the dead lodgepole would be removed. The overall stand characteristics of these types of stands would change from dense stands with a substantial component of small diameter trees to a more open condition of larger diameter trees. The smaller diameter lodgepole pine trees would be removed to create a more open canopy condition. Small openings generally less than two acres would occur where pockets of dead trees are removed and for landings.

Thinning has been shown to effectively limit beetle infestation within the boundaries of a thinned stand (Gibson 1989). Beetle activity would be reduced but not totally eliminated. Occasional trees would continue to die but mortality would not become excessive and would not significantly increase future fuel loadings. In untreated areas, mountain pine beetle would likely continue barring severe winter weather.

Larger diameter trees would be retained. Douglas-fir and aspen would be retained where they occur to promote a more diverse stand. Increased species diversity would lessen the future effects of insects and disease in these stands.

Although stand densities would decrease in these stands, the average diameter would increase slightly due to the removal of the smaller material. Aspen clones within treatment units would have more light available and would have less competition from conifer that would increase the vigor of the aspen. Existing mature aspen would be retained. Small openings generally less than 2 acres would be created for landings and as a result of slash disposal.

The resulting stand would be a more open grown stand of lodgepole pine intermixed with other species such as Douglas-fir, aspen and minor amounts of subalpine fir and spruce. More light would be available in the understory somewhat increasing the vigor of understory vegetation. Aspen suckering would be stimulated (Shepperd 1996).

Figure 3.19: Lodgepole pine stand thinned to a basal area of approximately 100 sq. ft. per acre.

Colonized Parks

Burning would also take place in openings that were formerly open grass and sage parks but are now dominated by sapling sized Douglas-fir. Low intensity fire would kill most of the sapling sized material while leaving some of the old larger diameter trees. Reducing the sapling component in openings and in the understory would stimulate shrub and grasses. Old, larger diameter Douglas-fir and possibly some lodgepole would be protected and not killed as a result of burning. Where conditions warrant, slashing and piling would be used to facilitate burning.

Following treatment, the density of the seedling and sapling sized material would be reduced. Most of the seedling and sapling sized understory would be removed. Canopy layering would decrease in the forested areas. Former openings would be restored within stands. Grass and shrub understories would increase in

the areas currently dominated by Douglas-fir saplings. Open park conditions would be restored along edges of stands and in parks that were formerly dominated by sagebrush. Fuel accumulations would be reduced throughout the treatment areas. Snags would be created in the pole sized material as a result of the burns.

Table3.27: Acres of each vegetative type treated in each alternative

	Mature Douglas-fir	Douglas-fir Pole	Mature Lodgepole	Lodgepole Pole	Colonized Parks
Alternative 2	274	245	288	114	181
Alternative 3	708	283	1158	117	334
Alternative 4	756 / 7*	446 / 17*	1900 / 766*	828 / 423*	337 / 19*
Alternative 5	747	429	1118	398	318

*Treated acres within roadless.

The cumulative effects of no action in the project area are similar to the effects to the entire Basin Creek and Blacktail Creek watersheds. At this time no projects are planned to increase or maintain non-forested vegetation in these two watersheds. Until a wildfire occurs non-forested vegetation or colonized parks will continue to decrease and be dominated by conifers.

Non-forest Vegetation

Colonized parks that are prescribed burned would allow non-forested vegetation to dominate the site. The burn will reduce the dominance of seedling and sapling size conifers and non-sprouting shrubs, and will allow herbaceous vegetation (grasses and forbs) to increase production two to three times. The increase in herbaceous production will last 10 to 15 years. Temporarily, shrubs will be reduced but should reach pre-burn densities in approximately 20 to 30 years (Mueggler and Stewart 1980, Wright et al 1979, Gruell et al 1986).

There are no cumulative effects since there are no other projects planned that will increase or maintain non-forested vegetation in the Basin or Blacktail watersheds.

Lands Suitable for Livestock Grazing

In treatment areas that are also suitable for livestock grazing (gentle slopes and forage producing), herbaceous production is expected to double. Approximately half of this increased herbage in mixed stands dominated by Douglas-fir and in grassland/shrublands is palatable forage for livestock and big game. The increase of forage is not enough to increase permitted livestock grazing. Treatment areas will be less tree-covered and will allow for easier travel for livestock and big game. Treatment areas will be rested from livestock grazing for two growing seasons after burning. Livestock grazing maybe temporarily, prohibited, in pastures where active logging and/or temporary road construction is occurring.

Noxious Weeds

Initially, the ground disturbance and reduction of conifer cover from these action alternatives will increase the opportunities for noxious weeds to become established. Implementing Best Management Practices and mitigation measures will minimize new infestations. For the short term, efforts in noxious weed

management will need to be increased, but in the long term, the ability of these alternatives to reduce fire size and fire severity will reduce opportunity for noxious weed infestations. Wildfire and the associated effects from control activities such as dozer line, create more long-term opportunities for weed establishment than planned management treatments.

SUMMARY OF DIRECT/INDIRECT EFFECTS

The analysis for effects to forested vegetation other than old growth is the project area and the adjacent Roosevelt Drive and Lime Kiln areas. The cumulative effects to the forested vegetation in these areas would be a reduction in tree density.

The thinning treatments proposed in this project would change the density of trees within the stands. Thinning treatments would not affect the amount of land that is considered forest. These treatments would affect the risk of the various types of fire that could occur within the stand. (More detailed descriptions are given in the "Direct and Indirect Effects" section.)

Treatments that propose to remove the dead trees from heavily infested stands of lodgepole pine would affect the forested character of the stand. Detailed descriptions of this treatment can be found in the "Direct and Indirect Effects" section, however the character of the stands would change from a dense stand of mostly dead trees to an open stand of seedling sized trees and shrubs and grasses with islands of dense timber and snags scattered throughout.

Burning treatments would not change the character of forested stands but would reduce the density of the understory. More detailed descriptions of effects can be found in the "Direct and Indirect Effects" section. In stands that are classified as dry meadows, burning treatments would reduce the amount of small diameter trees that occur scattered throughout the openings or as individual thickets. These areas would remain classified as dry meadows. Treatment would not change the character of the openings; it would only maintain the open character.

Table 3.28: Acres of each vegetative type affected by alternative for the Basin Creek project area.

Vegetative type	Total Acres	Alt 1 Acres Treated	Alt 2 Acres Treated	Alt 3 Acres Treated	Alt 4 Acres Treated	Alt 5 Acres Treated
Aspen	43	0	0	0	0	0
Douglas-fir Pole Timber	645	0	245	283	446	318
Mature Douglas-fir	1,515	0	274	708	756	747
Lodgepole Pole Timber	3,063	0	114	117	828	398
Mature Lodgepole	5,822	0	288	1,158	1,900	1,118
Spruce / Subalpine Fir	246	0	0	0	0	0
Colonized Parks	879	0	181	334	337	342
Private Land	2,106	0	0	0	0	0
Total	14,319	0	1,101	2600	4267	3,010

None of the proposed alternatives are expected to stop the spread of mountain pine beetle outside the treated stands. Gibson (1989) and Amman and Cole (1983) have shown that the beetles would spread to untreated stands and continue until the population cycle runs its course and either becomes limited by the amount of favorable size classes or is stopped by severe winter weather.

CUMULATIVE EFFECTS

Actions in the forested component of the South Butte analysis area include a roadside hazard tree removal action in Thompson Park. The roadside hazard tree removal was a minor action that does not affect any old growth stands and occurs only along a few roads in Thompson Park. This action encompassed about 43 acres in narrow strips immediately adjacent to existing roads. No old growth characteristics were affected.

Recent harvest in the project area consists of a 35-acre salvage sale in 1998. This sale removed blown down timber in an area in the southeast portion of the Basin Creek watershed. Additionally there have been some minor post and pole, firewood and house log sales that occurred in the 1960s to the 1980s. These minor activities were all selective tree removal and had little or no effects on the forested stands in the Basin Creek watershed.

The Lime Kiln timber sale is a foreseeable future action. The 1999 decision, which was never implemented, would have harvested 366 acres of sawtimber and roundwood, construct 0.5 mile of temporary road, and close 0.6 mile of dead end spur roads. However, this action could be modified pending additional environmental analysis.

The Forest Service is also considering removing up to 500 acres of dead and dying trees in the Thompson Park area around recreational sites. In most cases this would consist of removing beetle killed lodgepole pine. This action would result in more open canopy conditions in mixed Douglas-fir stands and clearings in stands of pure lodgepole. This action would not affect stands that are currently old growth or stands that have been identified as old growth recruitment.

As a result of mountain pine beetle activity, numerous private landowners are currently harvesting or plan to harvest timber on private land. We anticipate approximately 270 acres of private land in the project area have been recently harvested or are planned for harvest.

Private logging has occurred outside the analysis area, and we anticipate that additional logging would occur on private property in and outside of the analysis area. To date we estimate that approximately 200 acres have been harvested on various sites on private land in Terra Verde, Thompson Park, Blacktail canyon and Passmore Canyon. In most cases Douglas-fir was left and the related slash was piled and burned.

DIRECT AND INDIRECT EFFECTS TO OLD GROWTH

None of the action alternatives propose activity in old growth stands.

The analysis area for direct and indirect effects to old growth includes timber compartments 414, 415, and 416. The project area lies within portions of these compartments, and although no harvest is planned, old growth surveys were conducted in the summer of 2002. Old growth types were classified as lodgepole, Douglas-fir or spruce-subalpine fir according to Green et al. al. 1992.

The Forest Plan requires 5 percent old growth per compartment. Old growth stands were surveyed using a combination of walk through exams conducted in 2002 and data taken from stand exams conducted in the 1980s and 1990s. Approximately one-third of the stand exam sites were again visited in 2002 and field verified for accuracy. Refer to the project file for detailed information regarding site-specific surveys.

Compartment 414 currently falls below forest plan standards for old growth. This is attributable to logging that occurred around the turn of the century as a result of mining activity. As a consequence, Compartment 414 is primarily dominated by stands of lodgepole pine that range form 80 to 120 years old. Small amounts of old growth are located in the more remote and inaccessible areas of the compartment. No old growth stands are proposed for harvest activity in compartment 414.

In addition, approximately 278 acres of old grow recruitment in compartment 414 will be identified in the timber stand database to bring the compartment up to forest plan standards. Old growth recruitment stands will be grouped together to provide for large blocks of old growth. Additionally, the old growth recruitment stands will be located away from developed areas where possible. These recruitment stands will not be altered to significantly change characteristics that would be desirable for old growth.

Compartments 415 and 416 both meet and or exceed Forest Plan standards for acres of old growth (FP II-26). Compartment 416, was not completely field surveyed, however, field verification of selected stands indicated that this compartment contains more than twice the amount needed to meet Forest Plan standards.

Table 3.29: Acres of Old Growth by Timber Compartment.

Timber Compartment	Compartment Acres	Acres of Old Growth currently identified	Old Growth Percent of Compartment
414	10,950	262[1]	2.3
415	4,880	1,430[2]	29.30%
416	10,804	1,116[3]	10.3%
Total	26634		

[1] 11 acres Douglas-fir, 251 acres lodgepole pine.

[2] 255 acres Douglas-fir, 1,126 acres lodgepole pine, 49 acres subalpine fir

[3] 71 acres Douglas-fir, 861 lodgepole pine, 184 acres subalpine fir.

CUMULATIVE EFFECTS TO OLD GROWTH

Cumulative effects to old growth were analyzed for the North Zone of the Beaverhead-Deerlodge National Forest (formerly the old Deerlodge National Forest) and the entire Beaverhead-Deerlodge National Forest. Information gathered for the Forestry Inventory Analysis (FIA) was used to analyze cumulative effects to old growth. Forest Inventory Analysis is a continuing inventory mandated by Congress in the Forest and Rangeland Renewable Resources Planning Act of 1974 and the McSweeny-McNary Forest Research Act of 1928. The primary objective of FIA is to determine the extent, condition, growth and other characteristics on the nation's forested land. This database is updated annually (Miles et al. 2001).

More recent analysis was completed for the forest since the DEIS was completed. Since no areas of old growth were identified for treatment, the action alternatives would have no cumulative effect upon this resource. Stands that meet the Green et al definition for old growth will not be treated.

The analysis shows that old growth acreage for the Beaverhead-Deerlodge is consistent with Forest Plan standards that require at least 5 percent old growth. Following is the analysis that shows acres of timber type and the percentage of old growth for each type for the forest by landscape. The project area is within the Upper Clark Fork landscape. Lodgepole pine snags are likely higher than the estimated numbers because of the ongoing mountain pine beetle epidemic. The portion of the following report dealing with snags can be found in the project file.

Detailed Estimates of Old Growth

Analysis was done using Forest Inventory and Analysis (FIA) data, see *Application of Forest Inventory and Analysis (FIA) Data to Estimate Amount of Old Growth Forest and Snag Density in the Northern Region of the National Forest System* for an overview on why it is appropriate to use this data for broad-scale analysis. All forested FIA plots that were located on the Beaverhead-Deerlodge National Forest were used to estimate the proportion of old growth and density of snags with a minimum diameter breast height of 10.0 inches or larger. Those FIA plots in which wildfire or harvest have occurred since the 1996-1997 inventory was coded to: (1) not meet the old growth definition; and (2) represent that there were no snags remaining at these plot locations. This result is a conservative estimate of old growth and snag density as not all wildfire and harvest activities remove all old growth and snags on the landscape. The following provides estimates of old growth and density of snags for the Beaverhead-Deerlodge National Forest, by landscapes, and by cover types.

As stated in the Interior West Forest Land Resource Inventory Field Procedures, all forest FIA plots are "lands at least ten percent stocked, or currently nonstocked but formally having such stocking with timber and/or woodland trees, and where human activity on the site does not preclude natural succession of the forest (i.e. the site will be naturally or artificially regenerated)."

Proportion of Old Growth on the Beaverhead-Deerlodge National Forest.

Estimated percentage of Old Growth on all forested lands on the Beaverhead-Deerlodge National Forest is 20.95 percent with a 90 percent confidence interval of 18.52 percent to 23.47 percent.

Estimates of percentage of old growth by Landscapes and associated 90 percent confidence intervals follow.

Table 3.20: Estimates of percentage of old growth by landscapes

Landscape	Percent Old Growth			Average Number of Snags/Acre ≥ 10"			Plot Frequency	
	90% CI Lower Bound	Point Estimate	90% CI Upper Bound	90% CI Lower Bound	Point Estimate	90% CI Upper Bound	Number of Plots (Number of Subplots)	Percent of the Plots
Big Hole	9.07	13.49	18.25	6.14	10.45	15.41	83 (415)	15.20
Boulder River	12.11	20.54	29.66	2.61	5.92	9.89	37 (185)	6.78
Clark Fork - Flints	13.21	20.00	27.02	3.09	6.28	9.96	46 (230)	8.42
Gravelly	18.22	26.52	35.12	7.33	12.99	19.43	46 (230)	8.42
Jefferson River	5.52	13.10	21.90	1.15	5.52	11.36	29 (145)	5.31
Lima Tendoy	10.97	19.38	28.48	4.07	9.00	14.89	32 (160)	5.86
Madison	20.00	40.00	60.00	5.45	11.90	19.32	13 (65)	2.38
Pioneer	15.51	21.16	27.08	7.12	10.47	14.11	86 (430)	15.75
Tobacco Roots	12.73	25.71	40.00	3.56	11.71	22.11	21 (105)	3.85
Upper Clark Fork	0.00	11.11	24.00	0.00	2.19	7.25	9 (45)	1.65
Upper Rock Creek	23.33	31.50	40.00	6.59	14.51	23.58	40 (200)	7.33

Table 3.21: Estimates of percentage of Old Growth by cover type and associated 90 percent confidence intervals.

Cover Type	Percent Old Growth			Plot Frequency	
	90% CI Lower Bound	Point Estimate	90% CI Upper Bound	Number of Plots (Number of Subplots)	Percent of the Plots
ABLA (subalpine fir)	22.86	30.59	38.60	51 (255)	9.34
IMXS	0.00	13.33	40.00	3 (15)	0.55
JUNIP (juniper)	0.00	0.00	0.00	1 (5)	0.18
NONE	0.00	0.00	0.00	5 (25)	0.92
PIAL (whitebark pine)	20.57	29.47	38.86	38 (190)	6.96
PICO (lodgepole pine)	10.94	14.19	17.64	179 (895)	32.78
PIEN (spruce)	25.49	34.40	43.50	50 (250)	9.16
PIFL (limber pine)	0.00	28.00	65.00	5 (25)	0.92
POTR (aspen)	0.00	0.00	0.00	2 (10)	0.37
PSME (Douglas-fir)	15.19	19.81	24.64	106 (530)	19.41
TASH	0.00	20.00	60.00	2 (10)	0.37