United States
Department of
Agriculture

Forest
Service

November 2011

NFMA Summary Report

Castle Mountains Restoration Project

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Table of Contents

List of Tables

Introduction

The Forest Service has prepared this NFMA summary report to identify potential management opportunities to move the existing condition towards the desired condition, specifically with a focus on restoration of existing forest vegetation conditions. Existing mortality from mountain pine beetle has significantly affected the forest condition, and increased current and future fire potential and fuel loading. This summary and the specialist reports supporting this summary provide the foundation to identify a site-specific proposed action to be analyzed under NEPA. This document is not a decision document, nor a document subject to public review and comment.

Integrated Restoration and Protection Strategy

The Northern Region developed the Integrated Restoration and Protection Strategy (IRPS) to develop more resilient terrestrial and aquatic systems (USDA Forest Service 2010b). The focus of the strategy is to provide information for forests to manage with a more integrated approach in context of current and projects risks. The strategy identifies the highest priorities for nineteen key resource values associated with six themes, by comparing existing conditions to desired condition, and assigning values and risk factors. The comparison is used to develop a ranking for restoration and protection opportunities. For this analysis, the desired conditions and principles developed within the themes were incorporated for vegetation objectives and to assist in determining treatment priorities. The themes are:

- Restoration of forests, grasslands, and human communities to a more resilient condition.
- Restoration and maintenance of resilient, high value watersheds.
- Restoration of high value fisheries streams developing more resilient habitat.
- Restoration and maintenance of wildlife habitats, including restoration of more resilient vegetation conditions, where appropriate to meet ecological and social goals.
- Restoration and protection of recreation sites and scenic vistas.
- Protection of people, structures and community infra-structure (roads, bridges, power corridors, recreational development, etc), highlighting current and projected MPB and wildlife effects.

East-side Analysis of the Management Situation

Overall distribution of vegetation conditions desired within the Castle Mountain project area can be estimated based on the Historic Range of Variability (HRV) developed for geographic area 17 (which includes the project area) (Eastside HRV summary.xlsx). Although the area analyzed is much larger, estimated at 590,299 acres and with the accuracy and limitations of the data, the general distribution and relationships can be of some use to apply to the Castle project area.

These themes and the associated objectives are especially applicable to the Castle project area. The restoration of forest and grassland conditions toward HRV, status within the Willow Creek watershed used for culinary water, protection of private lands and Forest Service improvements, impacts from the ongoing MPB outbreak, importance of whitebark pine, aspen, dry forests, riparian areas, big game habitat, and the role of fire are all important values within the Castle Mountains.

Management Direction

The desired condition can be identified through the review and interpretation of the management direction provided by the Forest Plan Standards and Guidelines, and Management Area direction.

Forest Plan

The analysis area contains eight Management Areas (MAs): C, D, E, G, H, J and L. The overall goals and direction for the forest-wide standards and direction, as well as the individual MA pertaining to forest vegetation management are described below.

Forestwide Management Standards

Timber

Manage timber resource to enhance riparian values.

A minimum 5 percent of the commercial forest land within a timber compartment should be maintained in an old growth condition. A minimum stand size of 20 acres is recommended for old growth management.

Management activities will increase the timber resource productivity by bringing 282,307 suitable acres under regulated management. These activities will provide for an annual timber sale program of 14million board feet in the first decade and 20 million board feet by the third decade. Most of the timber will be harvested on the Jefferson Division. Achieving this level depends upon managing suitable acres with techniques such as stocking control, pre-commercial thinning, and commercial thinning and successfully managing any insect or disease outbreaks in the future. The Rocky Mountain Division will have a small sales program for local needs. Timber management activities and projects will be coordinated with other resources through an inter-disciplinary process. State water quality standards will be met through application of best management practices.

Emphasize harvest of stands that exhibit characteristics of high risk for mountain pine beetle attack. Locate timber sales in order to break-up continuous natural fuel accumulations. Systems will emphasize treatments that reduce losses to other insects and diseases by (a) improving species diversity, growth and vigor for stands, and for increasing the size diversity and class diversity between stands.

During ongoing infestations, control insects and disease through silvicultural and biological practices. Chemical controls will be limited to high value areas or used on a broader scale only when all other measures have failed and other resource values can be protected. Emphasize cooperative control measures between Federal, State, and private landowners.

Use prescribed fire as appropriate to achieve land management goals, including improvement or maintenance of vegetation diversity. Management area direction indicates the appropriate use of prescribed fire.

Leave approximately 10 tons of fuel per acre, where available. This should be material over four inches in diameter, which is randomly scattered over the area.

Range

Use prescribed fire for control of sagebrush and tree encroachment and other vegetative manipulation as needed to meet outputs.

Where analysis shows range resource damage, the cause will be identified and corrective action will be initiated through an allotment management plan. Allotment planning will be coordinated with adjacent and inclusive landowners.

Place a high priority on implementing improved grazing management systems on range allotments within identified big-game winter range.

Soils

Utilize adequate soil and water conservation practices to protect soil productivity and to control nonpoint water pollution from project activities, using as a minimum, practices specified in any State developed Best Management Practices.

Wildlife

Incorporate recommendations from the Montana Cooperative Elk-Logging Study in the planning of timber sales and road construction projects.

Require a big game cover analysis of projects involving significant vegetation removal to ensure that effective hiding cover is maintained. The cover analysis should be calculated using an area such as a watershed or elk herd unit which is neither too large to dilute effects, or too small to magnify the effects. Drainages or elk herd units containing identified summer range/fall range will be maintained at 30 percent or greater effective hiding cover.

Manage motorized use on National Forest system lands through the Forest Travel Plan, in cooperation with the public, State of Montana, and other Federal agencies, to reduce the effects on wildlife during periods of high stress (hunting seasons and wintering periods).

The forest plan was amended in March 2007 with the Northern Rockies Lynx Management Direction, as published in the Northern Rockies Lynx Management Direction Record of Decision (NRLMD ROD) (USDA Forest Service 2007a). The direction includes a goal, objectives, standards and guidelines related to all activities; vegetation management (VEG), grazing management (GRAZ), human uses (HU), and linkage habitat (LINK). Standards and guidelines are management requirements and actions that can be measured and displayed to show the predicted outcome of management activities in comparison to the existing condition. The NRLMD identifies four standards and two guidelines from the LCAS that should be considered in unoccupied LAUs when considering vegetation management projects. They are summarized below.

Standards and guidelines relating to quantity of winter snowshoe hare habitat.

Standard VEG S1: LAUs should not have more than 30 percent of the lynx habitat in an unsuitable condition.

Standard VEG S2: LAUs should not have more than 15 percent of lynx habitat changed to an unsuitable condition over a decade.

Guideline VEG G1: Recommends creating forage (winter snowshoe hare habitat) where it is lacking. Mainly focus regeneration efforts in pure lodgepole stands, with little understory, especially where forage is lacking.

Standards and guidelines relating to quality of winter snowshoe hare habitat.

Standard VEG S5: Recommends no precommercial thinning that reduces winter snowshoe hare habitat in the stand initiation structural stage.

Standard VEG S6: Recommends no precommercial thinning that reduces winter snowshoe hare habitat in multi-storied forests.

Standards and guidelines relating to denning habitat.

Guideline VEG G11: 1) have denning habitat distributed across an LAU in the form of pockets of large woody debris such as downed logs, root wads or areas of jack-strawed blowdown; and 2) if denning habitat is lacking, projects should be designed to retain coarse woody debris – by leaving piles or retaining residual trees that can become denning habitat later.

Management Areas

Management Area C (18,764 acres)

Goal - Maintain or enhance existing elk habitat by maximizing habitat effectiveness as a primary objective. Commodity resource management will be practiced where it is compatible with these wildlife management objectives.

Direction specific to forest vegetation

- Maintain or enhance important identified wildlife habitat, including T&E habitat, big-game winter ranges, calving or lambing areas, migration routes, elk summer concentration areas, raptor nesting sites, and significant nongame habitat.
- Use prescribed fire to control tree/shrub encroachment and to maintain or enhance forage production on range. Mechanical or chemical methods are also acceptable.
- Harvest unprogrammed amounts of forest products, including Christmas trees, firewood, ornamentals, and miscellaneous wood products through administrative use, free use, permits, salvage, and sanitation cutting.
- Natural regeneration is the primary objective.

Management Area D (19,875 acres)

Goal- Provide a sustained high level of forage production for livestock, while protecting, maintaining, and improving water, wildlife, and other resource qualities.

Direction specific to forest vegetation

- Minimize impacts on important identified wildlife habitat while achieving range management goal. Important identified habitat includes big-game winter ranges, calving areas, migration routes, and elk summer concentration areas.
- Use prescribed fire to control tree/shrub encroachment and to maintain or enhance forage production on range. Mechanical or chemical methods are also acceptable.
- Harvest unprogrammed amounts of forest products including Christmas trees, firewood, ornamentals, and miscellaneous wood products through administrative use, free use, permits, salvage, and sanitation cutting.

Management Area E (15,757 acres)

Goal - Provide sustained high level of forage for livestock and big game.

Direction specific to forest vegetation

- Coordinate prescribed burning and revegetation projects with range management
- Use prescribed fire to control tree/shrub encroachment and to maintain or enhance forage production on range. Mechanical or chemical methods are also acceptable.
- Harvest Unprogrammed amounts of forest products including Christmas trees, firewood, ornamentals, and miscellaneous wood products through administrative use, free use permits, salvage, and sanitation cutting.
- Prescribed fire with unplanned ignitions may be used in this management area for the enhancement and maintenance of resources, when within pre-established prescribed fire criteria.

Management Area G (15,076 acres)

Goal - Maintain and protect Forest resources with minimal investments.

Direction specific to forest vegetation

- Maintain important identified wildlife habitat, including T&E big-game winter ranges, calving or lambing areas, migration routes, elk summer range, raptor nesting sites, and significant nongame habitat values.
- Improve habitat by prescribed burning and planting desirable forage on disturbed sites.
- Use prescribed fire to control tree/shrub encroachment and to maintain or enhance forage production on range. Mechanical or chemical methods are also acceptable.
- Harvest unprogrammed amount of products including Christmas trees, firewood, ornamentals and miscellaneous wood products through administrative use, free use, permits, salvage, and sanitation cutting.
- Prescribed fire with planned ignitions will be used in this management area for the enhancement and maintenance of resources.

Management Area H (1,982 acres)

Goal - Provide winter recreation opportunities supported by public and private developments while maintaining other resource values.

Direction specific to forest vegetation.

- Minimize impacts on important identified wildlife habitat, big-game winter ranges, calving or lambing areas, migration routes, and elk summer ranges.
- Use prescribed fire to control tree/shrub encroachment and to maintain or enhance forage production on range. Mechanical or chemical methods are also acceptable.
- Harvest unprogrammed amount of products including Christmas trees, firewood, ornamentals and miscellaneous wood products through administrative use, free use, permits, salvage, and sanitation cutting, while maintaining or enhancing other resource values.
- Prescribed fire with planned ignitions will be used in this management area for the enhancement and maintenance of resources.

Management Area J (4,809 acres)

Goal.-Maintain high quality water for municipal use.

Direction specific to forest vegetation.

- Maintain important identified wildlife habitat, including T&E big-game winter ranges, calving or lambing areas, migration routes, elk summer range, raptor nesting sites.
- Timber should only be harvested where necessary to control hazard to the water resources.
- Harvest unprogrammed amounts of forest products, including Christmas trees, firewood, ornamentals, and miscellaneous wood products through administrative use, free use, permits, salvage, and sanitation cutting.
- Natural regeneration is the primary objective.

Management Area R (unmapped, unknown acres)

Goal - Manage to protect or enhance unique ecosystem values associated with riparian zones. Give preferential consideration to riparian area dependent resources. Timber and range management activities are permitted.

Direction specific to forest vegetation.

- Maintain or enhance important identified wildlife and fish habitat. Important identified habitat include T&E big-game winter ranges, calving or lambing areas, migration routes, elk summer range, raptor nesting sites, spawning areas, and significant nongame habitat values. Uneven-aged harvest systems will provide for stream shading, bank stability protection, and a range of successional stages.
- Harvest unprogrammed amounts of forest products, including Christmas trees, firewood, ornamentals, and miscellaneous wood products through administrative use, free use, permits, salvage, and sanitation cutting.
- Forest regeneration will be natural.
- Uneven-aged systems will predominate within the area, consisting of individual tree and group selection methods. Also, even-aged shelterwood harvest method may be permitted where conditions warrant. The silvicultural method employed will be based on site conditions, timber type, and compatibility with long-term scheduling on adjacent Management Areas A, B, C, and O. In riparian areas approximately 15 percent of the merchantable volume will be removed at each entry.
- Prescribed fire with planned ignitions will be used in this management area for the enhancement and maintenance of resources.

Management Area L (3,595 acres)

Goal – Emphasize opportunities for mineral exploration, development, and production while protecting historical values.

Direction specific to forest vegetation

- Harvest unprogrammed amounts of forest products, including Christmas trees, firewood, ornamentals, and miscellaneous wood products through administrative use, free use, permits, salvage, and sanitation cutting.

- Use prescribed fire to control tree/shrub encroachment and t o maintain or enhance forage production on range. Mechanical or chemical methods are also acceptable. Cooperate closely with other Federal and State agencies, individuals, contractors, and permittees to control noxious weed and pest infestations.

Vegetation

To assess and describe current forest vegetation conditions, various data sources were used, including stand exam, FVS modeling, field reconnaissance, FACTS database, Insect and Disease Detection Surveys, and GIS vegetation layers.

The Northern Region Vegetation Mapping Project (R1-VMap), a geospatial database for existing vegetation classification was utilized to describe general vegetation conditions within the project area. The dominance plurality 40% classification, suitable for mid-level planning and identification of the dominant species was used to compile forest types and conditions across the Castle Mountains (USDA Forest Service 2009b).

More site specific information at the stand level utilized historical stand exam data and field reconnaissance. Selected vegetation components were sampled from 1981 thru 1991 using Common Stand Exam protocol (USDA 2009). A total of 2,022 field plots were taken within 245 stands.

Estimates of changed conditions as a result of ongoing mortality since stand exam was collected, was based on field observations and insect and disease surveys. Natural regeneration since the plots were taken is projected using the FVS modeling feature for natural regeneration within the Eastern Montana Variant.

Field reconnaissance by resource specialists within many of the stands within the Castle Mountains was completed during the summer of 2010, documenting current stand conditions including changes as a result of ongoing bark beetle activity.

Further estimates of insect and disease activity were based on results of the Aerial Detection Surveys from 2006-2010.

Species Distribution

Vegetation species types are summarized in Table 1 by size class, and discussed by species following the table.

Table 1. Vegetation types/size class acres

Species (% of project area)	Size Class	Acres
Limber Pine (1%)	Seedling/Sapling (<5” dbh)	108
	Pole (5-9.9”dbh)	644
	Medium (10-14.9” dbh)	143
	Large (>15” dbh)	6
Total		920
Ponderosa pine (2%)	Seedling/Sapling (<5” dbh)	42
	Pole (5-9.9”dbh)	1,389
	Medium (10-14.9” dbh)	267
	Large (>15” dbh)	29

Species (% of project area)	Size Class	Acres
Total		1,726
Douglas-fir (35%)	Seedling/Sapling (<5” dbh)	2,214
	Pole (5-9.9”dbh)	11,526
	Medium (10-14.9” dbh)	12,349
	Large (>15” dbh)	1,778
Total		27,867
Lodgepole pine (30%)	Seedling/Sapling (<5” dbh)	466
	Pole (5-9.9”dbh)	18,454
	Medium (10-14.9” dbh)	4,907
	Large (>15” dbh)	177
Total		24,004
Whitebark pine (4%)	Seedling/Sapling (<5” dbh)	46
	Pole (5-9.9”dbh)	2,652
	Medium (10-14.9” dbh)	160
	Large (>15” dbh)	0
Total		2,857
Engelmann Spruce (<1%)	Seedling/Sapling (<5” dbh)	24
	Pole (5-9.9”dbh)	158
	Medium (10-14.9” dbh)	332
	Large (>15” dbh)	62
Total		576
Subalpine fir (2%)	Seedling/Sapling (<5” dbh)	8
	Pole (5-9.9”dbh)	887
	Medium (10-14.9” dbh)	567
	Large (>15” dbh)	10
Total		1,472
Aspen (not classified by size class) (<1%)		28
Total Forested Area		59,450
Grassland/Shrubs (25%)		19,634

Grassland/shrubs

Areas were classified as grassland/shrubs if trees occupy less than 10% canopy cover. Historically large grasslands dominated the central portion of the project area. Currently most of these stands are showing an increase in conifer regeneration along the edges and in some cases scattered within the interior. These areas with heavy conifer regeneration are now classified as smaller diameter conifer, resulting in a net reduction in grassland / shrub acres.

In the continued absence of disturbance conifer regeneration will increase. As the regeneration in the grassland / shrub type exceeds 10% canopy cover, the shift of grassland shrub to conifer classification occurs and therefore range decreases.

Limber pine

This type is composed of small scattered stands generally less than 3 acres in size. Field observations of this group indicate increasing stand density, ground litter, and a shift to more

shade tolerant species such as Douglas-fir and subalpine fir. Mountain Pine Beetle (MPB) is removing much of the larger diameter (>8" dbh) limber pine. White Pine Blister Rust (blister rust) has infected all of the size classes.

Ponderosa pine

Approximately 81% of the ponderosa pine is composed of polesize timber, followed by 15% of medium sized and only 2% each in the regeneration and large size trees. Canopy cover is weighted in the higher classes, indicating high stocking levels. Field reconnaissance indicates increasing stocking levels in the lower size classes, mortality from MPB in the larger size classes, and increasing Douglas-fir if adjacent to stand. These changes will result in a reduction in canopy cover in the larger size classes, increase to the smaller classes, and size class continued to be skewed towards the middle. Distribution may increase as regeneration continues in to surrounding meadows.

Douglas-fir

The majority (86%) of this species is composed of the middle size classes and upper canopy cover classes. Less than 10% is in the regeneration or large diameter class. Field reconnaissance observations support the lack of the larger diameter class as most often due to the relatively immature age of the stand or to a lesser effect timber harvest. Many of the stands contain an understory at high stocking levels of regeneration within stand classified under a larger tree size. Canopy cover was generally found to be high, indicating high stocking levels. Recent spruce budworm has reduced understory stocking levels. Expansion of Douglas-fir in to surrounding openings or ponderosa pine may increase distribution.

Lodgepole pine

The majority of the lodgepole pine is in the polesize (77%) and medium sized (20%) classes. Two percent or less is occupied in the largest and smallest category. Field observations support the lack of size class diversity and homogenous status of the lodgepole pine, given the fire history. A small portion of the seedling and sapling size class is a result of young plantations from timber harvest on private and Forest Service lands. However, many stands classified in the larger diameter size contain an understory of seedling and saplings that is not represented in the size class distribution table. Given that most of the lodgepole pine stands are climax subalpine fir or Douglas-fir, most of the regeneration is composed of the more shade tolerant species. Observations confirm high stocking levels, representing a closed, mid development successional stage. Ongoing MPB induced mortality will result in stands composed of other species or surviving lodgepole pine trees in the smaller diameter size. In the absence of fire disturbance, these changes will result in a shift to the smallest diameter size and conversion to other forest types, such as subalpine fir and Douglas-fir. Presence of the seedling/sapling and smaller polesize stands with a large component of trees less than 8.0" in diameter will result in greater resiliency from mortality from MPB and retention of lodgepole pine. Some expansion of lodgepole pine may occur as a result of natural regeneration in to meadows.

Whitebark pine

Whitebark pine is an ecologically significant forest type and where it occurs in the Castle Mountains with the majority in the polesize (93%) with generally high stocking levels. The lack of large diameter sizes can be attributed to recent MPB activity. One stand (716.001.007) visited with the largest diameter whitebark pine seen in the Castle Mountains sustained high loss to MPB. Continued MPB activity will result in a shift to the smallest size class, loss of overstory canopy cover, and accelerate succession to more shade tolerant type. Field reconnaissance observed moderate regeneration of whitebark pine with blister rust present. Given the seral

nature of the stands, increasing competition from other species is likely. The trend will result in loss of whitebark pine to other species, namely subalpine fir.

Engelmann spruce

This rare type is limited to small isolated patches. Distribution is dominated in the middle size classes (85%), but contains 11% in the large diameter size. Canopy cover is mainly in the higher range (82%), representing high stocking levels. Field reconnaissance throughout the project area detected few stands dominated by Engelmann spruce. Generally, these were small in size or located along drainage bottoms. Although Engelmann spruce dominated the overstory, other species such as subalpine fir, lodgepole pine, and Douglas-fir had a strong presence. Stands were uneven-aged with increasing subalpine fir regeneration. Recent MPB activity was removing most of the overstory lodgepole pine. No spruce beetle activity was noticed. Short term trends would include increasing canopy cover and growth of Engelmann spruce to the larger diameter sizes. Distribution would remain as is, unless spruce beetle populations increased.

Subalpine fir

Subalpine fir is primarily in the middle size classes. Larger diameter trees were observed to occur more often as scattered individuals. Given the uneven-aged nature of the stands, regeneration was prevalent underneath the overstory. High canopy cover is to be expected given the shade tolerance of the species and lack of disturbance. Minor mortality of subalpine fir from insect/disease was observed in scattered pockets. Short term trends would be expected to maintain current conditions. Distribution of subalpine fir may increase with recruitment from seral lodgepole and whitebark pine types experiencing mortality from MPB.

Aspen

Aspen was not classified in to canopy cover and size classes. Field reconnaissance throughout the project area indicated the aspen as seral to various conifer species, generally of the older age classes, with increasing competition from conifers, and insufficient aspen regeneration to serve as replacement. Most of the clones were less than 1acre in size, with the exception of larger clones along Bonanza Creek adjacent to the forest boundary.

Comparison of Desired and Existing conditions

Table 2 compares the desired HRV distribution of vegetation types versus existing conditions in Castle Mountains as calculated by VMAP.

Table 2. Species distribution comparison – HRV vs. Existing

Species	Historic Range of Variability (%)			Castle Project
	Minimum	Maximum	Average	Existing (%)
Grassland/ shrubland	14.4%	92.0%	6.7%	24.6%
Limber pine	NA	NA	NA	1.2%
Ponderosa pine	1.7%	4.6%	3.8%	2.2%
Douglas-fir	8.1%	24.7%	16.6%	34.9%
Aspen	0.7%	8.6%	5.1%	<0.0%
Lodgepole pine	18.9%	26.3%	22.9%	30.1%
Whitebark pine	0.3%	0.8%	0.3%	3.6%
Engelmann spruce	0.1%	1.1%	0.4%	0.7%
Subalpine fir	0.3%	4.8%	2.4%	1.8%

Rare vegetation types within the geographic area and present in the Castle Mountains include ponderosa pine, aspen, whitebark pine, Engelmann spruce, and subalpine fir. The whitebark pine present in the Castle Mountains represents a major source within the larger geographic area. Aspen conversely is much rarer in the Castle Mountains than in the larger geographic area. Limber pine, not identified within the geographic area, is rare in the Castle Mountains. The dominance by grassland/shrubs, Douglas-fir, and lodgepole pine is consistent across both scales.

Table 3 displays the comparison of diameter class distributions. Specific diameter distributions by species are documented in the Silviculture/Fuels specialist report (Keefe and Riegle 2011).

Table 3. Distribution of diameter classes

Diameter Class (dbh)	Estimated HRV Range (%)			Castle Project
	Minimum	Maximum	Average	Existing (%)
Seedling/sapling (<5.0")	6.2%	20.6%	17.3%	3.6%
Polesize (5.0-8.9")	4.3%	20.5%	9.7%	44.7%
Medium (9.0-14.9")	4.9%	16.7%	10.6%	23.4%
Large (>15.0")	0.8%	24.6%	18.9%	2.6%

There are some differences in tree size definitions between the two scales. The diameter class as defined between the polesize and medium size trees uses 9.9"dbh for existing condition versus 9.0" dbh in HRV. This difference will likely result in a larger percentage of polesize trees and lower percentage of medium sized reflected in existing conditions. General comparisons between conditions indicate the Castle Mountains is deficient in the seedling/sapling and large tree classes and contains a surplus in the polesize and medium size trees. This relationship is to be expected given the development of stands following stand replacement fire throughout the Castle Mountains at the turn of the century and the lack of large scale disturbances since. Current trends associated with the large scale MPB activity will result in a decrease in the larger diameter classes within the pine type and an increase in the seedling/sapling to polesize classes. Although not represented in the table, field observations indicated considerable presence of Douglas-fir seedling and saplings in the understory of Douglas-fir stands (24,875 acres) typed out in the larger diameter sizes.

Management Opportunities

Grassland/shrubs

The overall desired condition is to restore or maintain distribution and composition similar to HRV conditions consistent with forest plan direction. Although approximately 25% of the project area has been identified in this type, the distribution has decreased due to encroachment by conifer regeneration.

The northern region's IRPS includes dry shrublands and mixed grass prairie as important terrestrial species habitat. Desired condition for grass prairie is to retain mixed native grass prairie and their role in an intact ecosystem. Desired condition for shrublands is to retain high density mature sagebrush favored in large contiguous blocks, in proportions within HRV.

Opportunities

- Increase the range of grassland lost from succession to conifers.

- Protect mature sagebrush and increase range lost from succession to conifers.

Limber pine

The overall desired condition is to restore or maintain distribution and composition similar to HRV conditions consistent with forest plan direction. Limber pine forms less than 1% of the project area with distribution decreasing due to mortality from MPB and succession to other species.

The IRPS includes limber pine within two themes, the overall theme to restore and maintain resilient forests similar to conditions within HRV and the value of low elevation dry forest communities for terrestrial species. Desired conditions for limber pine include maintaining stand density levels within 40-60 basal area sq. ft/acre and presence of large size class. Specific limber pine HRV conditions were not analyzed in the East-side Analysis of the Management Situation.

The Middle Rocky Mountain Montane Douglas-fir Forest and Woodland- Fire Maintained Savanna Biophysical model (National LANDFIRE 1.1.0) developed in LANDFIRE described HRV conditions applicable to the limber pine sites located in the Castle Mountains. Stands are typically open, dominated by large diameter Douglas-fir with varying amounts of limber and ponderosa pine. This type is dominated by frequent surface fires with small patch size.

Estimates of current open versus dense stand conditions was based on the VMAP canopy cover range of less than or greater than 25% versus the desired condition using 30%. This difference would likely result in a lower estimate of open stand conditions for existing.

The existing condition exceeds historical levels in the middle size classes and contains higher density levels. Field reconnaissance indicates MPB and blister rust activity is reducing the larger diameter size and reducing presence of limber pine. Forest succession is shifting composition to Douglas-fir and subalpine fir.

Comparing expected disturbance levels associated with HRV with existing conditions indicate MPB and disease levels exceed historical.

Opportunities

- Increase the resiliency of existing limber pine by reducing overall stocking levels, releasing limber pine versus more shade tolerant species, and reducing risk of mortality from fire disturbance.

- Improve structural diversity of limber pine by reducing mortality to conebearing trees, increasing blister rust resistance, and promoting site conditions suitable for future regeneration.

Ponderosa pine

The overall desired condition is to restore or maintain distribution and composition similar to HRV conditions consistent with forest plan direction. Ponderosa pine forms about 2% of the project area with distribution decreasing due to mortality from MPB and succession to Douglas-fir. Currently, ponderosa pine is in the lower range expected for HRV.

The IRPS includes ponderosa pine within two themes, the overall theme to restore and maintain resilient forests similar to conditions within HRV and the value of low elevation dry forest communities for terrestrial species. Desired conditions for ponderosa pine include maintaining stand density levels within 40-60 basal area sq. ft/acre and presence of large size class.

More specific desired condition can be found in the Northern Rocky Mountain Ponderosa Pine Woodland and Savanna or Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest – Ponderosa Pine-Douglas-Fir Biophysical models (National LANDFIRE 1.1.0) with the former being predominant. This model will be used to represent overall desired condition. Frequent fire maintained a grass dominated understory with open late seral ponderosa pine. Canopy cover did not exceed 60%. Douglas-fir formed less than 10% of cover. Patch size was very small.

Large tree size included trees exceeding 15.0”dbh for existing versus 21 to 33” dbh for desired. These differences will likely result in higher presence of large tree for existing. Not included in the table is that 47% of the pine exceeded 60% cover. Ponderosa pine is deficient in the largest diameter size and exceeds canopy cover goals. Ongoing MPB will result in a decrease in the largest trees. Although the table indicates deficiency in the seedling and sapling class, field observations indicate a developing understory or patches of regeneration.

Comparing expected disturbance levels associated with HRV with existing conditions indicate severe MPB levels exceed historical levels.

Opportunities

- Increase the resiliency of existing ponderosa pine by reducing overall stocking levels, promote pine versus more shade tolerant species, and reduce risk of mortality from fire disturbance.
- Improve structural diversity by reducing mortality from MPB to the larger size classes and promoting site conditions suitable for future regeneration.
- Manage stand conditions to reduce loss from insect and disease by reducing stand density, providing for structural diversity, and reduction of infested or infected trees.
- density, providing for structural diversity, and reduction of infested or infected trees.

Douglas-fir

The overall desired condition is to restore or maintain distribution and composition similar to HRV conditions consistent with forest plan direction. The Douglas-fir type dominates, forming about 35% of the project area with distribution increasing due to encroachment in to the grassland/shrubs and forest succession in the ponderosa and lodgepole pine. Douglas-fir exceeds the HRV range for species composition.

The IRPS includes Douglas-fir within two themes, the overall theme to restore and maintain resilient forests similar to conditions within HRV and where applicable, the value of low elevation, dry forest communities for terrestrial species. Desired conditions for dry Douglas-fir type includes maintaining stand density levels within 40-60 basal area sq. ft/acre and presence of large size class.

More specific desired condition can be found in the Middle Rocky Mountain Montane Douglas-fir Forest, Middle Rocky Mountain Montane Douglas-fir Forest and Woodland - Fire-maintained Savanna, or Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest - Ponderosa Pine-Douglas-fir Biophysical models (National LANDFIRE 1.1.0) with the former being predominant. This model will be used to represent overall desired condition. Stands are typically dominated by Douglas-fir with an understory of grasses and sparse shrubs, open density with cover less than 90%, with large diameter Douglas-fir present. Other species include lodgepole and limber pine. Patch size is generally small due to the effect of limited fuels on fire.

Large tree size included trees exceeding 15.0" dbh for existing versus 21 to 33" h for LANDFIRE descriptions. Also, since the VMAP classification of the highest canopy cover range is 60-100%, a portion of the existing value displayed under 40-90% may include areas exceeding 90%. Comparison of the values indicate a deficiency in the seedling/sapling class and open stand conditions with a surplus in the medium to large size class with dense canopy cover. Much of the seedling/sapling areas represent encroachment in to grassland/shrubs. However, field observations show a general surplus of Douglas-fir regeneration underneath the canopy of larger trees which would not be reflected in the existing regeneration. The prevalence of dense stand conditions is consistent with field observations from increasing understory density and stand ingrowth. Due to the difference in diameter classification ranges, the presence of large trees is overstated. Most stands lack a true large diameter mature tree component due to the relative young stand establishment ages.

Comparing expected disturbance levels associated with HRV with existing conditions indicate severe spruce budworm levels exceed historical.

Opportunities

- Increase the resiliency of existing Douglas-fir by reducing overall stocking levels, releasing pine and Douglas-fir versus more shade tolerant species, and reducing risk of mortality from fire disturbance. In some cases the range of Douglas-fir will be reduced to favor ponderosa and limber pine as well as grassland/shrubs.

- Improve structural diversity by promoting tree growth in the largest available trees.

- Reduce risk to western spruce budworm and Douglas-fir beetle by reducing stand density levels, promoting structural and non host species diversity, and controlling canopy layers.

Aspen

The overall desired condition is to restore or maintain distribution and composition similar to HRV conditions consistent with forest plan direction. Aspen is rare, forms less than 1% of the project area with distribution decreasing due to succession to other species. Aspen is well below expectations for HRV.

The IRPS includes aspen within two themes, the overall theme to restore and maintain resilient forests similar to conditions within HRV and the value of aspen for terrestrial species. Desired conditions for aspen were not included.

More specific desired condition can be found in the Rocky Mountain Aspen Forest and Woodland, Northwestern Great Plains Aspen Forest and Parkland models (National LANDFIRE 1.1.0), or embedded in the other conifer models. This former model will be used to represent overall desired condition. Aspen dominates this type, with conifer species typically composing less than 30% cover. Other species include birch and poplar with an understory of grass and tall shrubs. However conifer species can dominate after long fire free periods. Patch size varies.

Current conditions using VMAP did not delineate aspen in to size and cover. Field observations indicate strong dominance in polesize size classes with conifer present. The seedling and saplings stage is often composed of conifer species. Aspen regeneration is most often present in open areas associated with either adjacent meadow or small areas of MPB mortality centers.

Opportunities

- Increase the range of aspen by reducing conifer presence within and surrounding aspen clones.

- Improve structural diversity by promoting aspen regeneration.
- Improve structural diversity by promoting aspen regeneration.

Lodgepole pine

The overall desired condition is to restore or maintain distribution and composition similar to HRV conditions consistent with forest plan direction. The lodgepole pine type dominates, forming about 30% of the project area with distribution decreasing due to high mortality from MPB and succession to other species. Lodgepole pine exceeds the HRV range.

The IRPS includes lodgepole pine within the overall theme to restore and maintain resilient forests similar to conditions within HRV, community fire resilience given the combination of high mortality from insects, recreation development, and interior private lands, and watershed protection for the South Fork of Willow Creek culinary watershed. Specific desired conditions for lodgepole pine were not analyzed in the East-side Analysis of the Management Situation.

More specific desired condition can be found in the Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland, Northern Rocky Mountain Subalpine Woodland and Parkland, or Rocky Mountain Lodgepole Pine Forest Biophysical models (National LANDFIRE 1.1.0) with the former being predominant. This model will be used to represent overall desired condition. Lodgepole pine, subalpine fir, and Engelmann spruce predominate, with lodgepole pine more prevalent on dryer sites and early succession stage, but may dominate for over 250 years. Whitebark pine can be present at higher elevations and southerly aspects. Douglas-fir may be present in early succession at lower elevations. In some areas, spruce beetle and MPB can influence stand conditions, accelerating succession to more shade tolerant species. The combination of mixed and stand replacement fire with climate and topography can create large patch sizes (>500 acres) and wide range of successional stages.

Large tree size included trees exceeding 15.0” dbh for existing versus 21” dbh for desired, which likely overstates the presence of existing large trees. Comparison of the table values indicates a deficiency in the seedling/sapling class and open stand conditions with a surplus in the medium size class with dense canopy cover. Much of the seedling/sapling areas represent subalpine fir and Douglas-fir regeneration. The prevalence of dense polesize stand conditions is consistent with field observations of homogenous stand conditions. Ongoing MPB will decrease canopy cover and larger tree sizes. Due to the difference in diameter classification ranges, the presence of large trees is overstated. Most stands lack a true large diameter mature tree component due to the relative younger stand establishment age.

Comparing expected disturbance levels associated with HRV with existing conditions indicate severe MPB levels exceed historical.

Opportunities

- Increase the resiliency of immature lodgepole pine to future MPB by reducing overall stocking levels
- Improve structural diversity by reducing mortality from MPB to the larger size classes and accelerating recovery of stands with epidemic mortality.
- Reduce the scale of potential uncharacteristically extreme fire and future MPB by increasing structural diversity across the lodgepole pine type.

Whitebark pine

The overall desired condition is to restore or maintain distribution and composition similar to HRV conditions consistent with forest plan direction. Whitebark pine forms about 4% of the project area with distribution decreasing due to mortality from MPB and blister rust, as well as succession to other species. Whitebark pine exceeds expected presence for HRV but likely represents a major source for whitebark in the geographic area.

The IRPS includes whitebark pine within two themes, the overall theme to restore and maintain resilient forests similar to conditions within HRV and the value of whitebark pine for terrestrial species. Specific desired conditions were not developed.

More specific desired condition can be found in the Northern Rocky Mountain Subalpine Woodland and Parkland or Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland Biophysical models (National LANDFIRE 1.1.0) with the former being predominant. This model will be used to represent overall desired condition. Lodgepole pine, subalpine fir, and Engelmann spruce predominate, with lodgepole pine more prevalent on dryer sites and early succession stage, but may dominate for over 250 years. Whitebark pine can be present at higher elevations and southerly aspects. Douglas-fir may be present in early succession at lower elevations. In some areas, spruce beetle and MPB can influence stand conditions, accelerating succession to more shade tolerant species. The combination of mixed and stand replacement fire with climate and topography can create large patch sizes (>500 acres) and wide range of successional stages.

Large tree size included trees exceeding 15.0” dbh for existing versus 21” dbh for desired, which likely overstates the presence of existing large trees. Comparison of the table values indicates a deficiency in the seedling/sapling class and open stand conditions with a surplus in the medium to large tree size class with dense canopy cover. Much of the seedling/sapling areas represent subalpine fir and Douglas-fir regeneration, although patches of whitebark pine exist. The prevalence of dense polesize stand conditions is consistent with field observations. Ongoing MPB will decrease canopy cover and tree size for whitebark pine. The presence of blister rust will reduce whitebark across the size classes. Due to the difference in diameter classification ranges, the presence of large trees is overstated. Most stands lack a true large diameter mature tree component due to MPB mortality or succession to other vegetation types.

Comparing expected disturbance levels associated with HRV with existing conditions indicate severe MPB and disease levels exceed historical.

Opportunities

- Increase the resiliency of existing whitebark pine by reducing overall stocking levels and releasing whitebark pine versus more shade tolerant species.
- Improve structural diversity of whitebark pine by reducing mortality to conebearing trees, increasing blister rust resistance, and promoting site conditions suitable for future regeneration.
- Reduce risk of mortality from fire disturbance considering both fire from within and adjacent.

Engelmann spruce

The overall desired condition is to restore or maintain distribution and composition similar to HRV conditions consistent with forest plan direction. Engelmann spruce forms less than 1% of the project area with distribution static. Engelmann is in the upper range expected for HRV.

Although the IRPS does not specifically identify Engelmann spruce as a resource value, the overall theme to restore and maintain resilient forests similar to conditions within HRV. Specific HRV conditions for Engelmann spruce were not analyzed in the East-side Analysis of the Management Situation.

The Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland, Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland or Northern Rocky Mountain Subalpine Woodland and Parkland Biophysical models (National LANDFIRE 1.1.0) , with the former as best suited to describe desired condtions. Lodgepole pine, subalpine fir, and Engelmann spruce dominate. Other species include whitebark pine, aspen, and Douglas-fir with presence dependent on site conditions and successional status. Understory species include a variety of grass, forbs, and shrubs. Spruce beetle and MPB can accelerate succession to more shade tolerant species. Patch size can vary from small to large. The size difference between medium and large was based on 15" dbh for existing versus 21" dbh for desired. This difference would result in a higher estimate of existing large trees.

Existing conditions exceed historical levels in the middle size at higher density levels while deficient in the other categories. Field reconnaissance observed the prevalence of high density levels. Although existing shows a deficiency in regeneration, field review indicated a strong presence of understory subalpine fir. MPB activity is reducing or eliminating larger diameter lodgepole pine.

Comparing expected disturbance levels associated with HRV with existing conditions indicate insect and disease levels within historical.

Opportunities

- Increase the resiliency of Engelmann spruce to future s by reducing overall stocking levels, enhancing non-suitable host species, and increasing structural diversity.
- Improve structural diversity by releasing larger diameter trees and promoting site conditions suitable for regeneration of spruce, whitebark and lodgepole pine, Douglas-fir and aspen.

Subalpine fir

The overall desired condition is to restore or maintain distribution and composition similar to HRV conditions consistent with forest plan direction. Subalpine fir forms approximately 2% of the project area with distribution increasing. Subalpine fir is in the lower range expected for HRV.

Although the IRPS does not specifically identify subalpine fir as a resource value, the overall theme to restore and maintain resilient forests similar to conditions within HRV. Specific HRV conditions for subalpine fir were not analyzed in the East-side Analysis of the Management Situation.

There are numerous models applicable to the subalpine fir type, with the Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland model (National LANDFIRE 1.1.0) as best suited to describe desired conditions. Lodgepole pine, subalpine fir, and Engelmann spruce

dominate. Other species include whitebark pine, aspen, and Douglas-fir with presence dependent on site conditions and successional status. Understory species include a variety of grass, forbs, and shrubs. Spruce beetle and MPB can accelerate succession to more shade tolerant species. Patch size can vary from small to large.

The size difference between medium and large classification was based on 15" dbh for existing versus 21" dbh for desired. This difference would result in a higher estimate of existing large trees. The existing conditions exceed historical levels in the middle size at higher density levels while deficient in the other categories. Field reconnaissance observed the prevalence of high density levels. Although existing shows a deficiency in regeneration, field review indicated a strong presence of understory subalpine fir. MPB activity is reducing or eliminating larger diameter lodgepole pine.

Comparing expected disturbance levels associated with HRV with existing conditions indicate insect and disease levels within historical.

Opportunities

- Improve structural diversity by releasing larger diameter trees.
- Although distribution of fir is in the lower historical range, current trends in succession will result in an increase of subalpine fir in the absence of disturbance.

Fire/Fuels

Lewis and Clark National Forest personnel developed a GIS based coverage of fire group and fire regime condition classes (FRCC) across the forest, including the project area in 2002.

Fire Groups

Delineation was based on matching habitat types with Fischer's fire groups (Fischer and Clayton, 1983). Habitat types were originally derived in TSMRS from ground surveys and aerial photo interpretation and are suitable for use in large scale planning.

During the Forest planning process the forest made a decision to deviate from Fischer's use of Fire Group Zero and use this group to define private inholdings'. Fire Groups 12, 13 and 20 were also created at that time as local fire groups for the Forest.

In addition to Fischer's Fire Groups 1-10, the Castle Mountain project area contains Fire Group 12 (grass land) and Fire Group 20 (what Fisher identified as "miscellaneous"). Fire Group 13 is not represented in the project area.

Fire Regime Condition Class

FRCC is a classification of the amount of departure from the natural regime. The classification uses three condition classes based on the relative departure from the historic natural fire regime. Natural fire regime is a classification of the role fire would play across a landscape in the absence of modern human mechanical intervention but includes the influence of aboriginal burning. The departure relates to vegetation conditions, including species composition, structural stages, stand age, canopy closure, and patterns. The three classes are low (FRCC 1), moderate (FRCC 2) and high (FRCC 3). Low departure is considered to be within the historic range, while moderate and high are outside (US 2010).

FRCC 1 - Fire regimes are within their historical range and the risk of losing key ecosystem components as a result of wildfire is low. Vegetation attributes (species composition and structure) are intact and functioning within an historical range. Fire effects would be similar to those expected during historical times

FRCC 2 - Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components as a result of wildfire is moderate. Fire frequencies have changed by one or more fire-return intervals (either increased or decreased). Vegetation attributes have been moderately altered from their historical range. Consequently, wildfires would likely be larger, more intense, more severe, and have altered burn patterns than that expected during historical times.

FRCC 3 - Fire regimes have changed substantially from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have changed by two or more fire-return intervals. Vegetation attributes have been significantly altered from their historical range. Consequently, wildfires would likely be larger, more intense, more severe, and have altered burn patterns than that expected during historical times.

Table 4 summarizes fire groups and condition class within the Castle Mountains.

Table 4. Fire group/Fire condition class summary

Fire Group (percent of project area)	Fire Regime Condition Class	Acres	Percent of Fire Group area
0 – private lands (3%)	unavailable	2,475	-
1 – dry limber pine types (less than 1%)	1 - low departure	84	32
	2 - moderate departure	33	13
	3 - high departure	143	55
	Total	259	100
2 – warm, dry ponderosa pine types (less than 1%)	1 - low departure	9	20
	2 - moderate departure	21	47
	3 - high departure	15	33
	Total	45	100
4 – warm, dry Douglas-fir types (3%)	1 - low departure	1,040	43
	2 - moderate departure	224	9
	3 - high departure	1,144	48
	Total	2,408	100
5 – Cool, dry Douglas-fir types (4%)	1 - low departure	954	34
	2 - moderate departure	180	6
	3 - high departure	1,692	60
	Total	2,825	100
6 – Moist, Douglas-fir types (28%)	1 - low departure	2,559	13
	2 - moderate departure	1,250	6
	3 - high departure	16,452	81
	Total	20,261	100
7 – Cool types dominated by lodgepole pine (36%)	1 - low departure	25,787	100
	2 - moderate departure	0	0
	3 - high departure	0	0
	Total	25,787	100
8 – Dry, lower subalpine fir types (less than 1%)	1 - low departure	331	100
	2 - moderate departure	0	0
	3 - high departure	0	0
	Total	331	100
9 – Moist, lower subalpine fir (less than 1%)	1 - low departure	466	100
	2 - moderate departure	0	0
	3 - high departure	0	0
	Total	466	100
10 - Cold, moist upper subalpine fir (less than 1%)	1 - low departure	498	100
	2 - moderate departure	0	0
	3 - high departure	0	0
	Total	498	100
12 – grassland (22%)	1 - low departure	0	0
	2 - moderate departure	16,113	100
	3 - high departure	0	0
	Total	16,113	100
20 – non-vegetation (less than 1%)	unavailable	613	-

Evaluation of fire regime condition classes across the project area indicates a majority of the stands (46%) are in condition class 1 or within the natural fire regime, followed by 28% in high departure, and 26% in moderate departure. A discussion by fire group follows, including a discussion relating to changes since 2005 utilizing insect and disease surveys and knowledge of forest conditions during field reconnaissance. Fire group 20, which consists of non vegetation such as rock, scree, and water, has been excluded in the discussion.

Fire Group Existing Conditions/Management Opportunities

For fire groups with the exception of fire groups 1 through 6, the continued absence of fire will result in a further trend away from historic conditions. For fire group 7through 10, current trends are within historic conditions.

Fire Group One

This group represents some of the driest sites supporting trees. Typically, limber pine is the predominant tree species present with minor presence from lodgepole pine, ponderosa pine, Douglas-fir and juniper. Trees are often stunted, occupying the lower foothills below the forest or on dry rocky hillsides. Bluebunch wheatgrass, Idaho and rough fescue occupy the undergrowth, and juniper and forbs found at the higher elevations. Hazardous fuel conditions are associated with dry herbaceous fuels as the larger down woody debris is scattered.

Fire frequencies are thought to be low, ranging from 50 to 100 years apart. Frequent, cool surface fires would favor establishment and retention of limber pine. Although this species is susceptible to fire while young, low intensity fires at this stage can be beneficial if they remove some trees and result in more open stands. Continued interruption of the fire cycles would allow regeneration, litter, and down woody debris to accumulate. Subsequent fire would be more severe, reverting site conditions towards the grassland state. As most of the type (55%) is estimated at FRCC 3, this group is at increasing risk to severe fire.

The combination of MPB and white pine blister rust activity across the project area increases the risk of mortality to mature and immature limber pine. Trees killed by these agents will eventually increase fuel loading as they fall to the ground. Subsequent wildfires burning under moderate or severe weather conditions would result in increased fire severity effects on the remaining live trees and site. In the continued absence of fire, stands will likely convert to dominance by other tree species present.

Management Opportunities

Return of cool, frequent surface fires that reduce understory litter and serve as a thinning agent to conifer trees. Limber pine is favored. Adjacent fire groups can influence fire frequency, but fire frequency is lower given the dry site conditions. A reduction in the unnatural build-up of ground litter and increased stand density is accomplished through the use any combination of applied fire, by hand or through mechanical means. Openings are provided for regeneration and increased forage for wildlife through similar means.

Fire Group Two

Group 2 is composed of ponderosa pine with grass undergrowth. Site conditions are typically dry, hot slopes at low elevation to flat terrain at the lowest elevation. Stocking levels are limited by moisture stress during summer months.

Down woody debris is light, rarely exceeding 5 tons/acre. Mortality associated with recent Mountain Pine Beetle outbreaks will undoubtedly result in significant increases in down woody

debris as this material falls to the ground. Live fuels can contribute to fire hazard when dense understory pine develops underneath scattered overstories.

The natural fire regime is frequent fire intervals from 5 to 25 years in most locations. Studies in ponderosa pine with a shrub understory such as bitterbrush have suggested longer fire frequencies, exceeding 50 years. Frequent fire may maintain grasslands, maintain open stands of ponderosa pine, or encourage pine regeneration. The interruption of fire can result in dense understory stands of conifer and establishment of trees in past grassland. A severe fire in dense uneven-aged ponderosa pine would result in an open parklike stand with grass. A severe fire within dense, even-aged pole size pine would result in grassland.

Specific to the project, this fire group is scarce. Of the 45 acres, 36 are estimated at moderate to high departure from natural conditions. Loss of fire has allowed increased stocking levels. Current MPB activity focuses on the largest diameter trees and higher density pockets of immature trees and will eventually contribute to higher fuel loading. This could increase effects of fire severity on the remaining trees and site under moderate to severe fire conditions.

Management Opportunities

Return of fairly frequent lower intensity surface fires is desired. The desired frequency of applied fire is between 5 and 25 years. Several closely timed burn entries may be needed initially. Sufficient recovery time between burn entries will allow adequate vegetative response. Once ecological process and function has been restored, longer periods between fire return within the natural fire regime should be considered in some areas.

Fire's role is restored in maintaining grasslands, maintaining open pine stands, and encouraging regeneration by providing variation in the timing, intensity and return interval of fire in this landscape.

Fire Group Four

This fire group consists of Douglas-fir habitat types with ponderosa pine. Douglas-fir is usually present, but ponderosa pine dominates due to droughty conditions. Douglas-fir may dominate in the colder habitat types. Fire exclusion can result in increased presence of Douglas-fir and high density levels. Understory is generally sparse due to moisture limitations.

Down woody debris averages between 5 and 10 tons/acre, but may contain up to 20 tons/acre in some areas. Mortality associated with recent Mountain Pine Beetle outbreaks will undoubtedly result in significant increases in down woody debris as this material falls to the ground. Grassy habitat types have lower debris than shrubby habitats. Live fuels can be a significant factor in fire potential, especially where dense thickets of Douglas-fir establish during fire-free periods.

Historic fire frequency is similar to Fire Group Two, every 5 to 20 or more years. Frequent fire maintained grasslands and open stands, while favoring ponderosa pine. A severe fire following a prolonged fire-free period in which Douglas-fir and stocking levels increase can return the stand to the grass stage.

Within the project area, 57% of the 2,408 acres are estimated at moderate to high departure from natural conditions. Absence of fire has allowed regeneration of Douglas-fir to survive, increasing stocking levels and fuel ladders. Recently, western spruce budworm activity has increased mortality to Douglas-fir, especially in the seedling/sapling size classes.

MPB activity has removed pockets of ponderosa pine and the associated mortality will eventually increase fuel loading on these sites as these trees fall to the ground. Down woody debris can

easily exceed 25 tons per acre in these areas. Subsequent wildfires burning under moderate or severe weather conditions would result in increased fire severity effects on the remaining live trees and site.

Management Opportunities

Return of fairly frequent lower intensity surface fires is desired. The desired frequency of applied fire is between 5 and 25 years. Several closely timed burn entries may be needed initially. Sufficient time will be provided between entries to allow adequate vegetative response. Once ecological process and function has been restored, longer periods between fire return within the natural fire regime should be considered in some areas.

Fire is utilized to perform its natural role in maintaining grasslands and open stands of Douglas-fir and seral, ponderosa pine. It is also used to prepare seedbeds for conifer regeneration.

Fire Group Five

Douglas-fir dominates this fire group. Site conditions are generally too dry for lodgepole pine and too cold for ponderosa pine. Other species, such as limber pine, whitebark pine, juniper, Engelmann spruce, and subalpine fir may be present. Forbs often dominate undergrowth with grass and shrubs present.

Down woody debris levels average 10 tons/acre. Live fuels are generally light enough to not present a problem for fire potential.

The role of fire has not been well defined. The light fuel loads coupled with open stand conditions would favor long fire-free periods. One study in southwestern Montana suggested a fire frequency of 35 to 40 years. Fire likely favored ponderosa pine, thinned out younger tree thickets, and maintained open, park like conditions. Extended, fire-free periods have allowed stands composed of scattered tree groves to become forested stands. A severe fire within a near climax stand developed under extended period without fire will return conditions to the grass stage.

Approximately two thirds of this group within the Castle Mountains is estimated to be at moderate to high departure from historic conditions. Interruption of the fire cycle has allowed increased stocking levels to develop in the mid to lower canopy layers. Recently, western spruce budworm activity has increased mortality to Douglas-fir, especially in the seedling/sapling size classes. MPB activity has removed some of the larger diameter limber pine and pockets of lodgepole pine. This will eventually contribute to increased fuel loading as these trees fall to the ground. Subsequent wildfires burning under moderate or severe weather conditions would result in increased fire severity effects on the remaining live trees and site.

Management Opportunities

Fire's role in this system is restored. Surface fires occur infrequently at an estimated return of at least every 35 – 45 years. In the short term more frequently applied prescribed fire is utilized to mitigate the impacts of a century of fire suppression.

Fire Group Six

Although Douglas-fir may dominate in the seral and climax successional stages, lodgepole pine is a major seral component. Whitebark and limber pine may also be present, depending on the habitat type. Shrubs and moist site forbs dominate undergrowth.

Downed woody fuels average about 13 tons/acre. Mortality associated with recent Mountain Pine Beetle outbreaks will undoubtedly result in significant increases in down woody debris as this material falls to the ground. Hazardous fuels conditions can develop with dense Douglas-fir understory accompanied by large amounts of twigs and branches beneath.

Areas where lodgepole pine are a major component tend to have fewer fuel ladders unless more shade tolerant species such as Douglas fir or subalpine fire are present in the understory. Down woody fuels as a result of MPB can create hazardous fuels conditions under moderate to severe fire weather and may easily exceed 50 tons per acre in some locations as these trees fall to the ground.

Historic fire study indicates a mean fire interval of 42 years in southeastern Montana. Fire served both as a thinning and stand replacement agent. Less severe fire reduced stocking levels, promoted retention of large Douglas-fir, and maintained more parklike conditions. Severe fires within dense, fuel heavy stands resulted in stand replacement, with severity increasing as fire absence increases.

Fire Group Six is a major group within the project area. Eighty seven percent (87%) of this group is estimated to be at moderate to high departure from historic conditions. The loss of fire has allowed for increased stocking levels and progression towards the climax stage. Stand composition has shifted towards Douglas-fir and away from lodgepole, limber, and whitebark pine. Blister rust has further accelerated this succession by reducing existing pine regeneration. MPB activity has been removing scattered larger diameter limber and whitebark pine and pockets of lodgepole pine, and will contribute to higher fuel loading as these trees fall to the ground. Development of multistoried Douglas-fir has stimulated recent western spruce budworm, resulting in mortality in the understory.

Management Opportunities

Fire's role in this system is restored. Surface fires occur fairly frequently at an estimated return of at least every 15- 42 years. In the short term more frequently applied prescribed fire is utilized to mitigate the impacts of a century of fire suppression.

Fire Group Seven

This fire group contains two groups of habitat types. One is climax lodgepole pine that has essentially pure lodgepole pine. The other group has Douglas-fir, spruce, and subalpine fir habitats that are dominated by lodgepole pine. These stands do not attain the climax stage due to disturbance by fire. Undergrowth consists of dense mats of grasses and shrubs, such as pinegrass, elk sedge, grouse whortleberry, and western twinflower.

Down woody debris averages 15 tons/acre on these sites but can range from as little as 5 tons/ acre to over 60 tons/acre in areas following significant MPB mortality. Mortality associated with recent Mountain Pine Beetle outbreaks will undoubtedly result in significant increases in down woody debris as this material falls to the ground. Live fuels can be a problem with dense patches of young lodegepole pine or stands with intermingled crowns. MPB is often the source that causes a stand to fall apart, with mortality during epidemics often exceeding 85% in the large diameter trees (Cole and Amman, 1980). Following the epidemic, surviving lodgepole pine and other species such as Douglas-fir and subalpine fir are released. MPB periodically removes the lodgepole pine as they attain suitable host size. Mortality to the pine hastens succession to other species.

Stand replacing fires range from less than 100 years to 500 years. These fires interrupt the succession to other species and reestablish the lodgepole pine if present in the stand. Should the

stand progress to the climax stage in which lodgepole pine has been replaced by shade tolerant species and stand replacement fire occur, the site will revert to the grass/shrub stage without a seed source for lodgepole pine.

Recurring cool fires may thin the stand and remove shade tolerant competitors. Stands above 7,500 ft. differ in the role of fire, with stand replacing fire intervals of 300 to 400 years. Site conditions limit the spread of fire, creating patches of age classes versus the single aged forests in lower elevations.

Fire group Seven is the most prevalent fire group within the Castle Mountains. All of this group is within the natural fire regime and represent natural conditions. This group is composed of seral lodgepole pine, succeeding to either Douglas-fir or subalpine fir as a climax species. Since 2004, this group has been experiencing a MPB epidemic, with many stands at or trending toward 85% mortality.

Management Opportunities

Fire is utilized to meet management objectives including wildfire hazard reduction, silviculture, range and wildlife habitat management, and improving recreation opportunities and esthetics. A combination of treatment by hand, mechanical means or prescribed fire is used where accumulations of dead down debris pose a threat to important resource values, critical infrastructure, private property or mining claims.

Fire Group Eight

This fire group consists of dry, lower subalpine fir habitat types in which subalpine fir or Engelmann spruce are the indicated climax species, but do not dominate in the seral stages. Other species such as Douglas-fir and lodgepole pine dominate, while species such as limber and whitebark may be present. Undergrowth of grasses and shrubs is luxuriant.

Down woody fuels average around 20 tons/acre and are mostly composed of fuels exceeding 3 inches in diameter. Mortality associated with recent Mountain Pine Beetle outbreaks will undoubtedly result in significant increases in down woody debris where pines are present, as this material falls to the ground. Live fuels can significantly contribute to fire hazard during dry conditions. The presence of dense understories, fuel ladders to the overstory, and deep duff layers contribute to these hazards.

Studies on fire history east of the Continental Divide are lacking. Fire frequencies probably fall between every 50 years to 90 to 130 years. Periodic low to moderate severity fire would favor Douglas-fir and lodgepole pine over the other species. More intense fires would favor lodgepole pine. Continued absence of fire will favor dominance by subalpine fir and Engelmann spruce.

Within the Castle Mountains area, this group is minor and has been estimated to be within historic conditions. Without recent fire disturbances, stand conditions favor subalpine fir, Engelmann spruce and Douglas-fir. MPB and blister rust has increased mortality to pine species.

Management Opportunities

Fire's role in this system is restored. Surface fires occur infrequently at an estimated return of at least every 50-130 years.

Fire Group Nine

A collection of moist and wet lower subalpine fir habitat types with generally wet or moist soils throughout the year form Fire Group Nine. Engelmann spruce, along with Douglas-fir and

lodgepole pine dominate the seral stages. Birch and cottonwood can be abundant. Abundant grasses and forbs occur in the undergrowth.

Forest fuels average about 20 tons/acre, with a large percentage exceeding 3 inches in diameter. Mortality associated with recent Mountain Pine Beetle outbreaks will undoubtedly result in significant increases in down woody debris where pines are present, as this material falls to the ground.

Fire history data is lacking within this group. Studies within this fire group in other areas have estimated a fire frequency ranging from every 90 years in Montana to as much as 400 years in southwestern Wyoming. The moist condition of these sites limits opportunities for fires. Stand composition can indicate past fire behavior. The presence of Douglas-fir, lodgepole pine, and spruce suggest past fire behavior.

All of this minor Fire Group is estimated within natural conditions. The lack of recent fire has allowed succession to proceed towards subalpine fir and Engelmann spruce. Hardwood species, such as black cottonwood and alder are in decline. MPB has reduced the presence of lodgepole pine.

Management Opportunities

Fire's role in this system is restored. Surface fires occur infrequently at an estimated return between 30-128 years.

Fire Group Ten

This group is composed of high elevation forests near timberline, representing the upper limit for Douglas-fir and above the limit for lodgepole and limber pine. Whitebark pine and Engelmann spruce can be abundant. Undergrowth is normally sparse.

Down woody fuels average approximately 11 tons/acre and are dominated by large diameter fuel. Often fuels are in the form of scattered large logs.

Site conditions limit both the extent and occurrence of fire. Fire frequencies ranging from every 35 to 300 years have been reported. Stand replacing fires most likely would develop in the forests below and burn in to the stands. Vegetation recovery would be slow.

This fire group contains much of the whitebark pine populations within the Castle Mountains. All of the 498 acres have been estimated within historic conditions. MPB has been severely reducing overstory trees with blister rust reducing regeneration. Mortality within the pine is accelerating succession to subalpine fir and increasing fuel loading. There has been some loss of small stand replacement fires which would have created small openings for pine regeneration.

Management Opportunities

Fire is utilized to establish and maintain whitebark pine populations, protect critical watersheds and natural areas, and enhance sanctuaries for wildlife.

Fire Group Twelve

This group consists of lands classified as grasslands. About 70% are composed of wheatgrass/fescue and the balance as sagebrush/grass. Studies of fire history in this type is limited with one study in wheatgrass/fescue suggesting a fire interval of at least 17 years and in sagebrush/grass ranging from 32 to 70 years. Another study found a fire return of 8 years. The

role of these fires would have been to maintain the grass and sagebrush and restoring early seral stages of development.

This fire group is a major element in the project area, forming at times large openings within the central portion of the Castle Mountains. All of the acres are estimated to be at moderate departure from historic conditions. The absence of fire has prevented return to the early succession grass stage. Many of the stands now contain seedling and sapling sized conifer trees which have become established within the last 25 to 30 years. Several hundred acres have recently had this conifer encroachment set back by hand felling of young conifer.

Management Opportunities

Prescribed fire, thinning by hand or by mechanical means is utilized to control conifer encroachment. In some instances this is done prior to burning where pockets of dense understory vegetation under a well developed overstory exist. The slash resulting from these activities is removed when necessary.

Potential treatment opportunities related to vegetation and fuels are summarized in Appendix 1, and are included in GIS coverages and maps.

Range

In 1997 an interdisciplinary team (ID team) of Forest Service resource specialists conducted an integrated and interdisciplinary review of the resource conditions in the Castle Mountains and identified actions to move the existing conditions towards desired future conditions. The Final Environmental Impact Statement (FEIS) for the Castle Mountains Range Analysis (USDA Forest Service 1997) documents that analysis. While some conditions have changed in the past few years, many are still as documented in 1997. Except where indicated as different, the following existing conditions descriptions are taken from that document.

Years of fire control and lack of prescribed burning has resulted in invasion and establishment of young lodgepole pine (*Pinus contorta*) and Douglas-fir (*Pseudotsuga menziesii*) trees and common juniper (*Juniperus communis*) over much of the area. The tree invasion accelerates in open areas as the tree height and the density of adjacent stands progress to a stage where they offer protection from wind, thereby modifying the environment favorably for tree growth. Underneath the large Douglas-fir trees, the absences of frequent ground fires, has allowed Douglas-fir, lodgepole pine, and an occasional ponderosa pine (*Pinus ponderosa*) seedlings to become established. This process is resulting in a reduction of forage production for livestock and wildlife.

Sagebrush types include the mountain big sagebrush (Artemisia tridentata ssp vaseyana)/Idaho fescue and mountain big sagebrush/rough fescue habitat types. The Douglas-fir/common juniper type is primarily sagebrush, with considerable encroachment of Douglas-fir seedlings. Historically, these sagebrush types have had the successional stage set back by periodic wildfire. Although the ecological status is mainly a result of natural succession and lack of fire, heavy grazing promotes a faster increase and a heavier canopy of sagebrush.

Management Opportunities

Using prescribed burning and/or mechanical means to reduce the tree encroachment can increase the amount of forage available and move the plant community towards the desired plant community.

Management Considerations

- Timber harvest and/or thinning will create transitory range, which will help lessen the grazing impact on primary range and aid in the distribution of grazing animals. Fences may need to be built if natural barriers (dense tree growth) are removed.
- Prescribed burning should be limited to one unit (pasture) per grazing system (distribution unit) per burning season. Coordination with the grazing permit administrator will be necessary. Some pastures may need to be rested prior to burning; most will need to be rested following burning, depending on the grazing pressure.
- The allotment management plans for the Flagstaff and Slaughterhouse allotments have the following restrictions pertaining to prescribed burning (These restrictions may make prescribed burning impracticable unless the allotment management plans are amended, or permittees are capable of taking non-use):
    - non-use on the area to be burned the growing season prior to burning;
    - non-use on the burned area the year following burning; and
    - late-season grazing the second year following burning.

Noxious Weeds

Noxious weeds known to be present in the Castle Mountains (NRIS database):

- Canada thistle (*Cirsium arvense*)
- common tansy (Tanacetum vulgare)
- diffuse knapweed (*Centaurea diffusa*)
- houndstongue (Cynoglossum officinale)
- leafy spurge (*Euphorbia esula*)
- nodding plumeless thistle (*Carduus nutans*)
- spotted knapweed (Centaurea stoebe ssp. micranthos)

Management Considerations

Weed infestations can be expected to expand with the disturbance resulting from timber removal and/or prescribed burning. Weed treatment will be necessary following vegetation management treatment. Treating known infestations prior to disturbance can help reduce weed spread and reduce the need for treatment following the disturbance.

Soils/Hydrology

The area experienced an extreme flood event with a 500 year recurrence interval which has exacerbated the existing conditions of the watershed resources. Nevertheless the effects from management activities were clearly differentiated from natural phenomena and the setting provided a comparative perspective between large scale catastrophic events and localized actions. Several springs are found throughout the western portion of the Castles Mountains, some mark the headwaters of perennial drainages, but many are isolated bedrock fractures running short

distances before going subsurface. This short but consistent perennial flow may be sufficient to support a healthy wetland ecosystem, and should be protected from ground disturbing activities.

In general most channels are mildly incised and currently degrading into deep valley fill with steep to perpendicular banks, often un-vegetated and heavily trampled by livestock. This includes the Four Mile Creek and tributaries, Hall Creek, West Fork Checkerboard Creek, and most gravel/cobble dominated channel substrates exposed to grazing activities. Eroding banks provided fine sediments to the channels. Excessive fine sediments are often visible in pools and pushed around bars keeping reaches in a perpetual instable state.

This overall condition augmented the effects of extreme peak flows experienced earlier this year. Excessive amounts of cobble-sized material that was moved at high flood stage has dropped out in large bars, plugged culverts, and caused road failure at stream crossings. Stream channels such as the West Fork Checkerboard Creek have disappeared and gone subsurface for over 500 feet. Riparian vegetation and large woody debris which would contribute to the dissipation of stream flow energy and the reestablishment of a new channel is nonexistent.

Municipal Watershed

The Willow Creek municipal watershed is located in the western portion of the project area and is the source of drinking water to the city of White Sulphur Springs. The watershed is fenced out and with the exception of few trespassers, livestock access is nonexistent. It has a healthy riparian area with a great diversity of plants included cottonwood, aspen, dogwood, alder, and willow. Mixed conifers adjacent to the channel provided excellent source of large woody debris which formed numerous log jams along the profile. A boulder dominated channel bed, less-prone to degradation when compared to other project area channels, dissipated the 500 year flood energy efficiently and showed no detrimental effects from the natural event. The overall condition of the watershed is excellent but hillslopes surrounding the creek have high fuel loading (dead Lodgepole) which could potentially triggered catastrophic wildfire.

Road Impacts

In the Northern section of the Castle Mountains, sediment is being delivered to Four Mile Creek due to road and channel connectivity. Road 211 bisects the flood plain of the creek several times, and runs adjacent to the creek for over a mile. The road proximity to the channel also increases recreational use and camping, causing compaction and vegetation loss. At the intersection of Hall Creek and Rd 211, there is an accumulation of sediment and a culvert that needs to be replaced. The sediment load at the inlet of the culvert is up to 12” deep. A small tributary of Checkerboard Creek flows across Rd 211 during high water because of a plugged culvert.

Temporary road building should be kept to a minimum due to soil limitations. In many areas, productive soils are only 2-3 inches deep. Even with the best road decommissioning practices, impacts from temp roads may last decades.

Management Opportunities

- Sedimentation from grazing and roads is occurring in many northern and eastern area channels, and should be considered for remedial treatment to reduce impacts of sedimentation.

- Reduce fuel loadings to reduce impacts of high severity wildfire within the Willow Creek drainage.

- Address existing road drainage and sedimentation delivery issues from existing road system.
- Minimize grazing impacts to riparian vegetation and streambank stability through fencing of Four Mile Creek near Richardson Campground.
- Retain sufficient organic matter (coarse woody debris, litter and duff) to ensure future site-productivity.

Wildlife

Climate change models strongly indicate that significant beetle infestation is here to stay, emphasizing the importance of developing management strategies and practices to mitigate effects of infestation. Present forest mortality has many implications for wildlife species and their habitat. Within 10-15 years it is expected that many of the now dead and dying trees will have fallen to the ground causing a loss of canopy cover and a large fuel load. This dead woody debris on the ground will provide habitat for many species of invertebrates as well as vertebrate species. In addition many snags will remain standing providing habitat for many additional species. While beneficial to some species it would degrade the habitat of others, potentially for decades, since coarse wood decay and development of green tree canopy in this cold, dry environment is very slow.

In addition to prolonged bark beetle epidemics killing millions of trees on western landscapes, there are additional effects from past fire suppression activities and the exotic white pine blister rust disease affecting five needle pines, in particular whitebark pine on the LCNF. While short term implications on individual wildlife species are considered minor with many species thriving on present forest mortality, long term implications are uncertain for some key species such as Clark's nutcracker and big game species.

Threatened, Endangered and Candidate Species

Grizzly Bear (Threatened)

The project area is within historic range of the grizzly bear but is currently unoccupied. The project area is an isolated mountain range surrounded on all sides by open grasslands and range. Most of the surrounding range land is privately owned with working cattle ranches. Over half of the project area is occupied by range allotments and occupied with cattle during the summer months. If a grizzly bear were able to pioneer its way to this unoccupied area and avoid getting into trouble with ranchers along the way, it would most likely find itself in trouble within short order within the project area. The project area is not remote enough and contains too much human activity to support a grizzly bear population.

Canada Lynx (Threatened)

In conjunction with listing of the Canada Lynx as threatened in the contiguous United States on March 24, 2000 (Federal Register Vol. 65, No. 58, 2000) the Canada Lynx Conservation and Assessment Strategy (LCAS) (Ruediger and others August 2000) was also being finalized. The LCAS recommended that all forests containing potential lynx habitat identify evaluation areas called "Lynx Analysis Units" (LAUs) to provide analysis of potential direct and indirect effects of projects or activities on a landscape area which is about the average size of a lynx home range. Two LAUs were identified in the Castle Mountain Project area centered on an Inventoried Roadless Area. The Canada Lynx is not listed by the U.S. Fish and Wildlife Service as a species that should be considered occupying or potentially occurring in Meagher County.

Methodology

Habitat within each LAU were queried in GIS using LCNF data from the Timber Stand Management and Record System database and data from the Wildlife Vegetation Jefferson Division (WildVeg) dataset by LCNF GIS staff. Data was exported to an Excel spreadsheet and summarized by LAU, ownership, cover class, suited and unsuited habitat.

Results

The existing conditions of the LAUs are displayed in Table 5. Habitat not currently suitable is minor at this time and includes stands in the stand initiation structural stage where the vegetation is not yet tall enough to provide habitat for snowshoe hare.

Table 5. Lynx Habitat within LAUs CA1 and CA2 in the Castle Mountain Project Area.

LAU Name	Total Acres	Private Acres	Unsuited Non Habitat	Lynx Habitat	Denning Habitat Acres / %	Foraging Habitat Acres / %	Habitat not suited
CA1	18955	129	2017	16809	1058 /6	16208 / 96	133 (<1%)
CA2	18999	2849	1897	14253	3974 / 28	13560 / 95	0

Foraging habitat in the Castles currently favors production of red squirrels in mid to late seral wet forest types. Red squirrels are considered secondary forage and important in lynx diet when primary forage (snowshoe hares) becomes scarce. Some research (Koehler 1990) suggests that a diet of red squirrels alone might not be enough to ensure lynx survival.

Southern populations of lynx may prey on a wider diversity of species than northern populations because of lower average hare densities and differences in small mammal communities (Ruediger and others 2000). In the high elevation habitat types of the Castle Mountains, it is not known whether any significant alternative prey populations that would sustain lynx are available.

Opportunities

An opportunity exists to convert secondary habitat (mid to late seral wet forest) back to a regenerated forest suitable for hare production. Potential constraints would be recommendations from the LCAS that activities would not reduce denning habitat to less than 5 percent (CA1), or change more than 15 percent of lynx habitat to an unsuited condition over a decade. Both recommendations only strictly apply to mapped habitat that is currently occupied by lynx. In unoccupied mapped lynx habitat Forests should consider the recommendations, especially the direction regarding linkage habitat (Northern Rockies Lynx Management Direction Record of Decision [USDA Forest Service 2007a]). Table 6 displays suited conifer acres in each LAU and how many acres could be treated abiding by the 15 percent recommendation.

Table 6. Suited and unsuited conifer habitat within CA 1 and CA2 in the Castle Mountain Project Area.

LAU Name	Conifer Forest (Acres)	Unsuited (dry) Forest (Acres)	Suited (wet) Forest (Acres)	15% of Suited (Acres)
CA1	15022	508	14514	2177
CA2	9411	688	8723	1308

Candidate Species

Three terrestrial wildlife species are currently listed as Candidate species for Meagher County, Montana. Candidate species are species that warrant protection under the ESA, however, a rulemaking to propose the species for protection is precluded by the need to address other higher priority species. Candidate species do not receive protection under the ESA. Their status is reviewed annually and as needed may be afforded full protection under the ESA at a later date. The species listed for Meagher County include greater sage-grouse, Sprague's pipit, and wolverine. None of the 3 species are known to occur in the project area.

The elevation in the project area is higher than suitable habitat used by either bird species for nesting. Rare sightings of greater sage-grouse are possible in the project area, but it is unlikely that the project area provides any significant habitat for any part of its life cycle {Adam Grant, Montana Department of Fish, Wildlife, and Parks (MDFWP), personal communication}. Sage grouse leks, and sighting of sage grouse occur near the Castle Mountains, therefore accommodating habitat needs for sage grouse by conserving sagebrush habitat would be recommended.

The project area lies on the eastern edge of the known range of the wolverine. The project area contains potential habitat with high elevation rock outcrops and formations suitable as denning habitat, which is mapped as such by the LCNF. This habitat is largely protected via the winter recreation use restrictions. The Castle Mountains may be a possible habitat linkage/connecting corridor with both the Crazies and the Little Belt ranges, and potentially is within the larger home range of wolverines.

Big Game Habitat

The LCNF Forest Plan (USDA Forest Service 1986, page 2-37) identifies elk, mule deer, whitetail deer, black bear, bighorn sheep, mountain goat, and mountain lion as MIS in the category of Commonly Hunted species. Bighorn sheep and mountain goat do not occur within the Castle Mountain PA.

The five species of big game MIS found within the Castle Mountain analysis area overlap in their habitats and food preferences. Black bear use dense forests and riparian areas in the project area. Their diet is omnivorous and they consume both plant and animal food items based on phenology and availability. Mountain lion are found in the mountains and foothills in Montana with deer and elk being their most important prey items. Whitetail deer generally use rivers and creek bottoms and also dense vegetation at higher elevations. Browse is their most important food source, although they use grasses in the spring and forbs when available. Mule deer are found in the mountains and foothills of Montana, being widely distributed in forest and subalpine habitats in the summer and moving to low elevation, open, shrub covered hill slopes in the winter. Shrub browse is an important food item year round, with forbs use important when available in spring, summer and fall. Grass is only a minor part of the diet for mule deer. Mule deer is more common in the project area than whitetail deer. Elk are found in coniferous forest with natural and man-made openings where forbs (when available) and grass are preferred over shrubs in their diet.

Wildlife species all need the same basic habitat elements to survive; food, water, and shelter. In the case of hunted species, they also need areas where they are not at risk to hunting. This could be areas with no hunting pressure (refuges), light hunting pressure (areas accessible only by foot or horse), or areas with plentiful cover (dense forest or hilly terrain). Of the five species of commonly hunted big game in the Castles project area, elk and deer populations are the most closely monitored (due to their value as a game animal), and some of the most researched

(Montana Cooperative Elk-Logging Study of 1970-1985, Starkey Experimental Forest). In addition, habitat needs for elk and deer cover the range of habitats for the other species. For these reasons, this report will use elk and deer as a surrogate to discuss habitat impacts for all big game MIS species.

Road Densities

Management Area direction for road densities applies to the management area as a whole, and is meant to be analyzed across large areas. In the Little Belt, Castle and North Half Crazy Mountains Travel Management Plan Final Environmental Impact Statement (USDA Forest Service 2007b, pages 254-255) and Record of Decision (USDA Forest Service 2007c, page 35) density of roads open to motorized vehicle travel was analyzed across the planning areas three mountain ranges. The Record of Decision shows that the standard was met for all Management Areas (USDA Forest Service 2007c, page 35, ROD Table 19).

Habitat Effectiveness

Habitat Effectiveness refers to the percentage of available habitat that is usable by elk outside the hunting season (Lyon and Christensen 1992). The Little Belt, Castle, North Half Crazy Mountain Travel Management Plan Final Environmental Impact Statement (USDA Forest Service 2007b, pages 255-263) utilized the habitat effectiveness model developed by Lyon (1983) based upon road densities. All motorized routes (including ATV and motorcycle trails) open during the period from June 30 to August 31 were used to calculate habitat effectiveness. Habitat Effectiveness in Hunting Districts 449 and 452, which includes the Castle Mountain PA, was increased to 51 and 74% respectively with the travel plan decision (USDA Forest Service 2007b).

Elk Security

Elk Security is defined by Lyon and Christensen (1992) as "the protection inherent in any situation that allows elk to remain in a defined area despite an increase in stress or disturbance associated with the hunting season or other human activities." When security is inadequate, elk become increasingly more vulnerable to harvest. Hillis and others (1991) provided guidelines for managing elk security and limiting elk vulnerability during the hunting season. The key concept is to provide secure areas for elk during the hunting season where they are less vulnerable to harvest. Secure habitats are defined as non-linear areas of hiding cover greater than 250 acres in size and greater than ½ mile from an open road. Hillis (and others 1991) recommended that secure elk habitat comprise greater than or equal to 30 percent of an analysis unit; although they caution that "unquestioning adherence to these guidelines may lead to serious misapplications and should be avoided."

The Little Belt, Castle, and North Half Crazy Mountains Travel Plan Final Environmental Impact Statement (USDA Forest Service 2007b, pages 255-263) and Record of Decision (USDA Forest Service 2007c, page 35-36) analyzed elk security, including motorized routes as open roads. The Record of Decision (USDA Forest Service 2007c, page 36, Table 20) shows that in Hunting Districts 449 and 452 the decision increased secure elk habitat to 13 and 51 percent respectively in the bow season and 13 and 51 percent respectively in the rifle season. Security in Hunt District 449 is difficult to increase due to large areas of low cover, high road densities, and private land boundaries.

Effective Hiding Cover

Effective hiding cover is defined as vegetation capable of essentially hiding an adult elk from view at a distance equal to or less than 200 feet (USDA Forest Service 1986, Glossary, page 5). The Forest Plan further states that effective "hiding cover is based on the percentages of PI types

which meet this definition as determined by the Montana Cooperative Elk/Logging Study." The forest began using the prescribed big game cover analysis methodology in the fall of 2008 (USDA Forest Service 2009).

Methodology

Big game habitat numbers were derived from ArcGIS using data queries of PI types derived from VMap data by LCNF GIS staff. Data was calculated for Management Area C only. Data was collected for Seventh Hydrologic Unit Code (HUC 7) drainage units which usually equate to an area large enough to analyze for the purposes of a big game cover analysis (Map2_Castle_EffectiveHidingCoverAnalysis in project file; wildlife/Castle GIS). Data was exported to a Microsoft Office 2007 Excel spreadsheet, where pivot tables derived acres.

Effective hiding cover for the analysis area is determined by multiplying the acres of each PI type by the percent cover in the Montana Rule, adding up the acres with cover, and dividing by the total acres in the analysis area.

Seventh Hydrologic Unit Code (HUC 7) watersheds usually equate to an area large enough to analyze for the purposes of a big game cover analysis. Lyon (1983) recommends that an analysis area should be at least 3,000 acres in size. The data for the Castle Mountain Project effective hiding cover analysis area includes 13,858 acres in 12 HUC 7 watersheds. Only two of the HUC 7 analyses areas met the minimum 3,000 acre size. Several (5) of the analyses areas contained trace amounts of acres too small to consider with some possibly being GIS layer alignment errors. Table 7 displays existing hiding cover within MA C of the Castle Mountain project area, and Table 8 displays existing hiding cover by PI type.

Table 7. Existing Effective Hiding cover in Management Area C in the Castle Mountains.

HUC 7 ID	Total HUC 7 Acres (FS acres only)	MA C Acres	Acres of Hiding Cover in MA C	Effective Hiding Cover Percent
10030103010403	2917	318	182	57
10030103010402	2968	2381	970	41
10040201010302	3057	15	6	43
10040201020302	3099	530	292	56
10040201020304	3376	59	23	39
10040201020303	3377	1715	897	52
10040201020101	3792	685	348	51
10040201020301	4004	0.75	.38	51
10030103020301	4591	2	.33	17
10030103010401	5079	5015	2809	56
10040201010201	6367	3130	1320	42
10030103010501	6780	9	5	60
Totals		13858	6853	49

Table 8. Photo Interpretation (PI) types and Effective Hiding Cover in Castle Mountain MA C

PI Type	PI Acres	PI Cover %	Acres Hiding cover	% Hiding Cover
0	103	0	0	0
11	2557	.58	1483	58

12	639	.38	243	38
13	398	.3	120	30
14	5440	.63	3427	63
15	8	.45	4	50
27	2163	.53	1146	53
28	745	.33	246	33
91	99	.15	15	15
93	1696	.1	170	10
Totals	13848		6854	49% Existing EHC

Opportunities

Photo Interpretation (P.I.) types 11 and 14 represent well stocked mature and pole sized timber stands respectively. They represent the stands most likely in need of treatment due to on-going mortality in the project area. Assuming recommendations that 1500 acres of PI 11 and 2700 acres of PI 14 be treated by clearcutting and/or Rx fire to reduce fuels and restore conditions in MA C, effective hiding cover would be reduced to about 34 percent as displayed in Table 9.

Table 9. Hypothetical Example assuming that 1500 acres of PI 11 and 2700 acres of PI 14 are clearcut harvested and converted to PI 93 with 10% effective Hiding cover.

PI Type	PI Acres	PI Cover %	Acres Hiding cover	% Hiding Cover
0	103	0	0	
11	1057	.58	613	
12	639	.38	243	
13	398	.3	120	
14	2740	.63	1726	
15	8	.45	4	
27	2163	.53	1146	
28	745	.33	246	
91	99	.15	15	
93	5896	.1	590	
Totals	13848		4703	34% Existing EHC

Northern Goshawk

The LCNF (USDA Forest Service 1986) identified northern goshawk as an MIS for old growth habitat. Forest-wide management standard C-5 (USDA Forest Service 1986, page 2-37) provides that population levels of MIS be monitored and evaluated as described in the Forest Plan monitoring plan as shown in Chapter V (USDA Forest Service 1986, page 5-11). Forest Plan monitoring item C-8 provides that “Old Growth Habitat” is monitored by sampling active nesting goshawk territories.

Increased efforts to monitor all known nest sites were begun in 2006. In June 2007 (USDA Forest Service 2007d) and September 2007 (USDA Forest Service 2007e), the forest completed monitoring reports for item C-8 Old Growth Habitat for Goshawk (project file). These reports summarize the goshawk monitoring efforts over time. Monitoring was completed from 2008-2011. Results are not yet summarized in a published monitoring report, however monitoring

results can be found in the project file. The following table (Table 10) summarizes the monitoring results for 2006 through 2009. In 2008 there was a wet, cold spring that likely contributed to a lower number of active nests (as discussed in USDA Forest Service 2007d). As can be seen in the table, the number of known territories has increased every year due to survey and monitoring efforts, and the number of occupied territories and active nests fluctuates year to year. This fluctuation is natural in goshawk populations (as discussed in USDA Forest Service 2007d). No conclusions on population trend are available from the monitoring data at this time.

Table 10. Goshawk Monitoring Results on the LCNF 2007-2009.

Results of Monitoring	2006	2007	2008	2009
Number of known territories	40	42	43	53
Number of monitored territories (%)	25(63)	41(98)	42(98)	50(94)
Number of occupied territories (%)	16(64)	24(59)	16(38)	27(54)
Number of active nests (%)	13(52)	17(41)	7(17)	25(50)

Methodology

Goshawk habitat numbers were derived from ArcGIS using data queries as described in the Northern Goshawk Northern Region Overview – Key Findings and Project Considerations (Brewer and others 2009) by LCNF staff (Appendix 1). The queries were based on the Northern Region Vegetation Mapping Program (VMap) (USDA Forest Service 2009), which is based on satellite imagery collected in 2010.

Discussion

Northern goshawk is considered globally secure, and in Montana, the population is considered potentially at risk because of limited and/or declining numbers, range, and/or habitat, even though it may be abundant in some areas (Montana Natural Heritage Program and Montana Fish, Wildlife and Parks 2011). In its 12-month status review of the species, the Fish and Wildlife Service concluded "that the goshawk population is well distributed and stable at the broadest scale" (USDI Fish and Wildlife Service 1998). Based on habitat and goshawk detection estimates, breeding goshawks and their habitat appear abundant and well distributed across the Region (Kowalski 2006, Samson 2005 as amended 2006). Each National Forest appears to have more than enough habitat to maintain a minimum viable population of goshawks (Samson 2006, as amended by USDA Forest Service 2008).

Samson (2006, as amended by USDA Forest Service 2008) estimated that a minimum viable population of northern goshawk required 30,147 acres of habitat across all of Region 1. Goshawk habitat across both the Forest and the Jefferson Division well exceed Samson's estimate (Table 11).

Table 11: Goshawk nesting, Post-Fledging Area (PFA), and foraging habitat across the Forest and Jefferson Division

Area	Nesting Habitat[1]	Possible Nesting Habitat[2]	Foraging/PFA[3] Habitat
Lewis and Clark National Forest	359,153	85,263	163,891
Jefferson Division	296,121	84,439	unknown

[1]Minimum value reflecting only stands of USFS ownership for which all of the attributes used in the query were available. USFS ownership missing some of the required attributes was not included. State, BLM, or private lands within the administrative boundary were not included as data used for analysis was not available for these ownerships.

[2]This number reflects possible nesting habitat which met some of the attributes used for the query, but for which some attributes necessary for the query were missing.

[3]Minimum value reflecting only USFS ownership, data used for analysis was not available for state, BLM, or private lands within the administrative boundary nor for just the Jefferson Division for the updated estimate.

Within the project area, table 12 displays the habitat components relative to goshawk habitat.

Table 12. Habitat within the Castle Mountain Goshawk Analysis Area (National Forest lands)

Stand size Class and Canopy Cover	Existing Acres (%)
Openings	15,002 (22)
Tree/0.0" – 4.9"	2,220 (3)
Tree/5.0 – 9.9"	33,197 (48)
Tree/10.0" plus	18,670 (27)
5.0"+/ canopy cover > 40%	46,586 (67)
Nesting Habitat DBH 10.0"+/ Canopy cover > 60%	9,156 (13)
Mature Forest DBH 10"+/ Canopy cover > 40%	17,148 (25)

The project area contains five known nest territories with 3 discovered 1985-86 and one each discovered in 2004 and 2005. Two of the territories are located on the edge or outside the boundary of NF lands with difficult access. The Flagstaff territory located on the edge of sub-analysis Unit 15 (Map3_Castle_GoshawkAnalysis in project file; wildlife/Castle GIS) was discovered in 1985 and determined to successfully fledge 3 young. It was monitored for 3 additional years (1986-88) and determined active in 87' and 88' with undetermined success. The West Fork of Cottonwood Creek territory was discovered in 2005 located in sub-analysis unit 3 on the southwest edge of the PA. Success was not determined and it has not been monitored since due to difficult access. Of the 3 territories located on NF lands, 2 were discovered in the mid 80s' and remain active with successful fledging of young within the last 6 years of intensive monitoring. One territory on NF lands discovered in 2004 was determined successful the same year, but has remained inactive since.

Reynolds et al. (1992) recommends maintaining six nest areas (three suitable and three replacements), each at least 30 acres in size, and totaling 180 acres per 5,000-acre foraging area in the southwestern United States. In west-central Montana, Clough (2000) found nest areas averaged 40 acres in size. The analysis area includes seventeen home range/foraging areas. A minimum of 3,060 acres of nesting habitat (180 acres times seventeen areas) is needed in the analysis area. The analysis area currently has over 9,000 acres of nesting habitat well distributed across the area.

Complete surveys of potential habitat (in conjunction with old growth surveys) within the project area have not been completed.

Old Growth

Identification of old growth habitat on commercial forest lands is incomplete. Currently 812 acres (35%) of the minimum 2,308 acres (Forestwide standard of 5% of commercial forest land) is classified at this time (Table 13).

Table 13. Old growth habitat identified in the Castle Mountain project area

Compartment	OG Code 8	OG Code 9	Totals
627	26	0	26
630	424	22	446
716	0	340	340
Totals	450	362	812

Surveys of old growth habitat have not been completed in the project area.

Appendix 1 – Potential Vegetation/Fuels treatment summary

Table 14. Potential Treatment Vegetation/Fuels summary

Silviculture Treatment	DF	LP	NF	PP	WLP	(blank)	Grand Total
Aspen Restoration	170	17				123	310
Aspen Rest/Clearcut		50					50
Aspen Rest/Comm thin	41						41
Aspen Rest/Meadow Rest	195		82			163	440
Aspen/Mdw Rest/Precomm				22			22
Aspen Rest/Precomm	116	36				5	157
Clearcut	90	1903				111	2103
Commercial Thin	3416	409			26	33	3884
Comm Thin/Mdw Rest	125						125
Comm/Precomm thin	308			130			439
Meadow Restoration	140	47	8546			2378	11112
MS			4				4
Precomm thin	2718	90	49			41	2898
Precomm thin/Mdw Rest	372		142			36	550
Salvage		33				190	223
Salvage/Mdw rest						42	42
Whitebark Pine		432			146	312	890
Fuels treatment without associated silviculture treatment							
Hand burn	84		229			10	323
Fuels tmt			17				17
Prescribed fire	112	847				1549	2508
Underburn	4547	1146	6	83		403	6184
Grand Total	**12434**	**5010**	**9076**	**235**	**172**	**5396**	**32322**

Silvicultural Treatment Methods

Aspen Restoration

The goal of Aspen Restoration treatment activities is healthy aspen clones composed of aspen with minimal conifer presence with multiple aspen age classes present distributed across the landscape similar to historic conditions. The Aspen Restoration treatment would involve cutting conifer from within and around existing aspen clones, the extent of the cutting depending upon site factors and clone-specific restoration objectives. To increase aspen regeneration, protection measures such as temporary fencing or scattering of slash may be included. In the aspen restoration treatment, no commercial tree removal from the site is being prescribed. Note also that many aspen clones are very small and the aspen restoration treatment, although prescribed for an entire stand, may actually take place on a small portion of the stand. The acreage of aspen restoration treatment given above is greater than would actually occur. This document identifies general aspen restoration objectives and guidelines only and following these general objectives and guidelines, more specific thinning objectives and guidelines would be established for

individual aspen clones in stand and site-specific silvicultural prescriptions developed to implement the results of an analysis.

Commercial Thinning

The goal of the thinning treatments is to move current vegetation conditions toward historic ranges of density, structure, and species composition, as described in the Desired Future Condition. Generally nominated for treatment is the dry forest type dominated by Douglas-fir. These stands contain a sufficient commercial component for reduction to be included as a harvest option. The objectives of the treatments are to create variable-spaced but more open stand conditions, composed of either ponderosa pine or Douglas-fir, distributed in even-aged groups of varying size or scattered individuals that together form an uneven-aged forest. The trees may be cut by hand or by a piece of equipment. Commercial thinning treatments would have forest restoration objectives to reduce stocking to desired levels, increase or maintain stand horizontal and vertical structural diversity, restore meadows and grasslands, and restore aspen. Commercial thinning may be prescribed as the sole thinning treatment or may be proposed in combination with pre-commercial thinning depending on individual stand tree size distributions and stocking levels. Note that the following discussion contains general thinning objectives and guidelines only and more specific thinning objectives and guidelines would be established for individual stands in stand and site-specific silvicultural prescriptions developed to implement an analysis.

Clearcut

Suggested treatment option is to utilize a clearcut with reserve to replicate islands of overstory trees which would have survived natural fire. Treatment objective is to regenerate the area to young lodgepole pine and maintain a two-aged stand structure with retention of reserve trees. With the exception of the reserve trees essentially all trees would be removed. Selection of stands was based on predominance of mature lodgepole pine with varying levels of mountain pine beetle. Approximately 5-10% of the stand would be retained to mimic islands of trees left following mixed severity fire. These trees should be left in clumps of a minimum of 2-3 acres for harvest efficiency and windthrow protection.

Salvage/Sanitation

Treatment objective is to suppress the incidence of dead and dying trees from mountain pine beetle or dwarf mistletoe in lodgepole pine and salvage their economic value. Suppression activities in these stands would primarily include sanitation thinning to remove those host trees currently infested by or susceptible to infestation by MPB. Selection of treatment stands was based on low level of insect and disease activity, presence of non-infested tree species such as Douglas-fir, or need to maintain a forested appearance along major forest roads. Dead and dying trees would be salvaged as soon as possible before the wood decays and value is lost.

Whitebark Pine Restoration

Mechanical treatment may entail felling and treating all mountain pine beetle infested whitebark pine and lodgepole pine trees, releasing healthy whitebark pine by cutting other tree species for 10-15 feet around immature pine or 30 feet around cone bearing pine trees, and planting disease resistant seedlings in openings. Slash treatment can include hand pile and burn, hand pile and cover with plastic, debarking, chipping, or shredding. Nomination for these stands was based on strong presence of whitebark pine, level of infection/infestation, and regeneration status. These stands are generally located in remote areas in which mechanical equipment access is limited.

Pre-commercial Thinning

Pre-commercial thinning in this project involves cutting trees less than 7.0 inches DBH. Pre-commercial, also called non-commercial thinning, would have the same forest restoration goal and objectives as commercial thinning. Pre-commercial thinning may be prescribed as the sole thinning treatment or may be proposed in combination with commercial thinning depending on individual stand tree size distributions and stocking levels. Stands nominated were generally of the dry forest type, dominated by Douglas-fir or ponderosa pine. Stand density levels in the candidate size class were high enough to compromise tree growth and vigor and determined to be of value to reduce stocking levels.

Meadow Restoration

Goal of the Meadow Restoration treatment is to create meadow conditions, distribution, and range, which is more similar to historic as described in the Desired Future Condition. The treatment would utilize tree cutting to reduce the size and tree stocking levels of grassland and meadow systems back toward their apparent historic limits. The extent of the tree cutting would depend upon site factors and meadow/grassland-specific restoration objectives. Stands were nominated based on the strong presence of conifer regeneration in to historical meadows. In many cases, trees to be cut occupy an outer ring of the meadow area, adjacent to the forested stands and would not entail cutting within the entire area.

Fuels Treatment Method

Table 15. Potential Fuels Treatment Summary

Row Labels		ARC_ACRES	
HB	1550	LTA/HB	42
HB/MAS	42	LTA/HB/UB	10
HB/PF	890	LTA/LS/MB	29
LS	102	LTA/LS/UB	324
LS/HB	77	LTA/MAS/HB	81
LS/HB/UB	10	LTA/MAS/HB/PF	33
LS/LTA	9	LTA/PF	2153
LS/LTA/UB	41	LTA/UB	3986
LS/MAS/HB	1371	MAS/HB	2465
LS/MAS/HB/PF	119	MAS/HB/PF	6477
LS/MAS/HB/UB	274	MAS/HB/UB	17
LS/PF	145	MB/HB/UB	30
LS/UB	3021	PF	2606
LTA	234	UB	6184
Grand Total	**32322**		

Treatment key

HB	Hand cut, pile, and burn
LS	Lop and Scatter
MAS	Masticate
LTA	Leave top attached

UB	Underburn
PF	Prescribed fire

Hand cut, pile, and burn

Hand cut, pile, and burn is a type of prescribed burning in which downed fuels such as thinning slash would be piled by hand and burned during conditions when risk of fire spread is low and when smoke will be adequately dispersed. Handpiles would be placed as far from the canopy drip-line of trees as possible to prevent scorch. In a number of settings, such as meadow restoration areas, this treatment is prescribed, but the area actually treated would be much less than that given above. This treatment method was generally prescribed within whitebark pine restoration areas where mechanical treatment removals would generate unacceptable fuel loadings.

Lop and Scatter

Lopping and scattering may be needed to facilitate prescribed burning or provide protection of aspen seedlings from browsing damage. Felled trees and shrubs would be limbed, lopped, and bucked using chainsaws so that slash would lie close to the ground, then the slash would be spread more or less evenly over the ground. Generally included in harvest intermediate treatments in the dry forest type in which predicted activity generated fuels are within tolerable limts or in seral aspen stands with conifer trees.

Masticate

Mastication aids in moderating fire behavior by reducing fuel bed depth and compacting surface fuels. Masticating involves using a tracked or rubber-tired machine to chop, shred, and/or grind small trees, limbs, shrubs, and dead woody debris into smaller pieces that remain on site. The masticated material that results is generally less than 3 feet long and not more than 6 inches in height. Mastication would be limited to areas where slope angles are 35 percent or less. Most stands selected were in meadow restoration treatments as a method to reduce conifer regeneration in lieu of fire. Included as an alternative slash treatment method in the presence of sagebrush in which fire would incur mortality to sagebrush.

Leave-Tops-Attached

Often referred to as whole-tree-yarding, which is a harvesting system whereby whole trees are cut and transported to a collection point (landing) with limbs and tops attached to the stem. In the case where the entire tree is too large to be transported as one piece, the trees would be cut into log length sections and the tree sections would be transported with the tops and limbs attached (leave-tops-attached). This treatment method was selected to control predicted high activity generated slash, most often associated with regeneration type treatments.

Underburning is a type of prescribed fire in which burning takes place in and is confined to surface fuels under a forest canopy. Underburning would be accomplished by applying low- to moderate-intensity fire using hand, mechanical or aerial firing methods. It would be used to reduce surface and ladder fuels (small trees and shrubs) and so reduce potential wildfire behavior, as well as a tool to restore more historic and “natural” understory vegetation species composition and coverage. Underburning would be accomplished when conditions are favorable and risk of fire escape is low. All burning would follow general goals, objectives and guidelines established in this analysis, but would also take place under specific burn objectives and guidelines documented in a prescribed fire burn plan developed specifically for all burning activities within the project area. Prescribed burn plans will address parameters for weather, air quality, contingency resources, and potential escapes. Underburning was selected for re-introducing fire

back in the dry forest types with acceptable stand conditions. Young plantations of Douglas-fir were not included due to predicted mortality.

Prescribed Fire

Stand replacement fire is a type of prescribed fire in which burning takes place throughout the forest canopy. Burning would be accomplished by applying moderate-to high intensity fire using hand, mechanical or aerial firing methods creating a mosaic pattern of openings. It would be used to induce mortality to a majority of the stand, as well as a tool to restore more historic and "natural" understory vegetation species composition and coverage. Stand selection was generally for mature stands of lodgepole pine, with some aspen included. Other criteria includes remoteness of sites, steepness of terrain, poor economics of harvest products, level of non-merchantable conifer trees to be removed, or need for large treatment blocks.

Prescribed Fire Blocks

In addition to the fuels treatments associated with silviculture treatments, there is an additional 7,994 acres of prescribed burning proposed both as WUI treatment areas and watershed restoration treatments within the municipal watershed. There are 55 separate burn blocks proposed, totaling 12,190 acres (incorporating 4,196 acres of silvicultural treatments with additional associated fuels treatments). These burn blocks are identified to be used in prioritization for implementation over time to begin modifying the homogenous landscape into a mosaic of age classes/fuel loadings.

Removal Method

Table 16. Potential Removal methods

Row Labels	ACRES
Ground Based	5770
Ground Based/Skyline	440
Not applicable (fuels treatment only)	25147
Not identified	563
Skyline	401
Grand Total	**32322**

Ground-Based equipment

Thinned trees would be transported from the site to landings with a ground-based machine such as a skidder or forwarder. If "skidded" ground contact by transported material would occur and if "forwarded" ground contact would not occur. Use of forwarding would reduce the level of temporary road construction to access the commercial treatment areas. Selection was generally based on slope, being less than 40% for favorable and less than 35% for adverse.

Skyline

Thinned trees would be pulled from the site to landings requiring partial suspension of logs. Selection of method was based on areas too steep to qualify for ground-based equipment.

Appendix 2 – Initial Proposed Action Vegetation/Fuels treatment summary

Once the Potential treatments were identified, the district and TEAMS reviewed the treatments to identify specific treatment focus areas. The primary focus areas are:

- Municipal watershed
- Whitebark Pine stands
- Wildland Urban Interface

Initial Proposed Action Summary

The Primary Silvicultural Treatment includes the vegetation treatment that is proposed on a treatment unit, while the Secondary Fuels Treatments are additional treatments that would occur within the Primary Silvicultural Treatment polygons.

Table 17. Initial Proposed Action Treatments Summary

Primary Silvicultural Treatment	Acres
Aspen Restoration	81
Aspen Rest/Meadow Restoration	9
Aspen Rest/Precommercial thin/Underburn	11
Clearcut/Prescribed fire	2,025
Commercial Thin/ Meadow Restoration	187
Commercial Thin / Precommercial thin/Underburn	132
Commercial Thin / Underburn	2,273
Meadow Restoration	5,622
Precommercial thin	37
Precommercial thin/Underburn	329
Prescribed Fire	8,134
Underburn	2,638
Whitebark Pine Restoration	1,037
Total treatment Acres	22,514
Secondary Fuels Treatments	**Acres**
Hand pile and burn/Prescribed Fire	996
Hand pile and burn/Underburn	41
Lop and Scatter	431
Lop and Scatter/Masticate/Hand pile and burn	9
Leave tops attached	4,325
Leave tops attached/ Lop and Scatter	132
Leave tops attached/ Masticate/Hand pile and burn	187
Masticate/Hand pile and burn	468
Masticate/Hand pile and burn/Prescribed fire	4,976
Masticate/Hand pile and burn/Underburn	10
Prescribed Fire (associated with meadow restoration)	143
Total Secondary Activity Acres	11,717
Removal Type	**Acres**
Ground Based	4,694

The Initial Proposed Action was developed by identifying all treatments that addressed one or more of these focus areas. Some areas that met these criteria were included; however additional assessment of access will need to be conducted to ensure feasibility. During the development of the Initial Proposed Action, additional GIS cleanup of polygons was conducted to minimize small treatment stands, group like treatments together, and ensure treatment polygons within the municipal watershed, and those within the Inventoried Roadless Area were wholly within those areas for analysis consistency.

The Initial Proposed Action is provided so that the full IDT can review, revise and finalize a specific proposed action for scoping. This review will identify specific areas of concern, potential issues that may not be 'ripe' to address through the proposed action, and areas that may be infeasible due to local site-specific knowledge.