USDA Forest Service
Pike National Forest
South Platte Ranger District
Morrison, Colorado

Environmental Assessment for the Upper South Platte Watershed Protection and Restoration Project

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CHAPTER 1
PURPOSE AND NEED FOR ACTION

SUMMARY OF PROPOSED ACTIONS

The U.S. Forest Service has proposed a series of actions with the goal of forest restoration in the Upper South Platte Watershed on the Pike National Forest. These actions would include timber harvesting, prescribed burning, revegetation in the Buffalo Creek burn area, obliteration and reclamation of unnecessary roads, and trail improvements. This Environmental Assessment (EA) discloses the environmental consequences of implementing the proposed actions.

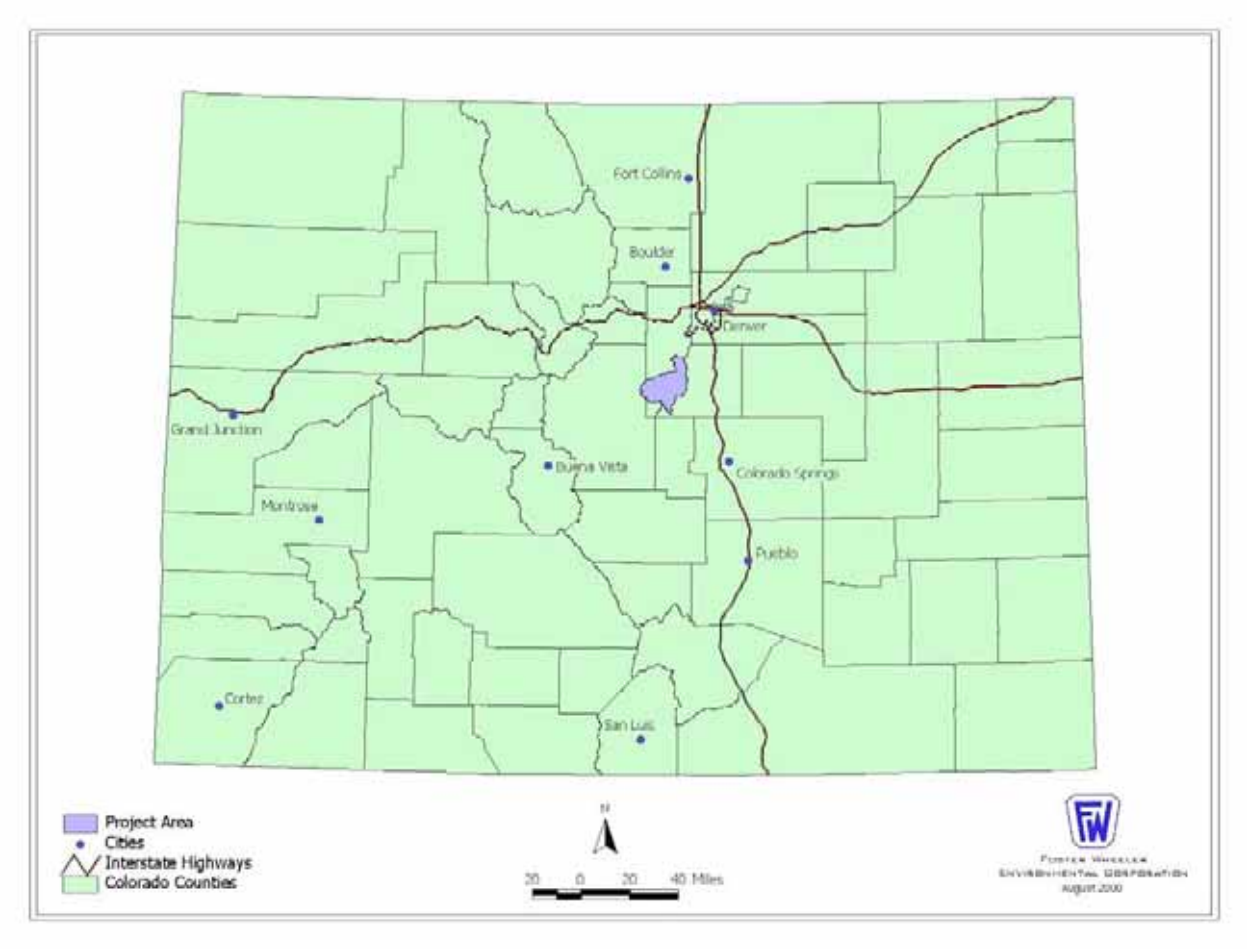
DESCRIPTION OF PROJECT AREA

The Upper South Platte watershed is located within the foothills of the Colorado Front Range of the Rocky Mountains. It is a large, important watershed that is a critical water supply for the city of Denver, providing 80 percent of the city's water supply. Due to its proximity to the city, it contains a large area of urban–forestinterface and provides easy access to fishing, hiking, and other outdoor pursuits. A portion of the South Platte River is a gold medal trout fishery.

The Project Area is approximately 140,000 acres in total area (public and private lands) and encompasses three sub-watersheds of the Upper South Platte River watershed including Horse Creek, Waterton/Deckers, and Buffalo Creek sub-watersheds. These watersheds are located in Jefferson and Douglas Counties, southwest of Denver (Maps 1-1 and 1-2). The project area targets subwatersheds with the highest fire and erosion risks within the Upper South Platte Basin. This area was selected based on recommendations from the Landscape Assessment of the Upper South Platte Watershed (Foster Wheeler, 1999). Approximately 120,000 acres of the Project Area are on National Forest land. The remaining areas within these sub-watersheds are predominately privately owned lands. However, there is also county land within the Project Area.

Elevations within the Project Area range from approximately 6,000 feet along the South Platte River to almost 9,000 feet at some of the higher peaks. The terrain is extremely varied and includes deep, narrow canyons; flat river-valley bottoms; broad meadows; rugged mountain foothills; steep slopes; rounded granite peaks; and scattered, rugged granite outcroppings. Portions of the Waterton/Deckers and Buffalo Creek watersheds are within the Lost Creek Wilderness Area.

A portion of the Project Area was burned in the 1996 Buffalo Creek fire. This large, hot fire resulted in loss of forest cover on 12,000 acres and burned several homes. Summer storms in the area of the burn caused catastrophic erosion and sediment deposition into the watershed's streams. Flooding events following the fire destroyed much of the stream channels and riparian zones along Buffalo and Spring Creeks. Even after four years, much of the burn area remains unvegetated. The Hi Meadows fire burned a small portion of the Project Area in the summer of 2000. This was also a large, hot fire that burned approximately 11,000 acres and 58 structures (see Proposed Action for further discussion of these fires).

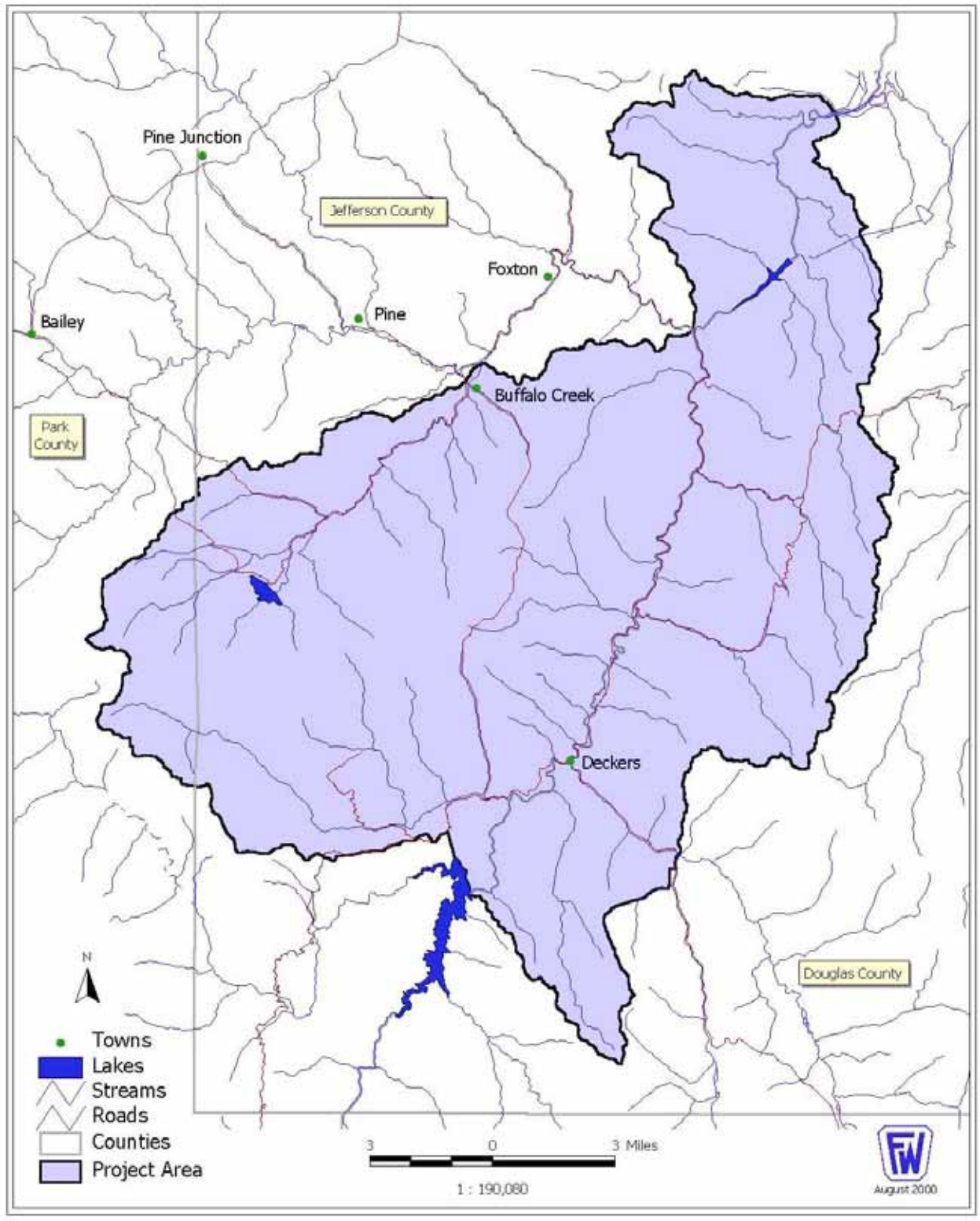


Map 1-1. Project Area Location

BACKGROUND

The Upper South Platte Watershed Protection and Restoration Project

The Upper South Platte Watershed Protection and Restoration Project was initiated in August 1998 to address concerns regarding continued soil and water problems resulting from the 1996 Buffalo Creek fire and the potential for future fires to cause problems in other parts of the watershed. The goal was to develop a strategy for watershed restoration and protection. The Project involves an interagency partnership between the US Forest Service, Colorado State Forest Service, Denver Water Board, US Geological Survey, Natural Resources Conservation Service, and the Environmental Protection Agency. The partners adopted watershed restoration as a guideline for management and project planning.



Map 1-2. Environmental Assessment Project Area

The first step was to complete a landscape assessment that would identify and prioritize restoration opportunities to maintain or restore watershed functions. A primary goal was to find areas for forest restoration that could reduce the extent and intensity of events such as the Buffalo Creek fire and strengthen the resilience of the most sensitive areas of the watershed if such events should occur.

The Landscape Assessment for the Upper South Platte Watershed (Foster Wheeler, 1999), which was completed in 1999, focused on identifying areas for restoration where forest conditions had deviated significantly from the historical composition. The deviations being due primarily to changes in the types of disturbances that regulate vegetation composition and structure. In these areas, the forest is no longer significantly regulated by the types of disturbances under which the ecosystem developed and is more susceptible to catastrophic events. The ultimate goal of the Assessment recommendations was to move the forest toward a condition that will provide a more sustainable long-term model for the ecosystem, based on the historic functioning of the ecosystem and with the constraints of the existing human presence and use.

Landscape Assessment - Summary

The following discussion summarizes some of the information presented in the Landscape Assessment for the Upper South Platte Watershed, particularly as it applies to the proposed action of this EA. For further, more detailed discussion, refer to the Landscape Assessment (Foster Wheeler, 1999).

HISTORICAL OR PRE-EUROPEAN CONDITION

Vegetation

The pre-European ponderosa pine forest was likely quite open with fewer trees, greater age diversity between stands, and larger openings than the area displays today. The forest would have been characterized by frequent fires, which were the primary disturbance factor in these forests. These fires varied in intensity and size. At times, large fires would move into the crowns and kill many trees. Crown fires played a critical role in maintaining the open stand structure and are likely to have occurred following wetter periods during which the understory vegetation had become established. This vegetation provided a ladder effect moving the fire from the ground into the canopy. In these types of events, the fire would have burned intensely in some locations, killing all trees in that area. In other areas of the same fire, the burning would have been limited to the surface, killing only some or smaller trees. Other areas would have been missed completely due to firebreaks.

Smaller fires that did not move into the crowns would have limited the growth of Douglas- fir, which does not tolerate fire well (see Chapter 3 Vegetation), to sites where fires were infrequent, particularly wetter, north-facing slopes. The smaller fires would also have kept the forest more open by limiting growth of understory trees.

Frequency and fire patterns created a varied burn pattern that in turn created a sustained vegetative pattern across the landscape. This mosaic pattern would be maintained as the patch-like variations of age classes, densities, and openings caused fires to skip around rather than kill all trees over several thousand acres. Some stands would have had a multitude of age classes from seedlings to trees more than 400 year old. There were probably few snags (standing dead trees) and cavities in live trees. A few stands would have been nearly even-aged due to stand-replacing fires followed by even-aged regeneration.

One key to the sustainability of the pre-European forest was the open condition. The open forest would have been somewhat protected against extensive fires because of the distance between tree crowns and larger openings. Openings may have covered 20 to 25 percent of the area, and some of these openings may have persisted for decades due to climatic and seed source limitations. Regeneration would have

begun immediately on other burned sites. Therefore, post-fire patterns of regrowth would have resulted in variations both in space and time, contributing to the complexity of the landscape.

In the subalpine forest, fire would also have been the major disturbance factor; however, windthrow and insect outbreaks may also have contributed to disturbance patterns. Fires in the subalpine zone appear to have been less frequent and more catastrophic. A typical fire pattern would be a stand-replacing crown fire that caused extensive mortality followed by a long (up to 300 or more years) fire-free period. This would have led to the establishment of large stands of primarily even-aged lodgepole pine with some aspen and spruce; spruce/fir would become established as an understory and eventual climax species.

Soils

The soils in the Upper South Platte watershed are highly erodible when exposed to the direct impacts of rain, sheetwash, rilling, or gullying. The primary processes controlling soil disturbance and erosion historically included wind and water. Wildland fire could have had negative impacts on soils by exposing them to the forces of erosion. A fire's intensity would determine the degree of detrimental impact. Soil should be viewed as both a habitat and selective growth medium when analyzing the effects of fire. Soils under dense vegetation contain the seeds of prior successional stands. A severe fire would kill a high percentage of these dormant seeds, whereas a low-intensity fire would scarify seed coats of many fire-adapted species, allowing germination in the next growing season.

Erosional events such as the one that followed the Buffalo Creek fire undoubtedly did occur. Hill-slope erosion following wildfire and high-rainfall events appear to have been a major source of sediment to the drainage network.

Aquatic Environment

The water runoff regime into the watershed's streams would have been somewhat different than current conditions. A lower density of trees would have reduced evapotranspiration and more water would have been available for streamflow. The forest openings would have created differing snowmelt patterns, earlier in open areas and later under tree cover. The increased runoff would probably have resulted in larger riparian areas that extended higher into the drainages.

The historical disturbance regime of more frequent fires most likely resulted in more frequent but less catastrophic sediment inputs due to erosion, transport, and deposition to the area's streams than occurs today. These more-frequent events would appear as pulses of sediment to the system, and the majority would not cause the watersheds' streams to move out of dynamic equilibrium (Foster Wheeler, 1999). Large disturbance events such as large fires and subsequent flooding and large-scale deposition (such as occurred in Buffalo Creek) would have occurred, although infrequently. These events would have tended to degrade affected stream channels by overwhelming them with deposition and causing them to move out of dynamic equilibrium. The paleoflood records indicate that events of this magnitude occurred approximately every 250 years.

Historically, the longnose sucker, white sucker, longnose dace, and greenback cutthroat trout were known to inhabit the Upper South Platte River. The greenback cutthroat trout, believed to have been a common species historically, is no longer found in the Project Area. Habitat loss, habitat modification and hybridization with or displacement by non-native trout species has eliminated greenbacks from most of its native range. The historic disturbance regimes would have resulted in more frequent, less catastrophic sediment inputs to the system. The sediment inputs would have consisted mostly of sand and gravels, and would have been easily transported through the system. High-magnitude events would have caused similar disruption to fish habitat as seen in Buffalo Creek.

EXISTING CONDITION OF THE UPPER SOUTH PLATTE WATERSHED

Vegetation

The effects of logging, grazing, and fire suppression have altered the character of nearly the entire forest. The ponderosa pine/Douglas-fir forests have been altered most significantly from the historic condition. Logging eliminated a large portion of the old growth. Across the landscape, trees growing in the openings created by logging did not have to compete with large trees due to selective harvesting. Fire suppression kept natural fires from reducing or eliminating growth of some trees, particularly Douglas-fir. The survival of new trees may also have been aided by grazing, which eliminated most of the grasses with which the trees would have competed for water and nutrients and which were needed to carry ground fires. As a result, conditions were created that brought a larger proportion of trees to maturity than would have been possible historically. These conditions created a forest that is more uniform and dense than the historical forest with its mosaic of different-aged trees and tree densities across the landscape.

The greatest departure from the historical condition is found in watersheds with dense ponderosa pine and Douglas-fir. The Douglas-fir component is proportionately higher than the expected historical condition because fires that were suppressed would have kept the Douglas-fir populations low and more limited to wetter, north-facing sites. Douglas-fir is more shade tolerant than ponderosa pine and can become established in the understory, becoming the site's climax species in the absence of fire.

The existing condition includes a forest that is relatively homogeneous and dense across the landscape. Individual stands may actually have more age class diversity than historical stands due to a lack of ground fires that would have limited the growth of a Douglas-fir understory. The density of the forest results in connected crowns where there are few openings that can create fire breaks (openings and widely spaced trees). Although ground fuels are light to moderate, the ground fuels can preheat the crown fuels during summer burning periods. These conditions increase the potential for catastrophic fires.

Soils

The primary changes in disturbance factors, and potential for increased erosion, include the addition of roads and trail networks, grazing, and suburban and rural development. The combined net effect of these changes may leave surface soil layers in an unstable or unprotected state, increasing the potential for erosion and deposition in area streams and reservoirs.

One of the greater risks to the soils is severe-intensity wildfires over a large area, which, due to the change in vegetation patterns, is a higher risk than would have been found historically. Although large erosional events, such as those that followed the Buffalo Creek fire, have been noted historically, the potential for this type of event occurring on a larger scale and potentially with more frequency has increased significantly from the historical condition. These types of fires not only increase erosion, but can destroy the seed source over a wide area. In the past, it is likely that patterns of soil erosion varied temporally and spatially. The current forest conditions increase the likelihood of large-scale erosion over a more uniform area due to fire.

Aquatic Environment

In the watershed, some of the most significant changes from historical conditions include a change in vegetation cover throughout the watershed, the introduction of roads, the addition of Cheesman Lake (reservoir), the introduction of nonnative trout species, and a change in the historical disturbance regime. The influence on runoff due to a change in vegetation cover is discussed above, under the *Historical or Pre-European Condition*.

Roads and trails can increase erosion by numerous mechanisms. Soil compaction reduces, or eliminates, infiltration of surface water, which increases sheet erosion thus leading to gully erosion during rainfall or

snowmelt. A network of roads and trails may refocus overland flow into artificial flow networks that may be even more erosive. Poor maintenance can be the most significant problem due to erosion of roadfill and even slope failure. Maintenance of used roads and rehabilitation of unused roads, including drainage systems, is key to limiting these impacts.

Cheesman Lake, completed in 1905, is the only major reservoir in the watershed. It has altered flow regimes for the headwaters of the South Platte River by reducing peak flows and increasing low flows. This has actually had a beneficial impact on fisheries, and the South Platte River below Cheesman is now a gold medal trout fishery. This section of the river probably supported a smaller population of trout before Cheesman Dam was constructed.

As discussed above, one of the main changes in the fish population has been the introduction of nonnative trout species, which was partly responsible for the decline of the greenback cutthroat trout. Habitat loss due to logging, mining and agricultural use, particularly in the late 1800s, also caused major declines in greenback populations. Parts of the watershed are currently being examined by the US Fish and Wildlife Service for reintroduction of this species.

The main watershed health concern is that the forest is set up for a series of catastrophic fires, such as the Buffalo Creek and Hi Meadow fires or larger. The current disturbance regime could result in larger, more catastrophic events that could reduce the quality of larger portions of fish habitat than the smaller and more frequent disturbances that appeared to be typical historically. The historical condition would therefore result in more sustainable trout populations in the watershed. The available data does suggest that these fires and the flooding following the Buffalo Creek fire were within the historical context. However, the watershed appears to be in a condition where many more, and potentially larger, similar events could occur within the next 250 years. The potential magnitude and frequency of these events is due to the large areas of uniform tree cover and high fuels in the forest. These conditions put the watershed at risk for major impacts to the area's streams, the water supply, and aquatic habitat that do not fit into the historical context and do not contribute to long-term sustainability.

SUSTAINABLE CONDITION – LANDSCAPE RESTORATION RECOMMENDATIONS

The intent of the actions proposed by this EA is to work toward restoring the landscape to a sustainable condition, in turn lessening the potential for catastrophic events that could significantly affect the forest, wildlife habitat, soils, and aquatic environment. The pre-European condition is useful for analyzing what historically was a more sustainable condition; however, those conditions cannot be replicated in parts of the watershed due to permanent changes in the environment, including the presence of permanent roads, urban areas, houses, etc. Sometime in the pre-European condition there would have been areas of large, intense fires. These types of fires would not be tolerable in an area so close to human development. Additionally, the watershed is a valuable water supply to the city of Denver, and what historically may have been natural, massive erosion events, may be something from which the water supply now needs to be shielded. The key is therefore to find a balance that emulates the pre-European conditions to an acceptable degree and still protects the human uses of the watershed.

Vegetation

The goal in restoring vegetation to a sustainable condition is to reduce tree density and create persistent openings in the forest canopy. Two approaches are suggested, including large-scale thinning and an attempt to restore forest mosaic conditions. Thinning is recommended to reduce tree density throughout the restoration area. The thinning would be somewhat selective in order to try to replicate the historical species distribution, with ponderosa pine dominating in most areas and Douglas-fir dominating on north-facing slopes.

The mosaic approach is also recommended to create openings in the landscape. Prescribed fire could be used to reduce fuel loadings, create mosaic conditions, and maintain created forest openings. Some areas should remain unchanged. In order to reduce fire risk, it was also recommended that opportunities for restoration in areas where topographic features provide additional fire protection be sought.

Soils and Aquatic Environments

The intensity of fires in the pre-European condition most likely varied from hot and severe to moderate surface fires, which resulted in a varying pattern of erosion. The sequence of wildfire, increased runoff, erosion, and downstream sedimentation is of concern because of the potential for intense fires in this area. In contrast to intense wildfires, low- or moderate-intensity burns generally do not result in a corresponding increase in runoff and erosion (Foster Wheeler, 1999). A reduction in fuels by prescribed fire or removal should reduce the threat of soil erosion, flooding, and sedimentation without harming the soils.

In order to reduce existing and potential future erosion due to introduced roads and trails, opportunities for correcting designs, improving maintenance, or closing unused roads should be sought throughout the restoration area. Reclamation of unused roads is also recommended. Any new road construction should be minimized.

PRIORITY WATERSHEDS FOR RESTORATION

The Landscape Assessment used the three primary subcomponents discussed above to study the watershed: forest vegetation and wildlife, soils, and aquatic environments. Two subwatersheds in the Upper South Platte Watershed—Waterton/Deckers and Horse Creek—were consistently identified as priority areas for restoration. Buffalo Creek did not score as high as some others for fire hazard, primarily because of the 1996 fire, which reduced fire risk in a portion of that watershed. However, several areas in the unburned portions of the Buffalo Creek watershed are at a high risk for fire. Additionally, areas that were burned are in need of restoration and revegetation to reduce the risk to soils and aquatic environments. Table 1-1 summarizes some of the risk factors that were studied and the relative risks for the watersheds included in this EA.

Table 1-1. Watershed Restoration Ranking for Subcomponents of the Watershed

Watershed	Fire Hazard	Priority for Restoration for the Watershed Subcomponents		
		Vegetation & Wildlife	Soils	Aquatic Environments
Waterton/Deckers	High	High	High	Very High
Horse Creek	High	Medium High	Extreme	Very High
Buffalo Creek	Medium	Medium High	High	High

A few additional watersheds appeared to be good targets for restoration. Elk Creek, Deer Creek, and Lower North Fork watersheds are located in the area with the largest human concentration and include large sections of private lands. There is an on-going project by the Colorado State Forest Service in Elk Creek watershed (See Chapter 2 - Alternatives – Future Foreseeable Actions). A small portion of the Elk Creek watershed burned in the Hi Meadow fire. However, the majority of the watershed was not burned and remains a target for restoration. The Colorado State Forest Service's project was only minimally affected by the fire. Other priority watersheds may be considered at a later date for restoration.

PROPOSED ACTIONS AND PURPOSE AND NEED

The U.S. Forest Service proposes in this EA to carry out forest restoration subprojects (see below) as part of the Upper South Platte Watershed Protection and Restoration Project. The Project is a cooperative effort between the U.S. Forest Service, Colorado Forest Service, Denver Water Board, and other federal and state agencies, local governments, and interested parties to plan, implement, and monitor restoration projects in the Upper South Platte River Basin (Business Plan for the Upper South Platte Restoration and Protection Project, 2000). It is a collaborative, innovative approach for assessing forest conditions and implementing management actions on a landscape level on both public and private lands within the basin. This EA is one of many projects that are being conducted, are planned, or will be considered in the future in order to achieve the following goals of the Upper South Platte Watershed Protection and Restoration Project:

- **Protect water quality for all users**
- **Reduce risks of large catastrophic wildfires**
- **Reduce risks to human life and property**
- **Create sustainable forest conditions in the Upper South Platte River Basin**
- **Integrate research, monitoring, and management**

Proposed Actions

The proposed actions evaluated in this EA represent the first phase of work that the U.S. Forest Service and its partners would implement under the Upper South Platte Watershed Protection and Restoration

Project. Other nonfederal and future federal restoration subprojects are addressed as connected actions in this document. Future federal restoration actions will be developed based on the outcome of ongoing planning, monitoring, and research in the Upper South Platte basin and evaluated in more detail in subsequent National Environmental Policy Act (NEPA) documents where federal actions are required. The proposed actions were developed with consideration of U.S. Forest Service management policies, legislative mandates, and approved forest management plans.

This EA evaluates a U.S. Forest Service proposal to achieve the stated goals of the Upper South Platte Watershed Protection and Restoration Project through four forest restoration subprojects. The actions or subprojects that are proposed include vegetation treatments, road reclamation, trail improvements and burn area revegetation. The specific actions proposed in this document would:

- **Treat 17,400 acres of dense forest with thinning and created openings**
- **Reclaim 25 miles of unclassified roads**
- **Improve 7.5 miles of South Platte River access trails**
- **Plant 60 acres of riparian and 1,000 acres of upland habitat in the Buffalo Creek burn area**

Purpose and Need for the Proposed Actions

VEGETATION TREATMENT

The purposes of the proposed vegetation treatments are to reduce the risk of large-scale fires and subsequent erosion in the Upper South Platte watershed that could threaten property and human life and exacerbate soil and water quality problems and to create or restore the forest to more sustainable conditions. The proposed action of these treatments also has the goal of improving prairie montane skipper habitat in order to reduce the current downward trend of this threatened butterfly.

As discussed above (*Background*), the current forest conditions combined with greater human encroachment into the forest lands have dramatically increased the risk of loss of life and property from wildfires in recent years. The current forested landscape condition does not reflect the historic disturbance regime and is not sustainable. Past fire control, logging, and grazing allowed smaller, thin-barked trees to proliferate. This resulted in relatively dense, even-aged, closed-crown forest conditions throughout the ponderosa pine/Douglas-fir forest that have a much higher risk of catastrophic fire compared to pre-settlement conditions. Because the forests have very little down wood to permit low-intensity ground fires, prescribed fires are unable to modify the forest structure. The existing small trees serve as ladder fuels, permitting surface fires to climb into the tree canopy and become crown fires. Wildfire will carry as a high-intensity crown fire under hot, dry, and windy conditions.

The 1996 Buffalo Creek and the 2000 Hi Meadow fires clearly demonstrated the potential devastation that large-scale fires can cause. The Buffalo Creek fire burned almost 10,000 acres in less than 11 hours and eventually burned a total of 12,000 acres. The fire destroyed several homes and essential forest cover on highly erodible soils. Heavy rainfall and floods following the fire resulted in two fatalities and caused substantial erosion and sedimentation. The fire also had severe impacts on downstream reservoirs that supply water to the Denver metropolitan area. Nearly 80 percent of the water used by the 1.5 million Denver metropolitan residents comes from or is transmitted through this river drainage. The Denver Water Board spent nearly $1 million on water quality cleanup and dredging operations at Strontia Springs reservoir after the flood. They anticipate spending an additional $10-15 million on future cleanup, dredging, and water-treatment modifications over the next 10 years because of the Buffalo Creek fire.

In June of 2000, the Hi Meadows fire burned nearly 11,000 acres, including a small portion of the Project Area. This fire destroyed 58 structures, including 51 homes. This fire followed a hot and dry period. These conditions combined with high winds created a high-intensity and fast moving crown fire in portions of the burn area. The fire suppression efforts cost nearly $5,000,000. Heavy rains have caused erosion and flooding, although not to the extent of the Buffalo Creek fire. The potential for further erosion and flooding from the Hi Meadow fire is at this time unknown because the fire was so recent.

Current research within the Upper South Platte watershed (Kaufmann, et al., submitted) and knowledge of wildfire behavior indicates that modification of forest structure and composition, as proposed in this EA, would help fire-control efforts and reduce the likelihood of future large-scale fires. The Hi Meadow Incident Operations Report (June, 2000) examined previous forest management activities on the behavior of this fire. The report found that "It is evident that thinning and prescribed fire reduced the spread and intensity of the High [sic] Meadow wildfire."

The proposed actions are also needed to help protect recreational resources, including the highly regarded South Platte River trout fishery, within the Project Area. This project would also increase forest structure and composition diversity, increase resistance to widespread insect and disease events, and increase the structural diversity of wildlife habitat. The project would improve habitat for the threatened pawnee montane skipper.

ROAD RECLAMATION

The purpose of the proposed road reclamation is to reduce road-related sediment from unclassified roads. Unclassified roads are roads that are not intended to be part of and are not managed as part of, the forest transportation system. They include temporary roads, unplanned roads, off-road vehicle tracks, and abandoned travelways. The action is needed because many unclassified roads have accelerated soil loss and increased stream sedimentation that reduces aquatic habitat productivity. Many of these roads were created for temporary access associated with fire suppression, timber harvest, and mineral exploration. Expanding off-road vehicle use has widened some roads and created additional new roads. Most of these roads are poorly located and/or not maintained and were not intended for long-term vehicle use.

Project area soils are highly erodible when exposed to the direct impacts of rain, sheetwash (overland flow), rilling, or gullying (Foster Wheeler, 1999). Roads compact soils, which reduces infiltration of surface water into the soil column. This increases sheet erosion, which can lead to rill and gully erosion during periods of rainfall or snowmelt. Roads also refocus overland flow, rills, and streamlets into artificial flow networks that move water downslope. The poorly maintained drainage ditches and culverts on roads built on fine-textured fill have also caused slope failure and erosion.

SOUTH PLATTE RIVER ACCESS TRAIL IMPROVEMENTS

The purposes of proposed improvements to river access trails, including Gill Trail, are to create a safe and sustainable trail system to meet the needs of hikers and fisherman while reducing soil erosion and vegetation loss and to improve habitat near the South Platte River.

The proposed work is needed to improve safety, reduce trail-related sediment, and restore disturbed habitat. Just an hour from Denver, the South Platte River continues to receive almost one half million visitors each year. Past efforts have protected and restored riparian habitat at many of the heavily visited sites along the river that were damaged by vehicle traffic. With so many people using this river, foot traffic has also begun to impact the riparian areas. Anglers and other river users have created an extensive network of social trails throughout the riparian vegetation that take visitors from parking sites to the river. These trails overlap or wind through the willows like a maze. Many of these social trails are on steep riverbanks that are often unstable and highly erodible. Once the route becomes too steep or unstable, it is

abandoned in favor of a new, temporarily more stable route. Unfortunately, as this process continues along the riverbank, it causes riparian vegetation loss, reduces riverbank stability, and increases river sediment loading.

The Gill Trail travels through the Cheesman Canyon and accesses a nationally known fishery along the South Platte River. The trail is also used by many hikers interested in seeing the natural rugged canyon scenery and the historic Cheesman Dam. The original Gill Trail was built about 40 years ago but stopped short of Cheesman Reservoir. There have been no major trail improvements since then. An estimated 25,000 visitors per year use the trail, and their effects are evident. Crumbling side-slope trails have caused numerous braided routes and excessive erosion. Many social trails have developed as alternate routes to Cheesman Reservoir, with some sections being dangerous. The excessive and braided trails also cut through habitat used by the pawnee montane skipper, a species federally listed as threatened, killing the plants on which they depend.

BUFFALO CREEK BURN AREA REVEGETATION

The purpose of this project would be to help reestablish riparian and forest communities within the Buffalo Creek burn area and to reduce erosion and stream sediment loading.

This action is needed because, four years after the Buffalo Creek fire, much of the burn area remains unvegetated and is a major source of stream sediment. The fire and subsequent flooding events decimated stream channels and riparian areas along much of Buffalo and Spring Creeks. Large areas adjacent to these streams are poorly vegetated sediment deposits that are easily eroded during high runoff. Periodic high flows continue to carry these sediments downstream to the main stem of the South Platte, adversely affecting downstream water quality and habitat. Revegetation of the floodplains and riparian areas would increase their potential for trapping and storing sediment. Additional tree planting in the upland burned areas would also reduce sediment entering the streams, compliment the riparian restoration, and provide upland vegetative diversity.

As required under section 303(d) of the Clean Water Act, the state of Colorado has compiled a list of streams that are impaired and do not fully or partially support their beneficial uses. Because of existing sediment problems, Buffalo and Spring Creeks are on a Monitoring and Evaluation list for possible inclusion on this 303(d) List. The proposal would reduce sediment and improve water quality over time. This project would help to protect and maintain state designated beneficial uses.

PLANNING PROCESS

SCOPE OF THE ANALYSIS

This environmental assessment evaluates the proposal according to NEPA standards conducted to meet the intent of NEPA, standards in the Pike and San Isabel Management Plan (Land and Resource Management Plan: Pike and San Isabel National Forests, Comanche and Cimmaron National Grasslands, 1984), Forest Service Manuals, and the Environmental Policy and Procedures Handbook. The EA analyzes specific actions that tier from the Forest Plan.

This EA presents a proposal that was not anticipated at the time of the Forest Plan (1984). The concept for restoration of this scope and magnitude was initiated following the Buffalo Creek fire of 1996 and included several different agencies, including the U.S. Forest Service, Colorado State Forest Service, Denver Water Board, and the Environmental Protection Agency. Therefore, the types of activities proposed may not necessarily be guided by the management prescriptions designed at the time of the Forest Plan. A part of the analysis will be to identify the current management prescriptions of the Forest Plan and compare this guidance to the proposed activities. Activities can then be identified as within or outside of the Forest Plan direction.

This EA will analyze the environmental, social, and economic consequences of the proposed action and reasonable, implementable alternatives to that action, while meeting the purpose and need. An EA is not a decision document. It is a document that discloses the environmental consequences of implementing the proposed action or alternatives to that action. The decision will be documented in a decision notice signed by the responsible official. The South Platte District Ranger is the responsible official for deciding what actions will be taken.

DECISIONS TO BE MADE

The Forest Service operates under the concept of multiple-use management. This type of management requires trade-offs between the various resources and uses of the forest. The objective is to balance resource uses across the forest. The decisions that must be made in connection with this proposed action depend on the answers to these questions:

1. **Should harvesting and prescribed fire be completed to reduce tree density and create openings in the restoration area?**
2. **Should unclassified roads be reclaimed to reduce existing and potential future erosion and sedimentation to streams?**
3. **Should South Platte River access trails be improved to create a more safe and sustainable trail system and reduce erosion and vegetation loss?**
4. **Should parts of the Buffalo Creek burn area be revegetated to help reestablish riparian and forest communities and reduce erosion and stream sediment loading?**

The objective for making these decisions will be to set the best long-term, sustainable management strategy for the Upper South Platte Project Area while wholly, or partially, meeting the purpose and need. These decisions will be guided by the land allocation and resource management objectives and guidelines set forth in the Forest Plan, along with public input, to select a reasonable, balanced, and appropriate decision.

ALTERNATIVES AND ANALYSIS

Alternatives

The agency must consider three types of alternatives (40 CFR 1508.25[b])

> "(1) No-action alternative. (2) Other reasonable courses of actions. (3) Mitigation measures (not in the proposed action)."

Included in Chapter 2, Alternatives, is a description of the No-Action alternative (Alternative 1) and the range of action alternatives that would entirely, or partially, satisfy the Purpose and Need of the proposal.

Impacts

Three types of impacts must be considered in the analyses—direct, indirect, and cumulative (40 CFR 1508.25[c]). The direct and indirect impacts of the proposed action and alternatives are discussed in detail in Chapter 4, Environmental Consequences. In addition, for each substantial issue, potential cumulative impacts of reasonably foreseeable or similar actions are disclosed. Cumulative impacts are determined based on the definition of 40 CFR 1508.7. The incremental impact of the proposed action and alternatives is considered when added to other past, present, and reasonably foreseeable future actions. The Proposed Action is also evaluated for (a) the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity (NEPA Sec. 102 (c)(iv)); (b) any irreversible or irretrievable commitments of resources should the alternative be implemented (Sec. 102 (c)(v)); and (c) any adverse impacts that cannot be avoided should the action be implemented (Sec. 102(c)(ii)).].

Incorporation of the Forest Plan

This document is tiered to and repeatedly references the Land and Resource Management Plan: Pike and San Isabel National Forests; Comanche and Cimarron National Grasslands, which sets forth the direction

for managing the resources of the Pike and San Isabel National Forests. For clarity, that document is referred to as the "Forest Plan."

Planning for activities on National Forest System lands involves two levels of decisions. The first level is development of a Forest Plan that provides direction for all resource management programs, practices, uses, and protection measures. The Forest Plan consists of both Forest-wide and area-specific standards and guidelines that provide for land uses with anticipated resource outputs under a given set of management constraints. The outputs are not fixed decisions by the Forest Plan, because all conditions required to produce the outputs are not controlled by the agency and because environmental conditions may change. These plans also contain general cumulative effects of the anticipated actions, i.e., effect of regional roadless values, regional wildlife populations, and the water quality of major drainage systems.

The second level of planning occurs during Forest Plan implementation. It usually involves the analysis and implementation of site-specific management practices designed to achieve the goals and objectives of the Forest Plan. However, as discussed above (Scope of the Analysis), this EA presents a proposal that was not anticipated at the time of the Forest Plan (1984). The proposed actions may not follow the site-specific management practices that were prescribed. It is possible that one or more Forest Plan Amendments will be required if one of the action alternatives is chosen.

THE SCHEDULE

The schedule of completion for this EA is outlined below.

March, 2000	Public information meetings with the U.S. Forest Service
April 22, 2000	Publication of the news release for public meetings
May 2-4, 2000	Public meetings
August, 2000	Environmental Assessment released to public
September, 2000	End of public comment period
September, 2000	Forest Service issues finding of no significant impact (FONSI) or notice of intent (NOI) to perform EIS
October, 2000	End of decision appeal period
November, 2000	Project implementation, if FONSI is issued

CHAPTER 2
ALTERNATIVES

This chapter describes the action alternatives that wholly or partially meet the Purpose and Need. A No-Action alternative is also discussed. The two action alternatives each respond to identified issues, resulting in a slightly different approach to achieving the purpose and need. This chapter describes the public involvement process, scoping and issues identification, and development of alternatives. The issues that were developed from the scoping process are discussed in terms of their incorporation into the alternatives. The elements of the alternatives are described, followed by a detailed discussion of each alternative. Finally, alternatives are briefly compared by the major issues that were part of alternative development.

MANAGEMENT DIRECTION

The Land and Resource Management Plan: Pike and San Isabel National Forests; Comanche and Cimarron National Grasslands (Forest Plan, USFS 1994a) provides the overall guidance for management of the land within its borders through its goals, standards and guidelines and Management Area (MA) direction. These goals and MA direction usually provide guidance for proposed actions on the Forest. However, the proposed actions in this Environmental Assessment (EA) are in response to concerns regarding the sustainability of the Forest, fire risk as evidenced by the Buffalo Creek fire of 1996, and the protection of the water supply, all elements that were not specifically part of the forest planning process in 1984. Therefore, the proposed activities may fall outside of the Forest Plan's MA direction and potentially some standards and guidelines. In this section, the general guidance of the MA directions is discussed. In Chapter 4, Environmental Consequences, the MA direction is compared to the proposed actions for each resource to determine whether the proposed activities are within or outside of the MA direction.

FOREST GOALS AND OBJECTIVES

The Forest Plan's goals and objectives provide broad, overall direction regarding the type and amount of goods and services that the Forest will provide. The goals are concise statements describing a desired condition to be achieved sometime in the future. They are expressed in broad, general terms and are timeless in that they have no specific date by which they are to be completed. The goal statements are the principal basis for the objectives. Goals are also in response to appropriate laws, regulations, and policies.

Forest Plan goals that are met by the proposed action are listed below (USDA Forest Service, 1984, pages III-4 and III-5):

- **Provide a cost-effective level of fire protection to minimize the combined costs of protection and damages, and prevent loss of human life.**
- **Conserve water and soil resources and prevent significant or permanent impairment of land productivity.**
- **Protect riparian areas and wetlands from degradation.**
- **Maintain or improve water quality to meet Federal and State standards and increase the average annual water yield.**

The objectives are concise, time-specific, measurable results that respond to the Forest Plan goals. These objectives are the basis for the management requirements listed in the Forest Plan and MA Directions (see Management Area Descriptions).

FOREST-WIDE DIRECTION, STANDARDS AND GUIDELINES

The Forest-wide management requirements set the baseline conditions that must be maintained throughout the Forest in order to implement the Forest Plan as it was intended. They establish the environmental quality and natural resource requirements and mitigating measures that apply to all areas of the Forest. Individual MAs (see below) may have additional requirements that must be followed. Substantive changes that alter the intent of these management requirements may not be made without amending or revising the Forest Plan.

The Forest Plan provides direction, and standards and guidelines that are specific to individual resources. These directions, as they pertain to this EA, are outlined in Chapter 4, Environmental Consequences, for each resource.

Management Areas

The Forest Plan divides the Forest into individual MAs, each of which has an emphasis that directs management activities within the MAs borders. The Forest Plan designates specific direction, goals, and standards and guidelines to be used in the management of these areas to more completely meet the MA emphasis (called “management area prescriptions”). Each MA is described by its management emphasis, or general direction and goals, and specific standards and guidelines to help achieve those goals for the MA.

There are 10 MAs in the Project Area. A brief description of these MAs, and the percentage of the Project Area, is included below (see also Figure 2-1). Approximately 85 percent of the Project Area is designated MA 2B (Rural and roaded-natural recreational opportunities, 7A (Wood-fiber production and utilization) or 8B (Primitive wilderness opportunities).

Management Area 2A – (2 percent of the Project Area)

MANAGEMENT EMPHASIS—SEMIPRIMITIVE MOTORIZED RECREATIONAL OPPORTUNITIES

The management emphasis is for semiprimitive motorized recreational opportunities, such as snowmobiling, four-wheel driving, and motorcycling, both on and off roads and trails. Motorized travel may be restricted or seasonally prohibited to designated routes to protect physical and biological resources.

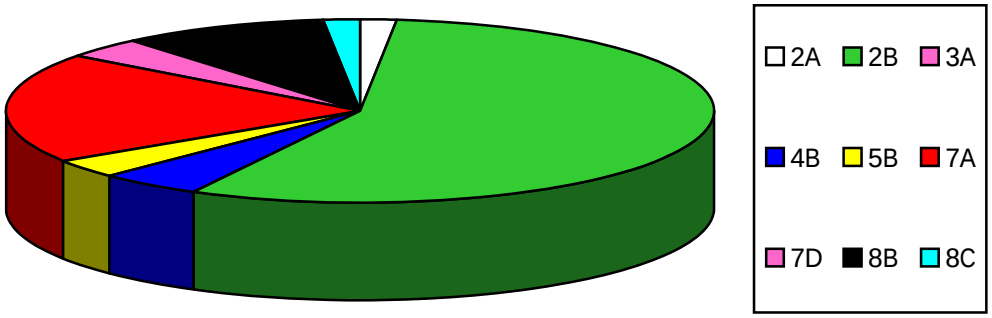


Figure 2-1. Project Area Management Areas

Management Area 2B– (55 percent of the Project Area)

MANAGEMENT EMPHASIS—RURAL AND ROADED-NATURAL RECREATIONAL OPPORTUNITIES

This MA covers the greatest percentage of the Project Area. MA 2B provides opportunity for outdoor recreation in roaded natural and rural settings, including developed recreational facilities and year-round motorized and nonmotorized recreation. Motorized and nonmotorized recreational activities, such as driving for pleasure, viewing scenery, picnicking, fishing, snowmobiling, and cross-country skiing, are possible. Conventional use of highway-type vehicles is provided for in facility design and construction. Motorized travel may be prohibited or restricted to designated routes to protect physical and biological resources.

Management Area 3A – (Less than 1 percent of Project Area)

MANAGEMENT EMPHASIS—SEMIPRIMITIVE NONMOTORIZED RECREATION IN ROADED OR NONROADED AREAS

This MA provides opportunity for nonmotorized recreation in a nonwilderness, semiprimitive setting, both roaded and unroaded. Recreational opportunities, such as hiking, horseback riding, hunting, cross-country skiing, etc., are available.

Management Area 4B – (5 percent of Project Area)

MANAGEMENT EMPHASIS–HABITAT FOR MANAGEMENT INDICATOR SPECIES

The management emphasis is on the habitat needs of one or more management indicator species for wildlife. Species with compatible habitat needs are selected for an area. The goal is to optimize habitat capability and thus numbers of the species. The prescription can be applied to emphasize groups of species, such as those that are early succession dependent, in order to increase species richness and diversity.

Vegetative characteristics and human activities are managed to provide optimum habitat for the selected species or to meet population goals jointly agreed to with the State Fish and Wildlife agencies. Tree stands are managed for specific size, shape, interspersion, crown closure, age structure, and edge contrast. Grass, forb, and browse vegetative characteristics are regulated. Rangeland vegetation is managed to provide needed vegetative species composition and interspersed grass, forb, and shrub sites or variety in age of browse plants. Recreation and other human activities are regulated to favor the needs of the designated species.

Management Area 5B – (3 percent of Project Area)

MANAGEMENT EMPHASIS—BIG GAME WINTER RANGE

The management emphasis provides for forage and cover on big game winter ranges. Winter habitat for deer, elk, bighorn sheep, and mountain goats is emphasized. Treatments to increase forage production or to create and maintain thermal and hiding cover for big game are applied. Investments in compatible resources occur. Livestock grazing is compatible but managed to favor wildlife habitat.

New roads other than short-term temporary roads are located outside of the MA. Short-term roads are obliterated within one season after intended use. Existing local roads are closed and new motorized recreational use is managed to prevent unacceptable stress on big game animals during the primary big game use season.

Management Area 7A - (19 percent of Project Area)

MANAGEMENT EMPHASIS—WOOD-FIBER PRODUCTION AND UTILIZATION

MA 7A is the second largest MA designation in the Project Area. This MA provides for wood-fiber production and utilization of large roundwood of a size and quality suitable for sawtimber. The area generally will have a mosaic of fully stocked stands that follow natural patterns and avoid straight lines and geometric shapes.

Roaded-natural recreational opportunities are provided along Forest arterial and collector roads. Semiprimitive motorized recreational opportunities are provided on local roads and trails that remain open; semiprimitive nonmotorized opportunities are provided on roads and trails that are closed.

Management Area 7D – (3 percent of Project Area)

MANAGEMENT EMPHASIS—WOOD-FIBER PRODUCTION AND UTILIZATION FOR PRODUCTS OTHER THAN SAWTIMBER

This MA provides for the production and utilization of small roundwood of a size and quality suitable for products such as fuelwood, posts, poles, props, etc. Management activities, although they may be visually dominant, harmonize and blend with the natural setting.

Management Area 8B – (10 percent of Project Area)

MANAGEMENT EMPHASIS—PRIMITIVE WILDERNESS OPPORTUNITIES

The management emphasis provides for the protection and perpetuation of natural biophysical conditions. On-site regulation of recreational use is minimal. Travel is cross-country or by use of a low-density constructed trail system. MA 8B is the third largest MA designation in the Project Area.

Management Area 8C – (2 percent of the Project Area)

MANAGEMENT EMPHASIS—SEMIPRIMITIVE RECREATIONAL OPPORTUNITIES

This area provides for the protection and perpetuation of essentially natural biophysical conditions. Solitude and a low level of encounters with other users or evidence of past use are not an essential part of the social setting. Human travel is principally on system trails. Designated campsites are used and show evidence of repeated but acceptable levels of use.

All resource management activities are integrated in such a way that current human use leaves only limited and site-specific evidence of their passing. Areas with unacceptable levels of past use are rehabilitated and the affected area restored.

Management Area 9A – (3 percent of the Project Area)

MANAGEMENT EMPHASIS – RIPARIAN AREA MANAGEMENT

The emphasis of this MA is on the management of all of the component ecosystems of riparian areas. These components include the aquatic ecosystem, the riparian ecosystem (characterized by distinct vegetation) and adjacent ecosystems that remain within approximately 100 from both edges of all perennial streams and from the shores of lakes and other still water bodies. All of the components are managed together as a land unit comprising an integrated riparian area.

The goals of this MA are to provide healthy, self-perpetuating plant communities, meet water quality standards, provide habitats for viable populations of wildlife and fish, and provide stable stream channels and still water-body shorelines. The aquatic ecosystem may contain fisheries habitat improvement and channel stabilizing facilities that harmonize with the visual setting. Forest riparian ecosystems are treated to improve wildlife and fish habitat diversity with specified silvicultural objectives. Fish habitat improvement treatments are applied to lakes and streams to enhance habitats and increase fish populations. This MA is not mapped in the Forest Plan, therefore the percentage is estimated and not included in Figure 2-1.

PUBLIC INVOLVEMENT, SCOPING, AND ISSUE IDENTIFICATION

INTRODUCTION

Public involvement is a process that continues throughout the development and refinement of the EA. However, there are two specific times when public and agency comments are solicited —before the environmental analyses are conducted to define the scope of the studies (scoping) and following publication of the EA.

Scoping is an early and open process that involves identification of issues regarding the proposed activities. During scoping, input is solicited from the public, the interdisciplinary team conducting the analyses, and governmental agencies to identify and define the issues and concerns. The issues and concerns can then be used to develop a range of alternatives to the proposed action. The alternatives attempt to meet the purpose and need of the proposed project and address the issues that were brought forward during the scoping process.

Scoping for this restoration project actually began during preparation of the Landscape Assessment in 1999 (see Chapter 1, Purpose and Need). Many of the project's goals and issues for this project were identified at that time. Scoping continued with the initiation of this specifically defined project in February, 2000.

PUBLIC INVOLVEMENT

Scoping Notice

The public scoping process was initiated with distribution of a scoping notice to local newspapers, and individuals, organizations, and government agencies on the project mailing list. This notice described the project, presented the purpose and need for the proposal, and provided information on how to participate in the scoping process. Interested parties were invited to comment on the proposal.

Public Comments

Oral comments and 12 written responses from individuals were received during the scoping period. Seven additional written responses were received at the open houses. These responses supported the restoration project and expressed few concerns regarding the proposed activities. The letters were reviewed and discussed by the project leaders.

Responses were received from two environmental groups: the local Sierra Club and the Upper Arkansas and South Platte Restoration. Both groups supported the restoration project and goals. The primary concerns were impacts to the roadless area, including potential new roads, mechanical methods for

removing trees, and potential commercial logging in the roadless area. There was also concern regarding any new roads that may be proposed in the Project Area.

The Upper Arkansas and South Platte Restoration comments also expressed concern that the term "sustainable" is being defined as manipulating the whole assessment area to fit human uses. The comments objected to human uses taking precedence in the wild portions of the study area. This group acknowledged that management is necessary, and that the status quo would inevitably lead to human or natural fires that may damage large areas, but they asked that values for both residential and wild areas be considered. In terms of trail improvements, the organization supports this activity, but indicated that Gill Trail improvements must not jeopardize the wild designation under the Wild and Scenic Rivers Act.

Public Meetings

A series of public meetings was held to inform the public about the restoration project and to solicit public input. The first set of six meetings was held by the Colorado State Forest Service, the U.S. Forest Service, and Denver Water between February 22 and March 3, 2000 in various locations. The purpose of the meetings was to give the public an opportunity to learn about and comment on four restoration projects that the U.S. Forest Service would like to complete as part of the Upper South Platte

The meetings were held in an open house format and included brief presentations about the projects, displays, maps, and a question and answer period. The meetings also provided an opportunity for one-on-one discussions with project panel members. Those attending the meetings were asked to complete feedback sheets that asked for input as to what individuals liked about the project, their suggestions and any questions or concerns they may have.

Responses to what people liked about the project covered three main areas.

- **People commented positively on the amount of research that has gone into the process.**
- **They thought the timing was right for the project.**
- **They appreciated the coalition of federal, state, and local agencies and thought that the public involvement effort was well done.**

The suggestions were broad in nature and seemed to reflect individual interests. One theme that emerged was a concern for involvement of all interested parties, i.e., environmental groups such as the Sierra Club, Audubon, Conifer Community Plan, and individual outdoor enthusiasts and homeowners in the affected area. Other suggestions involved continued publicity regarding actions contemplated or to be taken, educational outreach programs and materials for affected homeowners, and more cutting and thinning in old-growth areas.

Questions and concerns were quite specific to peoples' particular interests. Attendees wanted to know the specific implications for individual land owners, how fragile ecosystems would be protected, how surveys were conducted, how the Forest Service would reach remote, upland areas, and how insect issues would be handled.

The second set of meetings were held between May 2 and May 4, 2000, in three locations, including Buffalo Creek, Conifer, and Deckers, Colorado. The meetings had an open-house format and participants were free to review project maps and discuss ideas and concerns with project leaders.

Those attending these meetings were mostly residents who lived near Project Area attended the meetings in Buffalo Creek, Conifer and Deckers. The first of these two meetings drew only two individuals and the

final meeting drew eight. In general, those who attended supported the project and were very concerned with fire risk, especially those with vivid memories of the Buffalo Creek fire. One concern was that the proposed reclamation of unclassified roads would limit access within the Project Area. However, clarification that only roads that are currently closed would be reclaimed appeared to ease this concern.

Continued Involvement

Comments will also be solicited following publication of the EA. A 30-day comment period will start when the EA is published. The EA will be sent to those on the project mailing list that request a copy and will also be available for review at the South Platte Ranger District office.

INTERNAL SCOPING AND ISSUE IDENTIFICATION

The primary issues and goals for this project were determined by completing and reviewing the Upper South Platte Watershed Landscape Assessment (Foster Wheeler, 1999). Chapter 1, Purpose and Need, presents a summary of the Landscape Assessment. The public scoping and resulting issues were considered in order to develop alternatives. Internal scoping, which included participation of the Forest Service and the technical team completing the analysis, included recognition of the impending changes to the national roadless policy (Roadless Area Conservation Draft EIS, May, 2000).The public comment period on the Draft EIS was recently completed and the Final EIS is currently being prepared. None of the action alternatives would allow road construction in roadless areas in this Project Area. Regardless, the decision for the Roadless Area Conservation Proposed Rule will most likely not be issued until after the decision for this EA.

Scoping identified four key issues for alternative development. These issues and the objectives of the actions proposed by this EA to address the issues are presented in Table 2-1.

Table 2-1. Issues and Management Objectives for the Action Alternatives

Issue	Objectives for proposed actions
Deviation of the character and function of the forest from its historic condition.	Restore the Project Area to a more sustainable condition that emulates the historic functionality of the ecosystem, including reintroduction of the historical fire regime, where possible. Use timber harvesting, or vegetation treatments, to thin the forest and create openings that more closely emulate the historic vegetation patterns in treated areas.
The high risk of catastrophic wildfires due to the existing forest conditions.	Reduce the risk of large, intense wildfires that are outside of the historical fire regime and could put human life, water supplies, and property at high risk for loss or damage.
Excessive erosion, resource damage and stream sedimentation in the Project Area.	Reduce existing and potential stream sedimentation due to erosion and transport of the highly erodible soils throughout the Project Area. Specific objectives include improving the trail system to discourage use of social trails, and reducing erosion from the burn area and unclassified roads
Minimal management activity in roadless areas.	Minimal activity in the roadless area while striving to meet the project's objectives, including no mechanical entry or removal of harvested trees.

ALTERNATIVE DEVELOPMENT AND DESCRIPTIONS

Three alternatives (Alternatives A, B, and C) were developed in response to the issues identified during the scoping process, one of which is the proposed action (Alternative B). A primary goal for restoring the forest to a sustainable condition is to reduce tree density and create persistent openings in the forest canopy. The proposed action was designed to change the forest by thinning and creating openings over large areas. The other two alternatives include the "no-action" alternative and an action alternative that addresses the issue of activity in roadless areas.

ALTERNATIVE CONSIDERED BUT DROPPED FROM FURTHER ANALYSIS

One alternative, which was considered but dropped from further analysis, would have eliminated activity in all habitat for the pawnee montane skipper, a threatened butterfly. The alternative was dropped because it was determined that habitat could actually be improved through vegetative treatments. The US Fish and Wildlife Service was consulted on this issue. See Chapter 4, Environmental Consequences, for more information.

ALTERNATIVE A: NO ACTION

Key Issues

- **Satisfaction of NEPA requirements – no actions are proposed by this alternative**
- **No management activities in the roadless area**

Discussion and Description of Alternative

This alternative defers all U.S. Forest Service management decisions to some future date. The No-Action alternative, which is required by NEPA, addresses several of the issues and concerns expressed during scoping, such as no activity in roadless areas. The current forest management would be continued with no different action taken to reduce fire risks or stream sedimentation.

In the Buffalo Creek burn area, natural revegetation processes would be allowed to occur by relying on natural seeding. Riparian sediments would be stabilized over time by natural accumulation of woody debris and reforestation of the uplands under natural succession. The existing sediment deposits would gradually erode into streams until stabilized by natural processes.

Existing roads would be maintained as necessary to control erosion, including maintenance of drainage structures and use of vegetation. There would be no active road reclamation, except for the previous decisions in the Wildcat Area.

All designated trails would continue to be maintained to reduce erosion. There would be no additional trail improvements, except for maintenance of drainage structures and vegetation to control erosion

ALTERNATIVE B: PROPOSED ACTION

Key Issues

- **Deviation of the character and function of the forest from its historic condition.**
- **The high risk of catastrophic wildfires due to the existing forest conditions.**
- **Excessive erosion, resource damage and stream sedimentation in the Project Area.**

Discussion of Alternative

This alternative was designed to fully address the purpose and need. The overall concept of the alternative would be to meet the purpose and need for landscape restoration and catastrophic wildfire risk reduction by thinning, creating openings, and using prescribed fire. This approach would begin moving the area toward a more historical, mosaic pattern of vegetation than currently exists in the Project Area.

Large areas of dense forest would remain untreated. The openings and thinned forest would create firebreaks between areas of dense tree cover.

Table 2-2. Alternative Comparison of Proposed Activities

Proposed Action	Alternative A	Alternative B	Alternative C
Vegetative Treatment			
Thinning (acres)	0	13,400	Same as Alternative B
Openings (acres)	0	4,400	
Total treatment area (acres)	0	17,400	
Use of conventional log removal (acres)	0	8,600	8,600
Use of forwarders for log removal (acres)	0	3,000	500
Area of logs left on site (acres)	0	5,800	8,300
Buffalo Creek Burn Area Revegetation			
Area of planting in riparian zones (acres)	0	60	Same as Alternative B
Area of planting in uplands (acres)	0	1,000	
Use of biosolids as soil amendment	No	Yes	No
Road Reclamation			
Unclassified roads (miles)	0	25	Same as Alternative B
Use of biosolids as soil amendment	No	Yes	No
South Platte River Access Trail Improvements			
Trail improvements along South Platte River (miles)	0	7.5	Same as Alternative B

The current fire policy for the Project Area would remain. This policy requires controlling wildfires with emphasis on protecting property or developments. This would include crown fires, which are part of the historical fire regime, in areas of dense forest. However, the potential for large, catastrophic fires would be reduced in the Project Area due to openings and less dense forest conditions that would be created in the treatment areas.

The proposed harvesting would be completed without building new roads, permanent or temporary. Existing unclassified roads may be used to remove logs. These unclassified roads would be obliterated after use. The treatment areas were designed to use existing roads and stay on gentle slopes as much as possible. Off-road heavy equipment (skidders and forwarders) would be used as necessary to remove logs

from areas that are reachable by existing roads, eliminating the need to build access roads to these areas. Where the use of equipment is not feasible, logs would be left on-site.

The issue of stream sedimentation is also addressed through the landscape modifications, which reduce the risk of large-scale sedimentation from wildfire followed by flooding (see Background, in Chapter 1, Purpose and Need). Additional measures to reduce existing and potential future erosion problems include burn-area revegetation, road reclamation, and trail improvements. Soil amendments would be used to accelerate reestablishment of indigenous plant communities on reclaimed areas. These activities also address the issue of forest restoration.

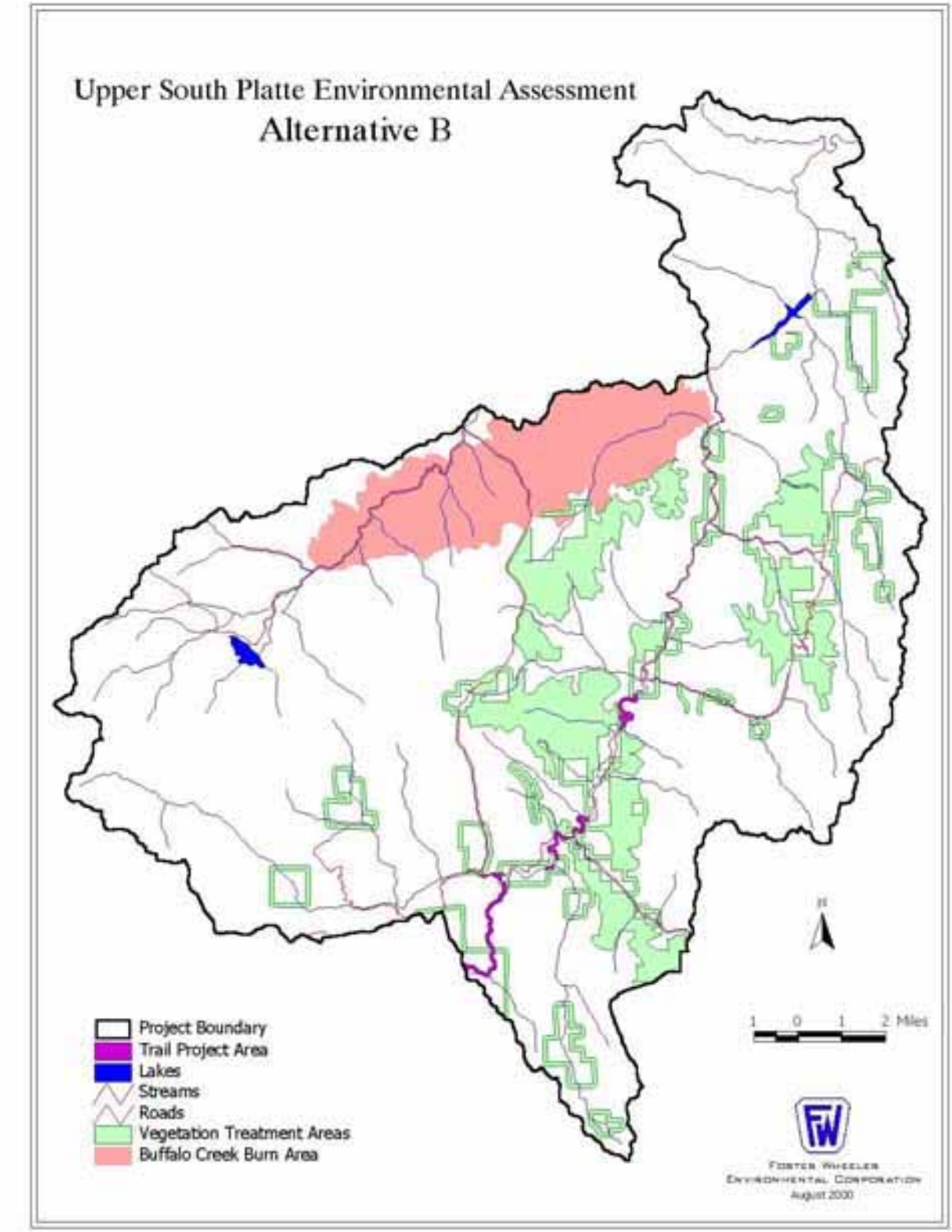
VEGETATION TREATMENTS

This alternative proposes to treat 17,400 acres of dense forest vegetation (Map 2-1). The forest would be thinned to a canopy closure of 25 percent on 13,000 acres. On the remaining 4,400 acres of treatment area, openings of 1 to 40 acres would be created. These openings would be dispersed within the thinned areas and would not be revegetated. The openings would be maintained by prescribed burns every 10 to 30 years, as appropriate. The thinning would be selective by age class and species to emulate the types of conditions found historically (see Background in Chapter 1, Purpose and Need). In all areas, the larger, more mature trees would typically be left. In most treated areas, ponderosa pine would be selected to remain, although some larger Douglas-fir may also be selected. The exception would be the Christmas tree cutting area near highway 126 where Douglas-fir are produced for Christmas trees.

Logs would be removed from approximately 11,600 acres of the treated area. Logs would not be removed from slopes that are too steep, are too far from existing roads, or have trees that are of little or no economic value. The areas where trees would be left on-site would be determined on the ground before harvest activities. Logs and slash left on-site would be crushed by the harvesting and yarding equipment. The slash and logs would then be allowed to dry for one to two years. At that time, burning would be prescribed to consume the most of the remaining downed materials.

The logging systems used would include both conventional systems and forwarders. Conventional systems would be used where there are existing roads (approximately 8,600 acres). In these areas, skidders would be used to yard the downed trees off the site. Skidders drag the trees, creating skid trails. Forwarders would be used in areas without existing roads that meet the criteria for removal discussed above (approximately 3,000 acres). Forwarders are larger machines and have 6 or more wheels. They pick the trees up off the ground and place them in a bunk so they do not drag on the ground. They can carry approximately 20 times the load of a skidder. This reduces the number of trips and associated disturbance. They do create paths or trails, similar to a skidder. Because of the way they can pick up and transport downed trees, forwarders create less disturbance than skidders, particularly where there are no roads to use as skid trails. However, forwarders are more expensive to use than skidders.

Private landowners would be consulted to determine if they are interested in having the National Forest land harvested around their property. If so, a 500-foot strip around their land would be treated using the above techniques. Landowners may be responsible for removing the trees, if they so choose. To be conservative in the analysis of effects, it is assumed that all property owners will choose this option. However, it is likely that many will choose not to have the harvest completed.



Map 2-1. Alternative B

The majority of the vegetation treatments would be located in MA 2B, Rural and roaded natural recreational opportunities or 7A, Wood-fiber production and utilization (66 percent, and 24 percent, respectively). There would be no treatment in the following MAs: MA 3A, Semiprimitive nonmotorized recreation in roaded or nonroaded areas; MA 8B, Primitive wilderness opportunities; MA 8C, Semiprimitive wilderness opportunities, MA 9A, Riparian area.

BUFFALO CREEK BURN AREA REVEGETATION

The objective of this proposed action is to reestablish vegetation on riparian and upland forested areas that have not successfully regenerated following the 1996 wildfire. Successful completion of this revegetation would reduce erosion from the exposed areas and subsequent stream sediment loading. The proposed activities would occur in Buffalo Creek and/or Spring Creek.

In the riparian areas, 60 acres of exposed sediments along streams and washes would be planted using certified weed-free indigenous plant material. Woody debris and boulders would be selectively placed in the stream channel to help stabilize the channel. The sediment deposits in the riparian zones would be reshaped as needed to facilitate plant reestablishment. In this alternative, conventional equipment would be used to complete this task.

In the upland areas, 1,000 acres of the burn area that have not successfully revegetated would be planted with ponderosa pine seedlings. In both the upland and riparian areas, appropriate types of biosolids would be used as a soil amendment to improve conditions for revegetation.

Suction dredging is also proposed in the Buffalo Creek stream channel as part of the monitoring program. A 100-meter section of the channel would be dredged to remove and measure accumulated sediments. The structure and composition of the stream channel would be assessed, both in the dredged area and in adjacent undredged areas. The objective would be to measure the effects of sediment on stream habitat. The removed sediments could possibly be used for road reclamation or would be disposed of off-site.

ROAD RECLAMATION

This alternative proposes to reclaim and make impassible 25 miles of non-system roads that are currently closed. These roads were built for various purposes, including historic logging and mining. The origins of some roads are unknown. Some are two-track roads with no drainage systems and no apparent standards. Because of the low standards with which many of these roads were built and poor or nonexistent drainage systems, these types of roads on the area's highly erodible soils are a particular problem for erosion.

The roads would be reclaimed by ripping and seeding the roadbeds, both for erosion control and to encourage revegetation. In this alternative, biosolids would be used to increase soil fertility. Existing culverts would be removed and self-maintaining drainage would be created. The first ¼ mile of each road may be obliterated and recontoured if needed to further discourage any use. Finally, trees would be felled across the roads throughout their length.

SOUTH PLATTE RIVER ACCESS TRAIL IMPROVEMENTS

The objective of this proposed action is to improve 7.5 miles of existing trail along the South Platte River to increase safety for hikers, anglers, create conditions that are sustainable for the trail system, and reduce soil erosion and vegetation loss. Many of the improvements would encourage hikers to remain along established trails and discourage use of social trails to access favorite areas. The actions that are proposed include:

- **Expand the existing trailhead and parking space at Wigwam Campground.**
- **Construct new trail between the end of the Gill Trail and Cheesman Dam.**
- **Upgrade the original Gill Trail to safer and sustainable conditions.**
- **Construct safe and sustainable river access trails to the South Platte River. This would include constructed stairways or hardened trails on the steepest trail sections.**
- **Construct barrier-free accessible fishing sites and trails from parking areas near the river.**
- **Reclaim existing social trails using conventional methods.**

ALTERNATIVE C

Key Issues

- **Deviation of the character and function of the forest from its historic condition.**
- **The high risk of catastrophic wildfires due to the existing forest conditions.**
- **Excessive erosion, resource damage and stream sedimentation in the Project Area.**
- **Minimal management activity in the roadless areas.**

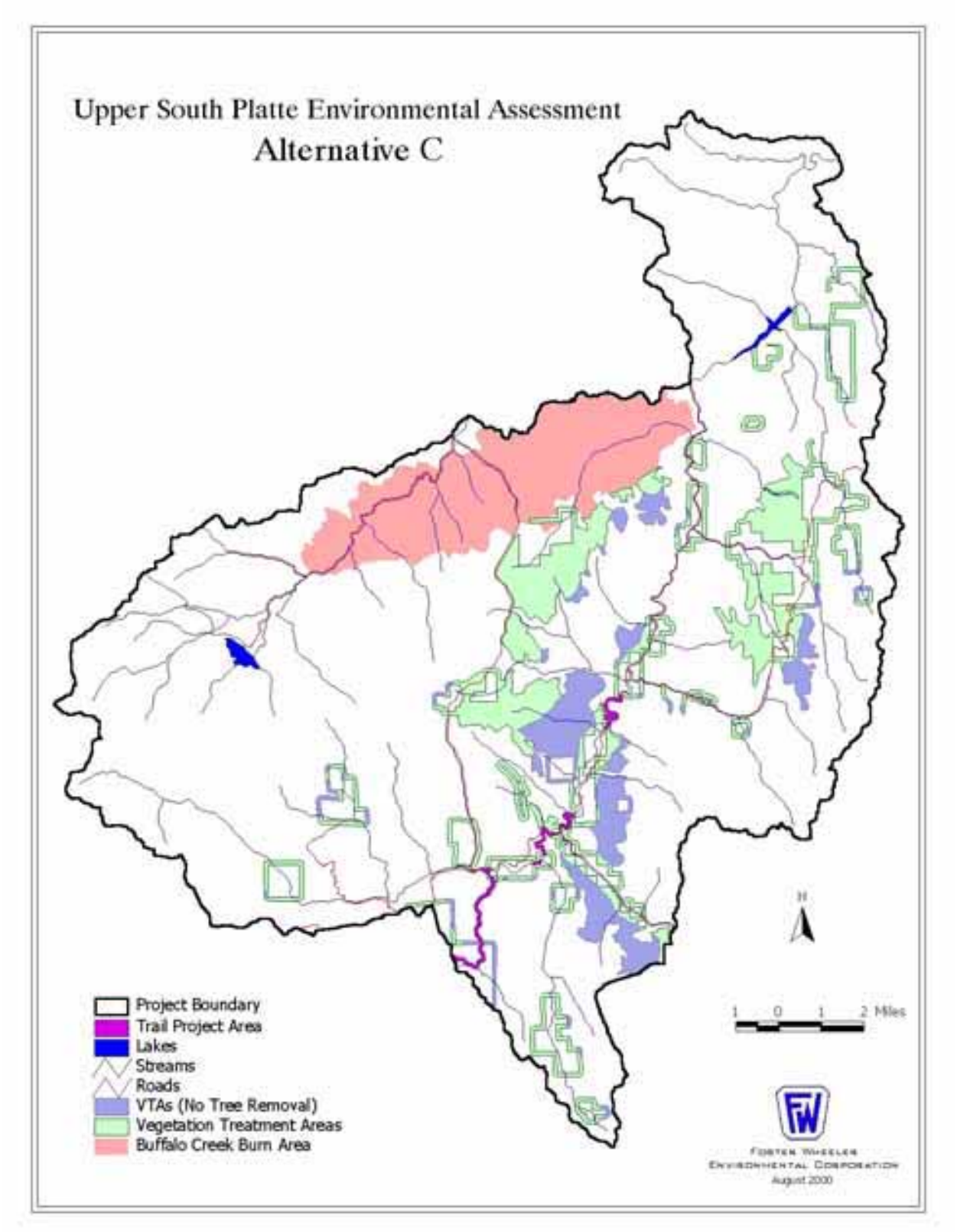
Discussion of Alternative

The overall concept of this alternative is the same as discussed for Alternative B. However, this alternative would minimize off-road heavy equipment use in the roadless area and use a slightly less intensive approach in other areas. The details of the two action alternatives are the same except for the differences discussed below. Roadless areas for this document include;

- **RARE II inventoried roadless areas plus**
- **All National Forest System unroaded areas of more than 1,000 acres that are contiguous to RARE II inventoried roadless areas or wilderness areas (see FR vol.64, o. 29, part 212).**

VEGETATION TREATMENTS

The amount and type of thinning and opening creation is the same as Alternative B. The difference is that there would be no removal of logs from the roadless area (Map 2-2). As in areas where logs are not removed in Alternative B, the logs in the roadless area would be allowed to degrade for one to two years. At that time, burning would be prescribed to consume the remaining slash and logs. Like Alternative B, this would also be the protocol for areas where logs are left on-site outside of the roadless area.



Map 2-2. Alternative C

BUFFALO CREEK BURN AREA REVEGETATION

This alternative proposes the same types of activities as Alternative B, except biosolids would not be used as a soil amendment to increase fertility for revegetation. Additionally, the sediment deposits in the riparian zone would be reshaped using hand tools only, rather than conventional equipment, such as backhoes. As in Alternative B, the objective would be to reshape the deposits as needed to facilitate plant reestablishment.

ROAD RECLAMATION

This alternative proposes the same activity as Alternative B, except biosolids would not be used to encourage vegetation of the road surfaces.

SOUTH PLATTE RIVER ACCESS TRAIL IMPROVEMENTS

This alternative proposes the same trail improvements as Alternative B.

ON-GOING OR FORESEEABLE FUTURE ACTIONS

The following projects are on-going or foreseeable future actions within or near the Project Area. The need to include these actions in the individual resource analysis is dependent on the cumulative effects area and duration of effects for each resource.

Colorado State Forest Service Projects

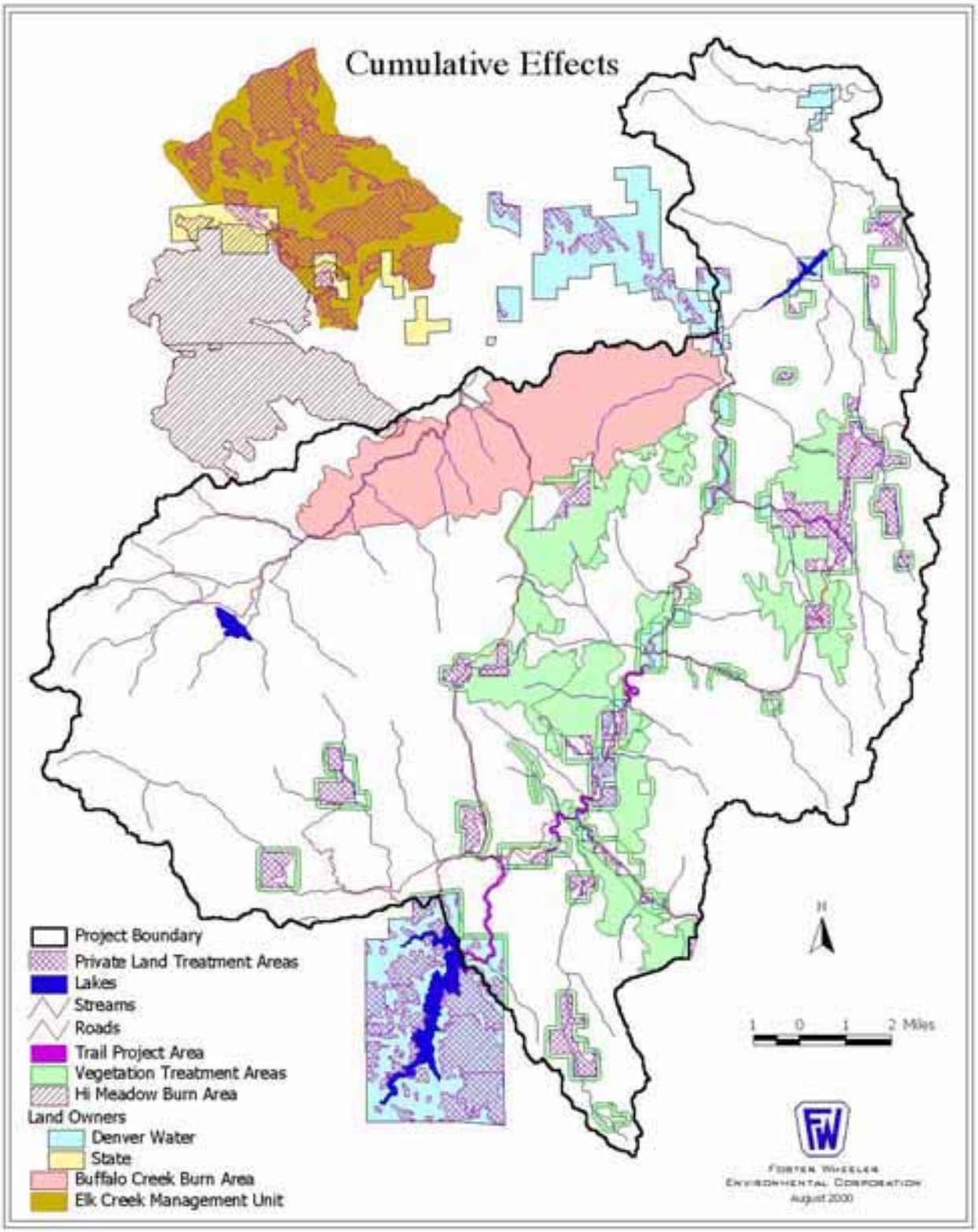
DENVER WATER

The Denver Board of Water Commissioners owns approximately 30,000 acres within the Upper South Platte Watershed. Within the Deckers-Waterton/Horse Creek project area, they are second only to the federal government in land ownership, with 2,845 acres. These lands are in various-sized parcels scattered along the main stem of the South Platte River and the North Fork of the South Platte River (Map 2-3).

Denver's interest and concern about fire and the need for vegetation and restoration management was graphically brought to point by the 1996 Buffalo Creek Fire and the ensuing floods. Their Strontia Springs reservoir received much of the sediment flowing from the burned landscape. They face future costs in the millions of dollars to restore the reservoir.

Denver became one of the founding partners in the development of the Upper South Platte Project. In March 1999, Denver Water contracted with the Colorado State Forest Service (CSFS) for the vegetation management of all of their lands within Colorado, approximately 55,000 acres. The contract prioritized management of Denver's lands within the Upper South Platte Watershed, and specifically in the Project Area.

Denver's management objectives for their lands include reducing wildfire hazards, reducing loss from insects and disease, improving forest health through harvest and prescribed fire, and re-establishing forest stands to better reflect historic conditions. They also have plans for managing noxious weeds and reducing active erosion.



Map 2-3. Cumulative Effects Map

To date the CSFS has completed several activities on Denver Water lands within or near the Project Area. These activities are listed in the Project File and will be considered by specialists for inclusion into the analyses of cumulative effects. The CSFS proposes treatment activities similar to the USFS proposal with the following differences:

- **Vegetation treatments would occur only on state or private land**
- **New temporary roads may be built to access unroaded private or state treatment areas. No new roads would be built across USFS land.**
- **The CSFS project area would include all private and state lands within the Waterton/Deckers/Horse Creek Watershed (EA Project Area) and the Lower Elk Creek Management Unit, Denver Water land surrounding Cheesman Reservoir, and Denver Water and state lands along the North Fork of the South Platte between Pine, Colorado and Strontia Springs Reservoir.**

The CSFS would focus treatment activities on Denver Water and state property. New roads would only be built if there were no existing roads to treatment areas and be reclaimed immediately after work was completed. These new roads would typically be short spurs less than 500 feet long. However, some areas on Denver Water property surrounding Cheesman Reservoir may require longer roads.

THE LOWER ELK CREEK MANAGEMENT UNIT

The Lower Elk Creek Management Unit includes approximately 10,000 of private and state lands. It is a highly-urbanized forest with a mixture of small-lot subdivisions, slightly larger ranchettes as well as a few remaining larger ownerships. The 1,120-acre Pine Gulch State Land is located along the southern boundary. The management unit is currently is experiencing considerable development pressure.

The Colorado State Forest Service will be the lead agency for planning, project development and implementation of activities within the Lower Elk Creek Management Unit. A major cooperator and partner in this effort is the Elk Creek Fire Protection District. Other cooperators include the Jefferson County Planning Department and Office of Emergency Management, the Colorado Board of Land Commissioners and Colorado Division of Wildlife.

A primary objective for this unit is reducing the threat of damaging wildfires. The recent Hi Meadow fire underscores this concern. The unit is highly developed with high human populations and the wildfire risk is high. This concern is shared by all partners. A management plan is being developed for this area. The start of project implementation is expected to begin sometime in the Fall of 2000. The types of management activities are likely to be similar to those proposed in this EA. A portion of the Lower Elk Creek Management Unit was burned in the Hi Meadow fire. Therefore, current management plans for vegetation treatment may need to be modified in areas of the burn.

U.S. Forest Service Projects

DOUGLAS-FIR/TUSSOCK MOTH TREATMENTS

In 1993 and 1994 there was an epidemic of the Douglas-fir Tussock Moth on National Forest land in the Pike and San Isabel National Forests. This epidemic caused heavy defoliation of Douglas-fir trees on 7,000 acres on the South Platte Ranger District (US Forest Service, 1996). Much of this defoliation

occurred in the Deckers/Waterton and Horse Creek watersheds. In response to this defoliation, the Forest Service salvaged trees on 116 acres and planned prescribed burning on approximately 14,000 acres. Currently, 1,000 acres of the planned burning and all of the salvage has been completed. The Forest Service plans to complete the remaining 13,000 acres of burning at some time in the future.

RAMPART RANGE MOTORIZED TRAILS

Off-highway vehicle (OHV) use within the Waterton/Deckers composite, Horse Creek, and Trout Creek subwatersheds has increased dramatically in recent years, resulting in vegetation loss, accelerated erosion and soil loss, degraded fish and wildlife habitat, and safety problems. There are over 76 miles of motorized trails within this area.

The Forest Service will develop a comprehensive trail management plan for the Rampart Range Motorized Recreation Area as well as an Environmental Assessment by May 2001. Improvement actions will include relocating trails away from sensitive and wet areas, surface hardening, repairing drainage problems, and reclaiming unauthorized trails. About 30 miles of trails will be relocated or improved within the watershed by fiscal year 2005. This project will help ensure a high quality and safe recreational experience while protecting sensitive resources such as water quality and wildlife habitat.

Status. Preliminary planning has begun.

NOXIOUS WEEDS

Leafy spurge, diffuse knapweed, yellow and Dalmatian toadflax, and Canada and musk thistles are noxious weeds along 25 miles of the South Platte River. These noxious weeds are less palatable to wildlife; are less effective in stabilizing soil, and often out compete native vegetation. The goal is to reduce the infested acres. Two hundred acres will be treated annually using chemical, biological, mechanical, and manual methods. Known infestation areas within the proposed vegetation treatment areas would be pretreated for noxious weeds.

Status. EA completed and FONSI/Decision Notice signed.

SUGAR CREEK RIPARIAN RESTORATION

This project would be a continuation of current District efforts to limit sediment entering Sugar Creek from Douglas County Road 67, immediately adjacent to the stream. Work would include riparian enhancement and road drainage improvements to reduce water velocities and sediment run-off. Additionally, changes in road maintenance methods by Douglas County would be encouraged or negotiated.

Status. Preliminary planning begun.

ADDITIONAL VEGETATION TREATMENT

After completion of the proposed action, the US Forest Service would mechanically treat additional vegetation in high fire risk areas in the project area. These future treatments will be more difficult because they would be in steeper and less accessible areas. Therefore, the US Forest Service would adapt the best vegetation treatment techniques developed during the first phase of work as proposed to subsequent treatment efforts.

Status. Preliminary planning begun.

CHAPTER 3
AFFECTED ENVIRONMENT

The affected environment discussion describes the physical and biological components of the environment that could be affected by implementation of the alternatives. The environment is described in terms of specific resources. This discussion sets the stage for a discussion of the environmental consequences and comparison of alternatives.

VEGETATION

This section discusses the existing condition of the forest vegetation on National Forest Lands in the Project Area, including current vegetation cover types, structural stages, and tree densities in the forested stands. The discussion also assesses potential and existing insects and tree diseases affecting forest stands, and the effects of past management activities on the forest vegetation. A comparison of the existing vegetation to historical trends is presented.

VEGETATION COVER TYPES

Existing Cover Types in Project Area

Cover types are used to describe the vegetation that currently occupies a site. They are named for the dominant species within a stand and represent the current species composition of an area. Table 3-1 presents the percentage of area occupied by each cover type for the National Forest Lands in the Project Area.

The dominant cover types found in the Project Area are ponderosa pine and Douglas-fir. These two cover types combined cover 81 percent of the area. Spruce-fir, lodgepole pine and aspen forest cover types are the next most common cover types, although combined occupy just less than 10 percent of the Project Area. Shrublands cover eight percent of the area.

The following discussion of describes the ponderosa pine and Douglas-fir cover types. These two cover types are the focus of the restoration activities in terms of species, as well as occupying the majority of the Project Area. A detailed discussion of the other primary cover types (occupying more than one percent of the Project Area) can be found in the project record.

Table 3-1. Percent of Area by Cover Type

Cover Type	Area (%)
Ponderosa Pine	42.0
Douglas-fir	38.7
Shrub	7.9
Spruce-Fir	5.1
Lodgepole Pine	2.6
Aspen	1.9
Pinyon-Juniper	0.8
Water/Rock	0.5
Grassland	0.4
Limber/Bristle Cone Pine	0.1

PONDEROSA PINE COVER TYPE

The ponderosa pine cover type is the most common cover type in the Project Area, occupying 42 percent of the National Forest Lands. It is found between 6,500 and 10,000 feet in elevation. Many of the ponderosa pine stands are pure stands, however, some stands include Douglas-fir, aspen, pinyon pine, juniper, and oak brush (Foster Wheeler, 1999).

Ponderosa pine has many fire-resistant characteristics. Pole sized and larger trees are temperature resistant due to insulative bark and the tendency for the meristems to be shielded by needles and thick bud scales. Ponderosa pine seedling establishment is favored when ground fires remove the forest floor litter and expose mineral soil. However, for successful natural regeneration, a good seed crop and ample moisture the spring following seed fall are also needed. These conditions coincide rather infrequently in the Project Area (Foster Wheeler, 1999).

Ponderosa pine is a climax species on many of the sites it occupies in the Project Area. A climax species is the type of vegetation community that will, overtime, come to dominate a particular site in the long-term absence of major disturbances. Some areas that have experienced hot wildfires may persist as brush or grass for extended periods, but appear to eventually convert to ponderosa pine as the dominant tree species. Historically, ponderosa pine tended to dominate even on some sites where it was not the true climax species. Reoccurring disturbances such as wildfire and insect and disease infestations would often favor ponderosa pine over more shade tolerant species on these sites.

DOUGLAS-FIR COVER TYPE

The Douglas-fir cover type is nearly as commonly found as ponderosa pine, occupying 39 percent of the Project Area's National Forest Lands. This cover type typically occurs on the moister aspects in the montane zone (6,500 feet to 10,000 feet in elevation). It is found on many of the steeper north and east

facing slopes and is often associated with ponderosa pine. It is also found in sparse stands on some south-facing slopes.

Mature Douglas-fir trees are relatively fire-resistant. Older trees have a thick layer of corky bark that provides protection against fire. However, when younger, this species has a tendency to develop branches and streaks of resin on the lower bole that can provide a mechanism for serious fire injury. Young Douglas-fir saplings have thin photosynthetically active bark, resin blisters and closely spaced flammable needles all of which make them susceptible to injury from surface fires. Dense sapling thickets can form an almost continuos layer of flammable foliage that will support wind driven crown fires and provide a route by which surface fires can reach the crowns of larger, mature, overstory trees.

Douglas-fir is a long-lived climax species on many sites in the Project Area. The species will continue to be a dominant component of these stands in the absence of a major disturbance. However, in the absence of fire suppression, the historical fire patterns typically kept the percentage of this cover type at a lower level and primarily relegated to moist north-facing slopes that were typically missed by periodic fire.

Historical Cover Types and Comparison to Existing Conditions

There is probably a greater proportion of the Douglas-fir cover type in the Project Area today than would have existed under historical disturbance regimes. More of these stands were most likely historically dominated by ponderosa pine. Research indicates that the period without fire in much of the Project Area is longer than any fire free period prior to European settlement (Brown et al, 1999). More frequent fires in the pre-European era may have limited the amount of this cover type by killing younger understory Douglas-fir trees and reducing the amount of Douglas-fir that reach maturity.

Additionally, the density of the existing forest (see below, Vegetation Density) encourages development of a shade tolerant understory. Douglas-fir is a more shade tolerant species than ponderosa pine and can become established in the understory on many sites. The open forest conditions that were more typical historically would have been less favorable to development of this kind of understory.

HABITAT STRUCTURAL STAGES

Habitat structural stages describe the current successional stages of the vegetation, corresponding primarily to stand age and tree size. Table 3-2 displays the percent of the Project Area's National Forest Lands for each habitat structural stage. Below is a brief description of each of these stages

Grass-forb - Areas with no established tree or shrub cover.

Seedling-shrub - Areas that are predominantly shrub or tree seedlings

Sapling-pole stands - Tree stands that are dominated by small to medium sized trees ranging from 1 to 9 inches in diameter.

Mature stands - Older forest stands in which the average growth rate has begun to decline. Trees in this category are generally 9 inches in diameter or bigger.

Old growth stands - much older forest stands. The growth in the stands has essentially stagnated. There are larger trees present where the diameter may exceed 18 inches, but may also include very old smaller trees. Generally, the majority of the trees have declining crowns and much dead and down tree debris will be evident.

Mature and old growth forest cover 82 percent of the National Forest land in the Project Area. Young sapling-pole stands cover 15 percent of the area and less than two percent is occupied by the more open grass-forb and seedling shrub structural stages. The forest vegetation of the area is clearly dominated by older mature forest stands.

Table 3-2. Percent of National Forest Land within each Habitat Structural Stage

Structural Stage	Area (%)
Grass-forb	1.2
Seedling-shrub	0.6
Sapling-pole	15.3
Mature	79.1
Old Growth	2.9
Unknown	0.3

Although the habitat structural stages are based primarily on physical characteristics rather than age, in general, the older trees found in these old growth stands are 200 years in age and older and the mature forest stands are around 150 years old. Sapling-pole stands range in age from 30 to 100 years and older. Seedlings represent the 1 to 30-year age group. The areas in the grass-forb stage are areas where there has not been any recruitment of tree species.

The effects of logging, grazing and fire suppression have contributed to the dominance of the mature structural stage. Logging and fire suppression began during the late 1800's. This was followed by heavy unregulated grazing in the area from the late 1800's to the mid-1900's (Kaufmann et al, submitted). Logging eliminated a large portion of the old growth in the ponderosa pine and Douglas-fir forests as well as some of the old growth in lodgepole pine and spruce-fir forests. Trees growing in the openings created by logging did not have to compete with larger trees, and fire suppression kept natural fires from reducing their growth or eliminating them. Grazing reduced the amount of competing grass in the area, which may also have aided the survival of the trees that developed during this time. Grazing may also have helped to reduce the number of wildfires by reducing the amount of fine fuels needed to ignite a fire. These land use practices created conditions where a larger proportion of the new trees reached maturity than would have under historical disturbance regimes while at the same time eliminating some of the oldest stands in the area (Foster Wheeler, 2000).

VEGETATION DENSITY (CROWN CLOSURE)

In addition to the species composition and successional stages, stand density is a key attribute used to describe the current condition of the vegetation. There are many different ways to measure stand density. For this assessment crown closure is used. Crown closure is the percent of a fixed area covered by the

vertical projection of the outermost perimeter of the tree. The total crown closure of an area can not exceed 100 percent. Kaufman (personal communication, 2000) in his research of historical conditions in the Project Area has estimated that under pre-European conditions, the typical crown closure averaged around 30 percent. Today, 63 percent of the area has a crown closure of 40 percent or greater. In mature forest stands on National Forest land, 80 percent of the stands have a crown closure greater than 40 percent.

It is apparent that much of the Project Area is occupied by dense, mature stands of ponderosa pine and Douglas-fir. The pattern of the vegetation that characterizes the landscape today is much different from that which was present prior to European settlement. Evidence indicates that the historical landscape was much less uniform and contained a greater number of openings and lower stand densities (Kaufmann et al., submitted). The ponderosa pine and Douglas-fir stands that occupied the area prior to European settlement were probably more variable with a greater range of successional stages and crown closures found across the landscape (Foster Wheeler, 1999).

FOREST INSECTS AND DISEASE

Several insects endemic to Colorado forests are present in the Project Area's stands. High populations of defoliating insects and bark beetles can cause substantial tree mortality, but will hardly be noticed when low populations are present. In general, older, denser stands tend to be more susceptible to insect and disease attack. This is because higher tree densities create greater demand for limited sunlight, water, and nutrients on a site. This competition places the trees within dense stands under stress. Trees under stress are less able to resist attack by insects and disease.

Research indicates that, in this area, forest insects and diseases have historically played a part primarily in the development of individual stands. Across the landscape, fire has been the major disturbance agent of the area's montane forests (Foster Wheeler, 1999). Insects and diseases may have played a more important role within the subalpine forests. While stand replacing fires were a major disturbance agent in the subalpine zone, there is also evidence of periodic large epidemics of bark beetles in the area's spruce-fir and lodgepole pine forests.

Defoliators

Defoliators are a group of insects that feed upon the tree foliage. Under endemic populations damage from this group of insects is minor. However, under epidemic populations heavy defoliation can cause tree mortality. Outbreaks of defoliators are characteristically sporadic. Initially, there is a gradual build up of the insect population with little noticeable effect on the host trees. Then there is acceleration in the population growth and defoliation becomes apparent. During the peak of the outbreak defoliation can be extensive and may result in large-scale host mortality. Finally, there is an abrupt decline in the population. Declines in population are usually the result of a combination of factors including; starvation and reduced reproductive capacity due to reduced food availability, adverse climatic and environmental conditions, and increased predation and disease.

In 1993 and 1994 the South Platte Ranger District of the Pike National Forest had an outbreak of Douglas-fir tussock moth. The larva of this insect feeds primarily on the foliage of Douglas-fir trees but will also feed on ponderosa pine when intermixed in the stand. This outbreak caused severe defoliation on approximately 7,000 acres across the District, some of which is in the Project Area. Many of the

defoliated trees have subsequently died and have added pockets of heavy fuels to the landscape. This epidemic was one of the largest recorded for Douglas-fir tussock moth in the state of Colorado (U.S. Forest Service, 1996). Outbreaks of this insect tend to develop explosively and then after about three years subside abruptly. Dense, multi-storied stands of predominately Douglas-fir are most susceptible to attack by this insect.

Other important defoliators that are endemic to the coniferous forests within the Project Area include the western spruce budworm and the pandora moth. Currently, defoliation by these two insects is not apparent within stands of the area.

Bark Beetles

Bark beetles can be major disturbance agents in western coniferous forests. Outbreaks of these insects have historically killed thousands of acres of forest. In forests of the western United States, four species of bark beetles have caused the greatest amount of mortality (Furniss and Carolin, 1977). These include the western pine beetle, mountain pine beetle, Douglas-fir beetle, and the spruce beetle. In addition, several species of beetle within the *Ips* genus are important insects within coniferous forests of the western United States. All of these bark beetles are endemic to the Project Area. Under endemic population levels, mortality caused by these insects is widely scattered, affecting only individual trees or groups of trees. Under conditions favorable for the beetles, epidemics may develop and spread, killing large areas of forest. Outbreaks often occur when conditions are adverse for the host trees, as during drought years or under high stand densities. Healthy trees may be able to resist attack by bark beetles by expelling them with pitch. Host trees under stress are less able to produce pitch and resist attack.

Mistletoes

Dwarf mistletoes are the most serious parasitic higher plants in North America (Manion, 1981). Most species of dwarf mistletoe are host specific, which means that only one or two tree species may be affected by any one species of dwarf mistletoe. Effects of these parasites include mortality of older trees, growth reduction, growth deformities, and an overall reduction in host vigor. Heavy infections of mistletoe are common in lodgepole pine stands on the Pike and San Isabel National Forests (Foster Wheeler, 1999). Pockets of mistletoe infected trees are also present in the ponderosa pine and Douglas-fir stands in the Project Area.

PAST MANAGEMENT PRACTICES

Many forested landscapes in the western United States have changed from their condition prior to European settlement. Disturbance is a natural part of all ecosystems. However, logging, grazing, and fire suppression since the late 1800's has changed the pattern of disturbance for many of the forests in the Rocky Mountain region. These changes in disturbance regimes have resulted in conditions outside the natural range of variability (Kaufmann et. al., submitted).

Logging and Livestock Grazing

Logging during the late 1800's removed many of the older trees present at that time. Heavy grazing during the late 1800's and early 1900's reduced the amount of grass in the area. The subsequent

regeneration of areas logged during this period produced many of the stands present in the area today. Competition for sunlight, water and nutrients on these sites was lessened by the removal of the large trees and the reduction in the amount of grass. These conditions would have favored the establishment and growth of young tree seedlings. Heavy grazing during this time also reduced the number of wildfires by eliminating the fine fuels needed to ignite a fire. With fewer wildfires, more of the seedlings were able to mature than would have under the historical fire regimes. These changes contributed to the establishment of the denser more uniform stands in the area today.

Fire Suppression

Periodic forest fires are part of the natural environment. Fire undoubtedly played an important role in shaping the historical structure and composition of the area's forest stands. Recurring disturbances by fire are essential to the functioning of many forested ecosystems. The role of fire in many forested landscapes has been undergoing change since human intervention began to play a more active role in managing natural resources. This is true for the forested areas of the Upper South Platte watershed. There is much evidence that the historic landscape consisted of many more openings, fewer trees, and a greater diversity of stand structure (Kaufmann, et. al., submitted). There is also evidence that historically fires burned more frequently in the ponderosa pine forests. These fires often killed some trees by spreading into the crowns. Crown fires played a critical role in maintaining the open structure of the forest. The open structure in turn helped to limit the extent of the wildfires by creating natural fuel breaks.

Research conducted near Cheesman Lake, adjacent to the Project Area, indicates that historic fire regimes in the ponderosa pine forests were quite variable (Brown et.al., 1999). Fire sizes ranged from individual trees to the entire landscape. Intervals between fires ranged from as frequent as every three years on some sites to more than 100 years in other areas. Fire severity was also variable with both surface fires and widespread stand replacing fires occurring (Brown et.al., 1999).

Fire suppression over the last 100 years has been a factor in the establishment of denser, more uniform stands with fewer openings, a greater proportion of understory trees and an increase in the Douglas-fir cover type. The small understory trees serve as ladder fuels permitting surface fires to climb into the tree canopy and become crown fires. The uniformity and density of the forest across the landscape allow crown fires to burn over extensive areas. In 1996, 12,000 acres burned in the Buffalo Creek area. This was a hot fast moving crown fire. Because of the current forest conditions, large crown fires are likely to occur elsewhere in the Project Area over time.

Current forest stand conditions within the montane zone of the Project Area may be favorable to more frequent and extensive insect and disease outbreaks in the future. Trees in high-density stands are under competitive stress. Trees that are under stress are less able to resist attack by bark beetles and are more susceptible to defoliators and other forest pathogens.

SPECIAL PLANTS

Special plants that are considered in this EA are listed in Table 3-3. These plants include two federally listed plants and 22 forest sensitive species. Of these 24 species only two would potentially be present in the vegetation treatment areas or other activity areas. Those two are associated with riparian/wet habitats and would likely be protected by proposed buffers. Ute's ladies tresses orchid, federally listed as threatened, has an upper elevation limit of 6,500 feet that would exclude it from occurrence in the

vegetation treatment areas. Addersmouth is found along streams in mosses where it is kept wet by spray from streams. The nearest known addersmouth population is near Bailey in Park County. No effects to special plants are expected and these species are not discussed further in this EA.

EXOTIC AND INVASIVE PLANTS

Exotic and invasive plants (noxious weeds) are alien species that are deemed detrimental to economic crops, can carry diseases or insects, poisonous to livestock, and may be detrimental to an agricultural or environmentally sound ecosystem (US Forest Service, 1998). They are typically introduced to an area, often times from a different continent, and would not occur there in an undisturbed natural habitat. Noxious weeds can be very disruptive, and have potential to take over complete plant communities. The control of these species is very difficult, due to their ability to adapt to an ecosystem relatively quickly. A management plan for the Pike and San Isabel National Forests and the Cimarron and Comanche National Grasslands is currently in place for the control of noxious weeds. This plan identifies the preferred way to control these species.

Exotic and invasive plant species that occur or are likely to occur in the Project Area were identified as target species. Table 3-4 presents the species and their preferred habitat and elevation range. Several of the species listed above have become common invasive plants in burned areas (Buffalo Creek burn area), out-competing native plants and reducing forage value. There have been extensive efforts to combat their spread. The species that have been noted in burned areas include leafy spurge, kochia, salt cedar, defuse knapweed, Canada thistle, musk thistle, yellow toad flax, and Russian thistle.

Mitigation measures designed to limit the introduction and spread of noxious weeds in the Project Area are proposed in the Wildlife section in Chapter 4. The use of these mitigation measures combined with the noxious weed management plan would minimize the effects of noxious weeds. Noxious weeds are not discussed further in this EA.

Table 3-3. Sensitive Plant Species Potentially Occurring in the Project Area

Species	Scientific Name	Status	Present in Vegetation Treatment Areas?
Penland eutrema	*Eutrema penladii*	T	No
Ute ladies' tresses orchid	*Spiranthes diluvialis*	T	Yes
Addersmouth	*Malaxis brachyopoda*	Sensitive	Yes
Altai cottongrass	*Eriophorum altaicum*	Sensitive	No
Colorado false needle grass	*Ptilagrostis mongholica*	Sensitive	No
Colorado tansy-aster	*Machaeranthera coloradoensis*	Sensitive	No
Degener's penstemon	*Penstemon degeneri*	Sensitive	No
Globe gilia	*Ipomopsis globularis*	Sensitive	No
Great-spurred violet	*Viola selkirkii*	Sensitive	No
Greenland primrose	*Primula egaliksensis*	Sensitive	No
Hall fescue	*Festuca hallii*	Sensitive	No
Livid sedge	*Carex livida*	Sensitive	No
Molybdenum milk-vetch	*Astragalus molybdenus*	Sensitive	No
Myrtle-leaf willow	*Salix myrtillifolia*	Sensitive	No
Narrow-leaved moonwort	*Botrychium lineare*	Sensitive	No
Northern blackberry	*Rubus arcticus*	Sensitive	No
Pale moonwort	*Botrychium pallidum*	Sensitive	No
Reflected moonwort	*Botrychium echo*	Sensitive	No
Rolland's bulrush	*Scirpus rollandii*	Sensitive	No
Sea pink	*Armeria maritima siberica*	Sensitive	No
Smith's whitlow-grass	*Draba smithii*	Sensitive	No
Smooth rockcress	*Braya glabella*	Sensitive	No
Weber's monkey-flower	*Mimulus genniparus*	Sensitive	No
Wooly willow	*Salix lanata*	Sensitive	No

Sensitive = Region 2 Forest Sensitive Species

T = Threatened

Table 3-4. Noxious Weeds of Concern in the Project Area

Noxious Weed Species	Place of Origin	Elevation Range (ft)	Examples of Preferred Habitat
Canada Thistle	Eurasia and North Africa	4,000-9,500	Open meadows, ponderosa pine savannas, roadsides, fields, pastures and other disturbed areas. Prefers rich, heavy and dry soils. Does not tolerate water-logged or poorly aerated soils.
Dalmation Toadflax	Southeastern Europe – Mediterranean Region. Introduced to North America as an ornamental	5,000 - 6,500	Oak, aspen, sagebrush, mountain brush, and riparian communities on roadsides, rangeland, waste places, cultivated fields, and semi-arid regions. Tolerates low temperatures and coarse textured soils.
Diffuse Knapweed	Eurasia	NA	Readily colonizes a wide range of soils.
Downy Broam	Eurasia and Mediterranean	4,000 - 9,000	Roadsides, waste areas, pastures, rangelands. Also occurs in open slopes, sagebrush, pinyon/juniper, and less commonly, aspen and conifer communities. Does not tolerate heavy soils
Field Bindweed	Europe – thought to have been introduced in wheat from Turkey	4,000 - 10,000	Common on roadsides, very adaptable. Prefers rich somewhat sandy and basic soils.
Houndstongue	Europe	5,000 - 9,000	Usually found in pastures, waste fields, and bare and disturbed patches of stony or sandy ground. Prefers gravely, somewhat limey soils.
Kochia	Europe	up to 8,500	Roadsides, waste places, fields
Leafy Spurge	Europe	5,000 - 6,500	Prefers open habitats, roadsides, waste areas, pastures, cultivated fields, irrigation ditches, disturbed sites, rangelands, fields etc. Tolerant of wide range of conditions.
Musk Thistle	Southern Europe and western Asia	NA	Disturbed sites along roads, fields, pastures spreading into sagebrush, pinyon juniper and mountain brush communities. Prefers dry, gravely soils and very abundant on fertile soils.
Russian Knapweed*	Europe	4,500 - 7,500	Roadsides, waste areas, cultivated fields, fence rows, ditch banks. Very adaptable and difficult to control
Russian Thistle	Eurasia	up to 8,500	Wide variety of habitats. Dry plains, cultivated fields, waste places, roadsides. Adapted to disturbed land
Salt Cedar	Eurasia and Africa – introduced as an ornamental shrub in early 1800s	NA	Disturbed and undisturbed streams, waterways, bottomlands, banks, and drainage washes. Also moist rangelands and patures. Seedlings require saturated soils. Tolerates highly saline soils and alkali conditions.
Spotted Knapweed	Europe – Introduced as contaminant of alfalfa and clover seed	NA	Includes habitats dominated by ponderosa pine and Douglas-fir as well as foothill prairie habitats. Found in light, porous fertile, well-drained and often calcareous soils in warm areas.
Hoary Cress	Europe – Introduced in alfalfa seed	3,500 - 8,500	Waste places, cultivated fields, pastures. Vigorous growth on irrigated alkaline soils
Yellow Toadflax	Eurasia – escaped as an ornamental	6,000 - 8,500	Waste places, pastures, roadsides, cultivated fields, meadows and gardens. Occurs in a wide variety of habitats but is limited in wet or dark conditions. Occurs mostly on sandy/gravely soils, but also common on chalky soils.

* Considered a serious noxious weed due to difficulty of control and eradication and is one of four plants that must be managed in accordance with the Colorado Weed Management Act.

SOIL RESOURCES

INTRODUCTION

Soil development and stability in the Upper South Platte Watershed have changed due to human influences. Early grazing practices caused accelerated erosion and loss of soil productivity in the past 100 years (Foster Wheeler, 1999). The development and stability of soils is variable and dependent upon climate, parent material, time, vegetation, topography and the size and intensity of the disturbance. The parent material of most of these watersheds is granite, which weathers to coarse gravel and fine sand in the soil profile. The coarse textured parent material provides a moderately acidic substrate for soil development which generally tends to be weakly developed and sandy to gravelly textured. The soils that develop on these coarse textured parent materials are all highly susceptible to erosion when exposed to direct impact of rain and wind.

HISTORY OF SOILS AND MANAGEMENT IN PROJECT AREA

It is likely that in the past soil erosion patterns varied temporally and spatially in the Upper South Platte Watershed. Patterns of disturbance relative to time are difficult to reconstruct historically, but are probably correlated to long-term climatic events such as major storms and the frequency of disturbance of the vegetation with fire. From a spatial standpoint, Bovis (1974, 1978) examined the spatial variation of soil movement rates along the Colorado Front Range and found that:

- **maximum soil movement in the forested areas of the Front Range occurred during the summer months due to intense summer rainstorms;**
- **maximum soil loss occurs in sparsely vegetated lower montane woodlands, and;**
- **variability in soil mobilization rates within a site are often great, suggesting that microscale controls are important.**

The key processes controlling soil disturbance processes contributing to soil erosion in the Project Area are eolian (the effects of wind) and fluvial (the effects of water). The degree to which these processes contribute to erosion is a function of local climate, topography, parent material and time. The influence of humans on the landscape has been extensive in some areas. It is well known that Native American communities practiced fire management of the landscape to enhance wildlife habitat and harvesting. It can be estimated that most of the Native American impacts ended by 1870. In general, fire suppression during the post-European period has reduced the frequency of soil disturbance.

The Upper South Platte Watershed Landscape Assessment (Foster Wheeler, 1999) concluded the watershed as a whole is highly susceptible to erosion and that human modifications to the landscape have increased the erosion potential in some areas. Grazing practices are responsible for most of the management-related erosion that has occurred in the South Platte Watershed (Sullivan, 2000). Road and trail networks can also cause detrimental soil compaction, which reduces or eliminates infiltration of surface water into the soil column. During rain or snowmelt, decreased infiltration capacity increases the amount of sheet erosion, which can lead to rill and gully formation. The network of roads and trails can re-focus overland flow, rills and streamlets into artificial flow networks that move water and soil downslope. Poor maintenance of road drainage ditches can lead to hypersaturation of road-fill in areas, potentially causing slope failure for certain finer-textured materials. Land use such as timber harvest, grazing, suburban and rural development, mining and farming are all activities that may increase compaction, and displace or remove nutrient rich organic and mineral layers from the soil. The cumulative effect may leave soil layers in an unprotected state, much more susceptible to future erosion events and soil loss.

POTENTIAL FIRE EFFECTS TO SOIL

Wildland fire can have negative impacts on soils and expose soil to the forces of erosion. Lower intensity/severity prescribed fire will have less impact on soils than high intensity and severity wildfires. Soil should be viewed as both a habitat and selective growth medium when analyzing the effect of fire. Soils contain the seeds of prior successional stands. Severe fires tend to kill a very high percentage of these dormant seeds, while lower intensity fires merely scarify seed coats of many fire-adapted species allowing them to germinate during the next growing season. In the Upper South Platte Watershed, the greatest fire hazard (over 80 percent of the watershed area with a high hazard) occur in the Horse Creek watershed, and Pine Creek, Stevens Gulch, Sugar Creek, and Upper Basin subwatersheds of the Waterton-Deckers watershed.

High severity burn areas experience higher rates of soil loss from erosion (McNabb and Swanson, 1990), increased peak flows of runoff, greater duff reduction, loss in soil nutrients (Harvey et al 1989)., and soil heating (Hungerford et al., 1991). Water and sediment yields may increase as more of the forest floor is consumed (Robichaud and Waldrop 1994, Soto et al, 1994; Wells et al, 1979). If the duff and organic layers of the soil are consumed by the fire and the mineral soil is exposed, soil infiltration and water storage capacities of the soil are reduced (Robichaud, 1996). These impacts may last weeks or decades, depending on the fire severity and intensity, any remedial measures, and the rate of vegetative recovery (Baker, 1990).

Hydrophobicity is a phenomenon by which intense surface fires lead to the formation of water-repellant layers in the soil. Hydrophobicity interferes with and reduces the soil's infiltration characteristics. DeBano (1975) has found that water repellent layers may be thicker and more intense in coarser soils under coniferous forests. In a qualitative sense hydrophobic soils probably increase the net surface erosion of soils by retarding infiltration and thereby increasing sheet wash. The condition may be relatively short-lived following fire, which may limit the extent of erosion (Morris and Moses, 1987; DeBano and Rice, 1973). However, hydrophobic soils played a role in the flooding of Buffalo Creek after the 1996 wildfire (Sullivan, 2000).

The greatest erosion risk in the Project Area (over 80 percent of the watershed with high to extreme erosion risk) occurs in the Bear Gulch and Cottonwood Gulch subwatersheds of the Waterton-Deckers

watershed. In the Landscape Assessment (Foster Wheeler, 1999), 50 percent of the Waterton/Deckers watershed, 56 percent of the Horse Creek watershed, and 42 percent of the Buffalo Creek watershed were determined to have a high to extreme susceptibility to soil loss following wildfire

Geomorphic investigations in the Buffalo Creek area (Jarrett, 1999) in the burned and unburned areas indicate at least 10 fire/flood sequences in the past 2,500 years have occurred prior to the 1996 Buffalo Creek fire. At least one event was larger than the July 12, 1996 flood. Several of the prehistoric fires produced much thicker alluvial deposits than did the 1996 fire. Hillslope erosion following wildfire and high rainfall events appears to be a major source of sediment to the drainage network.

Morris and Moses (1987) documented soil movement following forest fires in five ponderosa pine forested catchments along the Colorado Front Range. They concluded that wildfire disturbances might account for a large portion of the long-term sediment yield from Front Range hillslopes. Other studies suggest that high-severity wildfires can increase post-fire erosion rates by one or more orders of magnitude. Many of these processes interact to change the hydrologic regime from little or no surface runoff in the unburned condition to large amounts of overland flow from moderate- to high-intensity rainfall events. The removal or reduction in vegetation and formation of less permeable soils can increase surface runoff and overland flow. This runoff then acts as a force to cause the detachment and transport of sediment. The sediment-laden flows may then induce sheetwash, resulting in torrents and flows. As these mass movements of soil travel through the stream network they can bury riparian communities and intensify bank scour and erosion, which increases the volume of sediment delivered further downstream. Ultimately, the result may be downstream flooding and extensive damage to life and property.

The literature suggests that, in contrast to intense wildfires, low or moderate intensity burns generally do not cause a corresponding increase in runoff and erosion (e.g., Robichaud and Waldrop, 1994). Thus a reduction in existing fuel loadings by prescribed fire or other treatments should greatly reduce the threat of high-intensity wildfires and the associated risks of flooding, erosion, and downstream sedimentation.

SOIL DESCRIPTIONS

The soils that could be affected by the proposed actions consist of predominantly two general soil mapping units: the Sphinx-Legault-Rock Outcrop and the Security-Cathedral-Rock Outcrop. In some valley bottoms, there are also soils originated from alluvium.

The Sphinx-Legault-Rock outcrop soil map unit covers most of the Project Area with the exception of the most northeastern portion. This soil unit occurs on slopes of 15 to 80 percent. This map unit consists of approximately 50 percent Sphinx soils, 20 percent Legault soils, 15 percent rock outcrop, and 15 percent other soils of minor extent. The Sphinx soils are coarse textured, shallow and somewhat excessively drained. They formed in material weathered from Pike Peak granite on mountainsides. The surface layer is gravelly coarse sandy loam. Permeability is rapid and the available water capacity is low. Runoff is moderate to rapid and the hazard of water erosion is moderate to severe depending on slope. The Sphinx soil supports ponderosa pine and Douglas-fir communities. The Legault soil is a dark grayish brown, very gravelly coarse sandy loam that has also formed from weathered Pike Peak granites. It is found on north-facing aspects and higher elevations of the mountainsides. Permeability is moderately rapid, and the available water capacity is very low. Runoff is rapid and the hazard of erosion is moderate to severe depending on slope. The dominant vegetation is Douglas-fir (Moore, 1992).

The Security-Cathedral-Rock Outcrop soil map unit occurs in the northern part of the vegetation treatment areas. This unit occurs on slopes of 5 to 80 percent and forms in material weathered from mixed schist, gneiss, and granite. It is approximately 40 percent Security, 30 percent Cathedral and similar soils, 20 percent areas of rock outcrop, and 10 percent other soils. The Security soils are moderately deep, well drained soils. The surface layer is a dark gray very gravelly coarse sandy loam. Permeability is rapid and the hazard of water erosion is moderate to severe depending upon slope. The Security soil primarily supports ponderosa pine. The Cathedral soil is a shallow, well-drained soil that commonly occurs on upland ridges and mountainsides of slopes 50 to 65 percent. It is a dark brown gravelly sand loam. The Cathedral soils have a high runoff potential and a severe erosion hazard. This soil primarily supports Douglas-fir and Ponderosa pine (Moore, 1992).

HYDROLOGY

INTRODUCTION

In 1996, the Buffalo Creek fire, in Buffalo and Spring Creek watersheds, burned 12,000 acres of the forest in the watershed. The crown dominated fire burned with high intensity. Shortly after the fire, runoff from a large thunderstorm caused flooding and transported large quantities of sediment, destroying property, roads and bridges. Despite intensive efforts to rehabilitate the burned area, a second flood in the watershed transported additional sediment and resulted in a human fatality. Sediment generated by this fire-flood sequence has caused adverse impacts to the local water supply, water quality, and aquatic habitat.

In response to this damage, a concerted effort to protect and restore the landscape to more sustainable conditions has begun. This effort includes forest restoration activities designed to reduce the potential for catastrophic fires and floods similar to the Buffalo Creek fire. The Buffalo Creek, Horse Creek, and Waterton/Deckers Composite watersheds were ranked as high priority for restoration in the Landscape Assessment of the Upper South Platte Watershed (Foster Wheeler, 1999). These watersheds have high value because of their value as an important natural resource and water supply to the City of Denver and surrounding communities. Sediment is the dominant concern in these drainage basins because changes in sediment transport and distribution can significantly alter the streams in these watersheds.

METHODOLOGY

Four physical characteristics were examined in the Landscape Assessment of the Upper South Platte Watershed (Foster Wheeler Environmental, 1999) to determine the relative susceptibility of the watersheds to sediment related problems:

- **Sediment transport and deposition characteristics of streams;**
- **Erodibility and availability of soils in sediment source zones;**
- **Areas susceptible to rainfall peakflow events; and**
- **Existing water quality problems related to sediment.**

The four characteristics are discussed below, followed by discussions of the current condition of the watersheds in the Project Area.

Sediment Transport and Deposition

This discussion is divided into descriptions of channel dynamic equilibrium, Rosgen stream types, and sediment transport limiting points.

CHANNEL DYNAMIC EQUILIBRIUM

A channel that is in dynamic equilibrium responds to changes in stream flow and sediment input without losing its physical integrity. Dynamic equilibrium does not imply a static channel condition. A stream in dynamic equilibrium will exhibit physical change, however, the basic structure of the channel (i.e. pool frequency, depth, and pool:riffle ratio) will remain relatively consistent, even in response to average storm events and naturally fluctuating flow conditions.

Disequilibrium is a state in which the bed armor has been destroyed by a high flow event and bedload movement is significant enough to alter the channel structure (pools, riffles, etc.). Compared to a stream in dynamic equilibrium, a stream out of equilibrium will often have fewer pools, longer riffles, and pools filled with migrating sediments. A large percentage of the normal streambed will be loose and frequently transported.

Peak flows are the primary channel-forming device and can cause significant changes in stream channel morphology. The integrity of a stream channel can be illustrated by the channel's response to changes in flow or sediment load. If peak flows and sediment load are sufficiently high, a stream's response to such changes may be altered.

ROSGEN STREAM TYPING

Streams in the Project Area were classified according to the Level 1 Rosgen classification method (Rosgen, 1994). In general, stream channel positions in the drainage network and sediment transport characteristics of stream reach-level morphologies define source, transport, and response reaches (Montgomery and Buffington, 1993).

Source reaches are transport-limited sediment-storage sites subject to intermittent debris flow. Source reaches are generally located in steep areas with an adequate source of sediment for erosion. Despite the steep gradient and high streamflow velocity, the amount of available sediment usually exceeds the transport capacity of the source reaches. These reaches are generally small tributaries or headwaters with low streamflow. Sediment in source reaches is moved intermittently during peakflow or disturbance events. Due to the steep gradient and high velocities in these source reaches peakflow events can produce large amounts of sediment erosion.

Response reaches are low-gradient transport-limited channels in which significant morphologic adjustment occurs in response to increased sediment supply (Montgomery and Buffington, 1993). Low gradient stream reaches lack the capacity to transport all the sediment that is delivered from the surrounding watershed. Sediment delivered to these reaches is deposited in the reach rather than transported further downstream. Although response reaches tend to have the greatest streamflow in a watershed, they have the lowest velocity. Transport of sediments deposited in response reaches usually occurs during peak flows events (runoff from snowmelt or seasonal thunderstorms).

Sediment deposition in response reaches is a natural process. The sediment may form bars or be stored in stream banks, allowing the reach to retain its function. However, when sediment yield increases or catastrophic events occur in the watershed upstream, sediment delivered to the response reach can choke the stream. Consequently, the stream may not function properly until another peak flow event scours the

channel and transports the sediment downstream, restoring the reach to a functional state of dynamic equilibrium.

SEDIMENT TRANSPORT LIMITING POINTS

The spatial distribution of source, transport, and response reaches governs the distribution of potential impacts and recovery times for the watersheds. Junctions between source and transport reaches and transport and response reaches define locations in the channel network where impacts from increased sediment supply may be pronounced and persistent. These junctions are termed sediment transport limiting points.

Transport limiting points are ranked according to the likelihood of deposition. Transition points between source and transport or transport and response reaches are highly susceptible to excess sediment inputs. Transition points from the highest gradient reaches to low gradient reaches are most susceptible. Following heavy precipitation events, transport reaches may rapidly deliver high sediment loads to response reaches that lack the capacity to handle the abrupt sediment input. This is evident from the sediment deposition at the confluence of Buffalo and Spring Creeks that resulted from the flooding after the Buffalo Creek fire.

Sediment Source Zones

Areas of highly erodible soils and sediment source zones were established for each stream in the Project Area (Foster Wheeler Environmental, 1999). Sediment source zones include areas adjacent to streams where eroding soils carried by runoff are likely to reach the channel. Steeper areas have proportionately larger sediment source zones because the steep gradients make it even more likely that eroding soils will reach the channel. Highly erodible soils considered in this section include those soils classified with severe or extreme erosion risk. Highly erodible soils located in the sediment source zone have a higher potential to contribute sediment to the stream compared to highly erodible soils outside of the sediment source areas. Therefore, the critical locations are areas with highly erodible soils that are located in the sediment source zones.

Other source zones for sediment exist in the Project Area. Connected disturbed areas such as road and trail stream crossings can contribute sediment to streams. Dispersed camping areas and disturbed riparian areas also can contribute sediment to streams above background conditions.

Peakflow Events

Peakflows are the dominate channel forming event. There are two different types of peak flows that occur in the Project Area; rainfall generated peakflows and those derived from snowmelt. The flow regime of the Upper South Platte watershed has been extensively studied to understand mountain stream hydrology. These studies indicate that peakflows above an elevation of 7,500 feet are dominated by snowmelt and that channel formation above this elevation is primarily determined by long-term snowmelt patterns. Below 7,500 feet in elevation peakflows are dominated by rainfall.

Discharge records for Buffalo Creek, which has only 20 percent of its watershed below 7500 feet, illustrate the dramatic differences between runoff from snowmelt and runoff from summer storms (Figure 3-1). Paleoflood evidence in Colorado indicates that streamflows generally do not exceed bankfull discharge above 7,500 feet in elevation. Jarrett (1990) concluded that flood frequency (out of channel flow) in the Rocky Mountains is influenced by the elevation of the drainage area and proposed a 7,500-foot elevation flash flood limit. Jarrett's work was reinforced by Grimm et al. (1995) in a study of Bear

Creek. Grimm's work identified a trend of increasing sediment grain size in channels below the 7,500-foot elevation flash flood limit. This trend suggests that the energy for sediment transport is much greater below 7,500 feet in elevation. Therefore, for similar stream types, the flash flood elevation limit is a significant factor in sediment distribution.

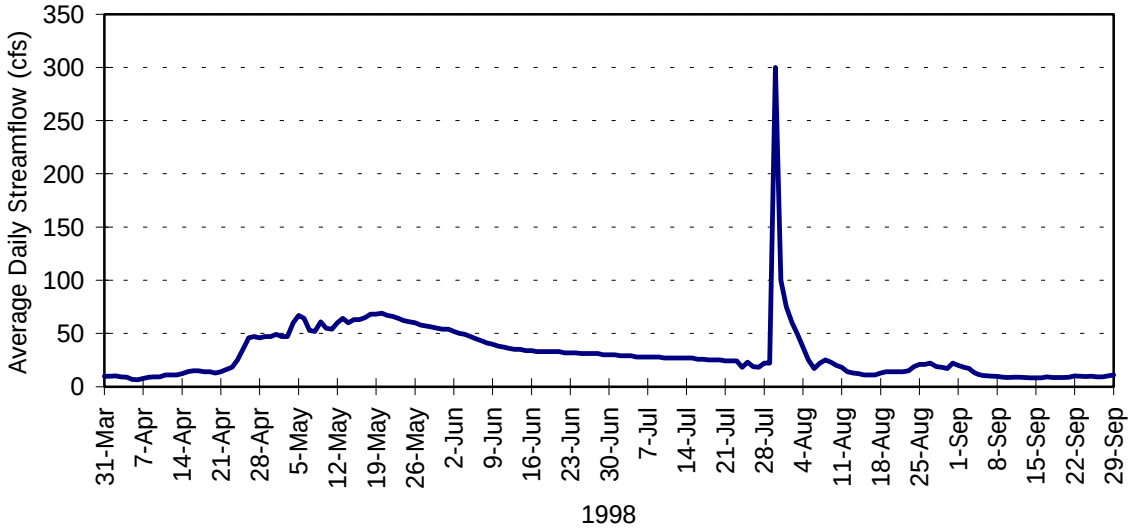


Figure 3-1. Peakflow Comparison (Buffalo Creek at Mouth at Buffalo Creek)

The importance of elevation is that peak flows resulting from rainfall events have greater potential than peak flows resulting from snowmelt to transport sediment into streams by processes such as overland sheetflow. Peak flows from snowmelt are less likely to cause flood events (out of bank) with high potential for erosion and transport. However, although peakflows at higher elevations are primarily caused by snowmelt, the largest peakflows at higher elevations may include runoff from rainfall events. Based on this trend, watershed areas below an elevation of 7,500 feet are considered as the critical sediment source zones because of the greater potential for rainfall events to produce higher peakflows.

Water Quality

The State of Colorado's Department of Health has designated beneficial uses for streams in the Project Area. All streams in the Project Area have Cold water Class 1 and Domestic Water Supply beneficial uses. The federal Clean Water Act requires states to compile a list (303(d) list) of streams that are impaired (do not fully or partially support their beneficial uses). The State of Colorado's Department of Health has identified stream reaches that have impaired water quality. Some of these reaches have water quality problems severe enough to only partially support their beneficial uses. There are no streams in the Project Area on the 303(d) list. If there is a concern for a stream and the documentation is not adequate for listing on the 303(d) list then it may be placed on the Monitoring and Evaluation list. Ten stream segments in the Project Area are on the Monitoring and Evaluation list.

All of the identified water quality problems in the Project Area are sediment or temperature related. No sources of elevated nutrients or heavy metals have been identified.

WATERSHEDS IN THE PROJECT AREA

Buffalo Creek, Horse Creek, and Waterton/Deckers Composite watersheds are the three 6th level watersheds that comprise the Project Area. The 6th level designation is based upon United States Geological Survey (USGS) hydrologic unit codes (HUCs). General characteristics are discussed below for these watersheds. Additionally, twelve subwatersheds were delineated for the Waterton/Deckers Composite watershed (Map 3-1). The current conditions of those subwatersheds were evaluated and documented in the hydrology report.

BUFFALO CREEK WATERSHED

Physical Characteristics

Buffalo Creek watershed is a 6th level watershed located on the western boundary of the Project Area. Buffalo Creek is the major stream in the 48 mi^2 drainage basin and discharges to the North Fork of the South Platte River (located outside the Project Area).

The highest elevation in the Project Area, approximately 11,800 feet, is located at the western end of this watershed. Total relief exceeds 5,000 feet. Approximately two thirds of the forest located at lower elevations in the northeastern part of the watershed was burned during the Buffalo Creek fire. Twenty percent of the watershed, approximately 9.5 mi^2, is located below an elevation of 7,500 feet.

Surface water features in the watershed include approximately 45 miles of streams and one lake. Wellington Lake, 0.2 mi^2 in area, is located in the western half of the watershed at an elevation of approximately 8,100 feet. Buffalo Creek is a 3rd order stream for which the watershed is named. Including Buffalo Creek, 30.3 miles (68 percent) of the stream reaches in this watershed are classified as transport reaches. Source and response reaches include 7.8 and 6.7 miles of streams, respectively.

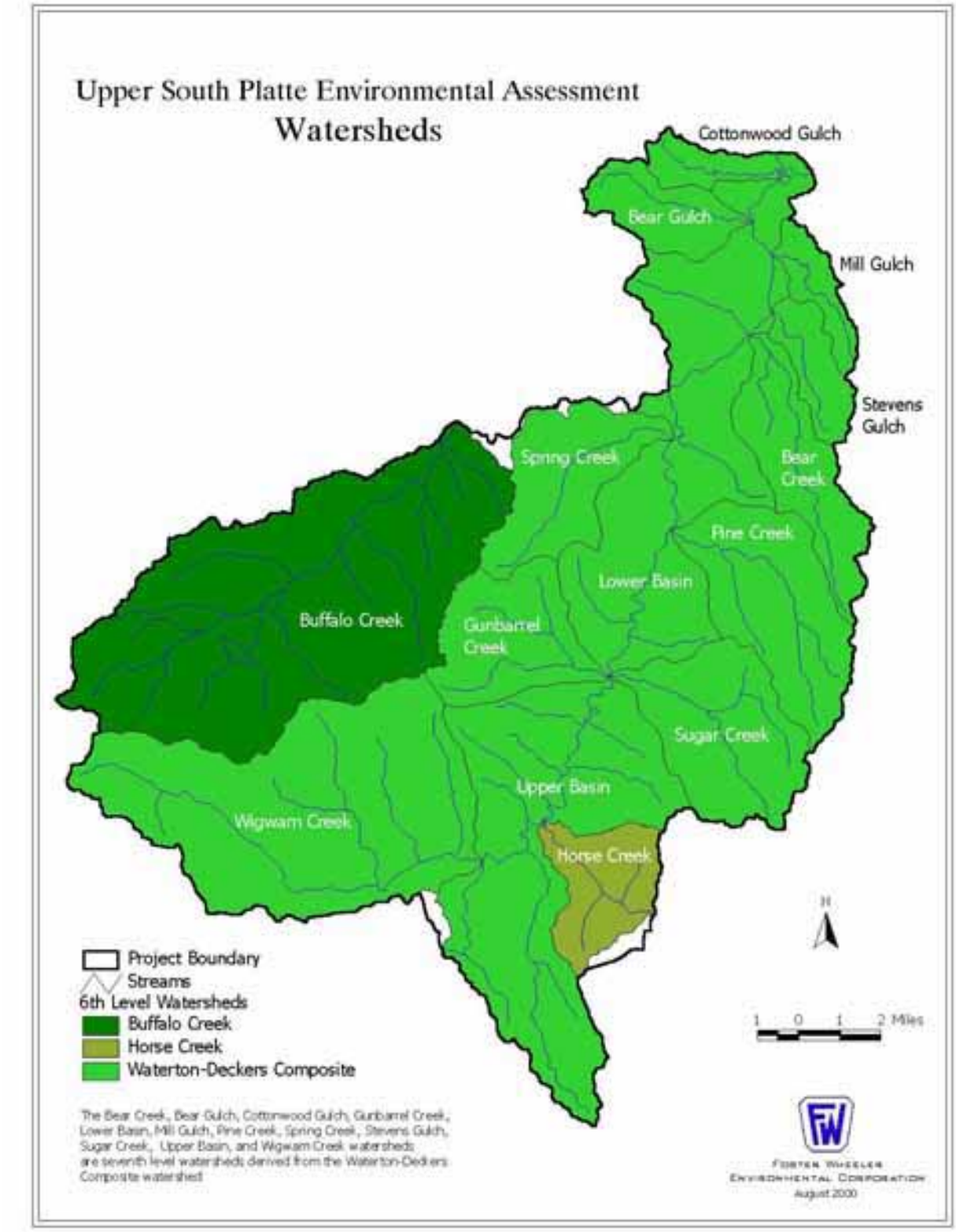
Almost 50 miles of roads traverse the watershed creating a road density of 1.0 mi/ mi^2. Roads on highly erodible soils can significantly increase sediment loading to streams where they are poorly located or designed. Road density by itself is not a problem, but sections of roads that are close to streams and on highly erodible soils can be sources of sediment delivery to streams. Many of the roads are located parallel to streams, especially Buffalo Creek. Roads in sediment sources zones and on highly erodible soils are 40.0 and 8.3 miles in length, respectively.

Sediment Characteristics

Sediment source zones include more than 6 mi^2 (13%) of area primarily located adjacent to the streams in this watershed. Highly erodible soils (classified by severe or extreme erosion risk) comprise 24.6 mi^2 (51%) of the watershed. More than 2 mi^2 of the highly erodible soils are located within sediment source zones. Fifteen sediment transport limiting points are located along streams within this watershed.

Peak Flow

Peak flows in Buffalo Creek have been altered significantly due to the Buffalo Creek Fire in 1996. The fire created some areas of hydrophobicity that contributed to the tremendous peak flows following the fire. The hydrophobic conditions are not still present but the lack of trees on a larger portion of the Buffalo Creek watershed results in increased peak flows during rainfall runoff events. There is a streamflow gage (6706800) at the mouth of Buffalo Creek that has been in operation since only 1998. Figure 3-1 displays the daily average streamflow at the Buffalo Creek gage for 1998, and clearly shows one of the floods that have impacted Buffalo Creek.



Map 3-1. Project Area Watersheds

Water Quality

The only identified water quality problems in Buffalo Creek are related to the extensive sediment deposits that were formed following the floods after the Buffalo Creek Fire in 1996. Buffalo Creek is listed on the State's Monitoring and Evaluation List for water quality impairment due to sediment.

HORSE CREEK WATERSHED

Horse Creek is an intermediate watershed with two streams (West Creek and Trout Creek) joining to form Horse Creek. Therefore Horse Creek is much larger than it's watershed size would suggest.

Physical Characteristics

Horse Creek watershed is the smallest of the three 6th level watersheds, with an area of approximately 7 mi^2. This watershed is located in the southeastern part of the Project Area.

This watershed is located between 6,600 and 8,600 feet, representing a total relief of approximately 2,000 feet. Eighty percent of the watershed, approximately 5.7 mi^2, is located below 7,500 feet.

Response reaches represent the dominant stream characteristic in this watershed, comprising 3.9 miles (58%) of the total stream miles. Source and transport stream reaches comprise 1.3 and 1.6 miles of streams, respectively.

Among the 6th level watersheds, Horse Creek watershed contains the fewest miles (5.3) of roads and highways. Roads in sediment sources zones and highly erodible soils are 6.4 and 0.1 miles in length, respectively.

Sediment Characteristics

Sediment source zones adjacent to streams comprise only 1.0 mi^2 (14%) of the watershed. Areas of highly erodible soils totaling 3.7 mi^2 comprise more than half (52%) of the watershed. Only 0.3 mi^2 of erodible soils are located within the sediment source zones. Streams in this watershed contain two sediment transport limiting points.

Peak Flow

There are no gage records available for Horse Creek or its tributaries. There are a few small reservoirs on Trout and West Creeks, which are the two tributaries that form Horse Creek. However, there are no major dams or diversions upstream, therefore Horse Creek has a relatively natural runoff regime.

Water Quality

Horse Creek is an intermediate watershed with two streams (West Creek and Trout Creek) joining to form Horse Creek. Trout Creek is on the 303(d) list and West Creek is on the Monitoring and Evaluation List. Horse Creek is on the State's Monitoring and Evaluation List and may be impacted somewhat by the upstream conditions of Trout and West Creeks. Horse Creek is listed for both sediment and temperature.

WATERTON/DECKERS COMPOSITE WATERSHED

The Waterton/Deckers Composite watershed consists of twelve sub-basins that were delineated as 7th level watersheds for this analysis.

Physical Characteristics

Waterton/Deckers Composite watershed is the largest 6th level watershed in the Project Area. It occupies approximately 172 mi^2 of area along the South Platte River between the Buffalo Creek and Horse creek watersheds.

This watershed contains some of the highest elevations in the Project Area at approximately 11,400 feet. In addition, the watershed contains the lowest elevation in the Project Area at approximately 5,600 feet. These extremes represent 5,800 feet of total relief, the largest in the Project Area. The 84 mi^2 of drainage area located below 7,500 feet in elevation represent nearly 50 percent of the watershed.

Surface water features in the composite watershed area include approximately 157 miles of streams and one lake. Strontia Springs is a long, narrow reservoir located along the South Platte River in the northern part of the watershed. The reservoir is approximately 0.2 mi^2 in area. The South Platte River is the largest river in this watershed and is supplied by many 1st, 2nd, and 3rd order streams that drain sub-basins within the drainage area. Despite the overall relief in the watershed, the South Platte River has a relatively low gradient. These qualities lead to the river's primary characterization as a transport reach. Cumulatively, transport reaches comprise 95.9 miles (61%) of the streams in this watershed. Source and response reaches include 29.7 and 28.1 miles of streams, respectively.

More than 170 miles of roads distributed throughout this watershed create a road density of 1.0 mi/ mi^2. Roads in sediment sources zones and highly erodible soils are 133.0 and 30.0 miles in length, respectively. The Rampart Ridge area receives heavy off-road vehicle use, which may contribute to sediment loading in Pine and Sugar Creeks.

Due to its size and the number of sub-basins with 2nd and 3rd order streams, the Waterton/Deckers Composite watershed was sub-divided into smaller drainage areas. Twelve sub-basins, including ten 7th level watersheds, were delineated within the Waterton/Deckers Composite watershed during this assessment. Delineation of the sub-basins was completed by identifying drainage divides between major streams (2nd and 3rd order) on the elevation coverage for the Project Area. The drainage divides were identified on the elevation coverage using 100-foot contours at a scale of 1:266,000. A smaller scale was used to delineate the 6th level watersheds which accounts for the jagged nature of the 6th level watershed boundaries compared to the smooth nature of the 7th level watershed boundaries. Sub-basins within the Waterton/Deckers Composite watershed are considered in a following section under the heading, 7th Level Watersheds.

Sediment Characteristics

Sediment source zones include approximately 24 mi^2 (14%) of area primarily located adjacent to the 2nd and 3rd order streams in the watershed. Highly erodible soils comprise approximately 91 mi^2 (53%) of the watershed. Nearly 9 mi^2 of the highly erodible soils are located within the sediment source zones. Compared to the other 6th level watersheds, Waterton/Deckers Composite contains the greatest number (32) of sediment transport limiting points in the Project Area.

Peak Flow

Cheesman Dam at the upper end of the watershed has a dramatic effect on peak flows in the South Platte River. The dam significantly reduces peak flows from snowmelt and rainfall runoff events. Strontia Springs reservoir at the north end (downstream) of this watershed is the location of substantial diversions of the South Platte River that feed the Denver Water Department's supply system.

Water Quality

Seven segments in the Waterton/Deckers Composite watershed are on the 303(d) list for sediment related problems. Two segments (Spring Creek, and Lower South Platte) were impacted by sediment generated from the floods after the Buffalo Creek fire. Pine Creek, Russell Gulch, Spring Creek and Wigwam Creek are all listed on the State's Monitoring and Evaluation List for sediment.

FISHERIES

This section describes the fish and aquatic habitat that could be affected by the proposed actions. The Project Area's aquatic resources are divided into three habitats based on geographic location and differences in physical and biological attributes. These habitats are the mainstem of the South Platte River from Cheesman Dam downstream to Russell Gulch, tributaries of the South Platte River, and Buffalo Creek and its tributaries.

Historically, the longnose sucker, white sucker, longnose dace, and greenback cutthroat trout were known to inhabit the Upper South Platte River. The greenback cutthroat trout, believed to have been a common species historically, is no longer found in the Project Area. Habitat loss, habitat modification and hybridization with or displacement by non-native trout species has eliminated greenbacks from most of its native range.

There are two Management Indicator Species (MIS) for this area; cutthroat trout and brook trout. Cutthroat trout have been found during CDOW sampling. However, there is no record of brook trout in the Project Area, although they are suspected to occur in some of the South Platte tributaries.

DESCRIPTION OF AQUATIC HABITATS

Mainstem of the South Platte River

The Colorado Division of Wildlife manages the South Platte River from Cheesman Reservoir downstream to Russell as a sport fishery for trout. The section from Cheesman Dam downstream to Scraggy View picnic ground (excluding the Wigwam property) is classified as "gold medal water" and is nationally known as an outstanding trout fishery. Gold Medal Waters provide quality fishing and produce many "quality size" (14 inch or longer) trout. The criteria for a Gold Medal Water are a minimum trout standing stock of 60 pounds per acre and a minimum of 12 quality trout per acre. Data collected by the Colorado Division of Wildlife (CDOW) during 1999 suggests that the South Platte River within the Project Area greatly exceeds these minimum criteria. In the upper reaches of the river, trout exceeding 20 inches in length are not uncommon. Over 600 pounds of fish per acre has recently been reported.

The dominant fish species in this reach are Brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*). Cutthroat trout (*Oncorhynchus clarki*), longnose sucker (*Catostomus catostomus*), white sucker (*Catostomus commersoni*), and longnose dace (*Rhinichthys cataractae*) have also been reported. The CDOW has been conducting annual trout surveys at four locations in this reach for over ten years. The data collected by these surveys indicates that the largest populations of wild fish occur in the upper portions of this reach and that brown trout are the dominant trout species. The data also show that trout populations are consistently higher than the criteria for a Gold Medal Water.

The South Platte River within the Project Area maintains good aquatic habitat diversity and bank stability. Habitat improvement structures have been placed in various locations to provide more areas of

depth and cover. Denver Water controls water releases from Cheesman Dam, which influences flows and water temperatures.

Whirling disease is present in the South Platte River. This parasite affects most trout species but is particularly lethal to rainbow trout. Wild rainbow trout were well represented in the 1999 CDOW surveys, so the impact of whirling disease in the Project Area is unclear. It is unlikely that the proposed actions would have any positive or negative effects on the existence of whirling disease in this system.

Tributaries of the South Platte River

Numerous small tributaries flow into the South Platte River in the Project Area. All tributaries in this area have a natural flow regime influenced by snowmelt and ground-water. Fish habitat is typically limited by relatively steep gradients, low habitat diversity, sparse stream cover, and high levels of fine sediments. The highly erodible watershed soils are the source of fine sediments in the stream channels. The larger tributaries have sufficient habitat to maintain stable fish populations, while the smaller tributaries support few fish because of intermittent flows, natural barriers, and high sediment loads. All aquatic environments provide habitat for other various aquatic biota.

The primary tributaries that support fish in this subwatershed include Horse Creek, Wigwam Creek, Fourmile Creek, Gunbarrel Creek, Sugar Creek and Pine Creek. The CDOW has conducted fish surveys on portions of most of these streams, however fish population information is generally lacking. The smaller intermittent tributaries, such as Jenny Gulch and Russell Gulch, do not support stable fish populations. Brown trout are the dominant species collected at most of the lower elevation sampling sites. Other species collected included rainbow trout, brook trout (*Salvelinus fontinalis*), longnose sucker, white sucker, and longnose dace. The fish survey data showed that these tributaries generally support low numbers of small fish.

Buffalo Creek

This habitat area includes numerous small tributaries and the mainstem of Buffalo Creek from the confluence with the South Fork of Buffalo Creek downstream to its confluence with the North Fork of the South Platte River. Flows in Buffalo Creek are primarily a product of snowmelt, ground water, and releases from Wellington Lake through the South Fork of Buffalo Creek.

In the summer of 1996, fine sediments due to the Buffalo Creek fire and subsequent flooding heavily impacted the lower reaches of Buffalo Creek. This caused a major change in aquatic habitat. Habitat diversity decreased, as well as the proportion of glide habitat and pool habitat, while the amount of riffle habitat increased. The sedimentation also destroyed most of the available cover and decreased bank stability. The sediment deposition eventually destroyed most of the trout habitat in the lower reaches of Buffalo Creek.

Fish sampling has been completed in Buffalo Creek, immediately upstream of its confluence with the South Fork of Buffalo Creek. Fish populations at this location have consisted entirely of brown trout, however several brook trout were collected during 1987. Most reaches of Buffalo Creek downstream of Morrison Creek were heavily impacted by sedimentation that resulted from the erosion of the burned area during 1996. Fish sampling by the CDOW in the impacted reach of Buffalo Creek during September 1996 indicated that the fish population had been greatly reduced.

WILDLIFE

This section first discusses the existing condition for major wildlife habitats and the general wildlife species present on National Forest Lands in the Project Area. The second part of this section discusses federal or state species that are protected as threatened or endangered, or those on the United States Forest Service (USFS) Region 2 sensitive species.

GENERAL WILDLIFE DISCUSSION

Wildlife Species

The following discussion identifies groups of wildlife that are known to occur in the Project Area. These groups include game species, predators, reptiles, amphibians, small mammals, birds, and invertebrates. Management Indicator Species (MIS), which are specific species of special interest to resource management agencies, are also discussed.

GAME SPECIES

The terrestrial game species that occur in the Project Area are bighorn sheep (*Ovis canadensis*), elk, and mule deer. Other game species include wild turkey (*Meleagris gallopavo merriami*), redhead (*Aythya americana*), mourning dove (*Zenaida macroura*), Canada goose (*Branta canadensis*), and common merganser (*Mergus merganser*) (Fitzgerald et al. 1994). Black bear (*Ursus americanus*) also occur.

Although bighorn sheep, elk, and mule deer occur throughout the entire region, important habitat, including summering, crucial wintering, and breeding areas, occur within the treatment areas. Bighorn sheep occupy mountain slopes with spare growth of trees. A very small segment of bighorn sheep summer range occurs in the extreme western portion of the Project Area.

Elk and black bears prefer semi-open, somewhat rugged forests and mountain meadows. Elk habitat extends throughout the Project Area. The summer range of elk encompasses most of the Project Area with the exception of the northern portion, where winter range occurs. In the extreme northern portion of the area very small elk calving and winter concentration areas are present.

Mule deer typically occupy coniferous forest and shrubland (Burt and Grossenheider 1980). Overall mule deer habitat extends throughout the entire Project Area. The winter range extends from the central portion to the northern boarder of the Project Area. The severe winter range has the same distribution as the winter range except for the eastern side of the winter range. Winter concentration areas for mule deer are present in the northern section of the Project Area.

A number of bird species also occur within the Project Area and are hunted as game species on private lands and areas around the Project Area. Waterfowl occupy streams and lakes with open water. The turkey prefers open woodlands and forest clearings (Robbins et al. 1983). The mourning dove inhabits open ground and rocky areas with limited shrub cover.

PREDATORS, SMALL MAMMALS AND BIRDS

There are a few mammalian predators present in the Project Area including the coyote, red fox, mountain lion and bobcat. Predators are dependent on small mammals and small birds as prey items. Therefore, critical habitat has to be able to support their prey. They typically also have a large home range that they will travel in short amounts of time. Small mammals that occur in the Project Area are typically prey items to large mammalian predators and birds of prey. Small mammals typically feed on plants, berries, and small invertebrates.

Birds are the most diverse wildlife group in the Project Area. Many passerine (songbirds) and non-passerine (predatory) species are present.

REPTILES AND AMPHIBIANS

Except for documented occurrences, little is known about the populations of reptiles or amphibians that occur in the Project Area. Most reptilian species occur along the South Platte River corridor, which the exception of the racer, which is found in mountain meadows and rocky wooded hillsides (Hammerson, 1982 and Behler and King, 1979). Amphibians are expected to occur in the riparian areas, within the corridor of the South Platte River.

INVERTEBRATES

A variety of invertebrates are found within the Project Area. Common insects include moths, butterflies, grasshoppers, crickets, caterpillars, ants, grubs, flies, mosquitoes, and gnats. With the exception of a few invertebrate species, specific information about populations is not known.

A few insects that are considered pests to trees and habitats are present in the Project Area. The Douglas-fir tussock moth (*Orgyia pseudotsugata*) (McCunnough) and pine beetle (*Dendroctonus brevicomis*) are the major pests found in the area. Both species can destroy trees and thereby alter the habitat that exists in that area. Portions along the central and eastern of the Project Area have had an outbreak of the tussock moth and have altered the original habitat present in these areas.

Major Habitat Types

There are five major habitat types in the Project Area including coniferous, deciduous, grassland/meadow, shrubland, rock outcrop and open water. The habitat is dominated by the coniferous habitat type, which covers over 80 percent of the area (Table 3-5).

CONIFEROUS FOREST

The majority of the habitat in the Project Area is coniferous forests. These forests are dominated by ponderosa pine, Douglas-fir, and lodgepole pine. They range from open ponderosa pine parklands to dense Douglas-fir stands. Ponderosa pine forests typically are drier than Douglas-fir stands. However, these trees can form a mixed pine/fir forest (Fitzgerald et al. 1994). The forest within the Project Area typically has a closed canopy. The closed canopy contributes to a sparse understory.

DECIDUOUS FOREST

The deciduous forests in the Project Area typically consist of quaking aspen. The majority of the deciduous forest occurs in the western portion of the Project Area, however, along the eastern side of is a

small segment of deciduous forest. This forest usually has a rich understory of shrubs and forbs. It is often mixed with lodgepole pine, ponderosa pine and subalpine fir.

Table 3-5. Major Habitat Types and their Occurrence in the Project Area.

Habitat Type	Area (acres)	Area (%)
Coniferous Forest	119,327	81.2
Deciduous Forest	2,759	1.9
Grassland/Mountain Meadow	12,277	8.3
Shrubland	568	0.4
Rock Outcrop	11,879	8.1
Open Water	202	0.1
Totals:	147,013	

RIPARIAN

The riparian areas within the Project Area occur mostly along the South Platte River corridor. Riparian areas are dominated by sandbar willow (*Salix exiqua*), and narrowleaf cottonwood (*Populus angustifolia*). They typically occur as valley-bottom corridors along rivers and streams.

SHRUBLANDS

Shrublands within the Project Area are typically dominated by common juniper (*Juniperus communis*), mountain-mahogany (*Cercocarpus montanus*), blue grama (*Bouteloua gracilis*), and gambel oak (*Quercus gambelii*), which occurs in the eastern and northern portion of the Project Area. Shrublands typically occur higher than grasslands and below deciduous forests on rocky, coarse, and well-drained soils. They typically are very diverse ecosystems. Common plants in moist areas of shrublands are wax currant (*Ribes cereum*) and gooseberry (*Ribes inerme*) (Mutel 1992).

GRASSLAND/MOUNTAIN MEADOW

Grasslands and mountain meadows comprise a small portion of the Project Area. These habitats typically have short grasses like blue grama, side oats grama (*Bouteloua curtipendula), little bluestem (Schizachyrium scoparium*), and Idaho fescue (*Festuca idahoensis*) (Fitzgerald et al. 1994). These areas are typically very diverse and have both grasses and forbs. They generally occur in basins that the soil, precipitation, and temperature are unsuitable for tree growth (Mutel and Emerick 1992).

ROCK OUTCROP

Rock outcroppings also comprise a small portion of the Project Area. Rock outcrops are sparsely vegetated due to lack of soil substrate to support plant seed germination and root establishment.

OPEN WATER

Open water habitats are generally associated with lakes, ponds, and rivers and creeks. There are two lakes within the Project Area (Wellington Lake and Strontia Springs Reservoir). Wetlands and riparian zones are generally associated with these land features.

Management Indicator Species

The species discussed below (Table 3-6) are those identified as management indicator species (MIS) in the Forest Plan that occur within the Project Area. These species are considered to be important indicators of forest health or important game species. The tool used for determining habitat capability for this EA is the HABCAP model. It uses detailed cover type, vegetation and topographic information combined with scientifically determined habitat relationships for each species. The model then determines the habitat capability for an area of interest.

Table 3-6. Forest Management Indicator Species Occurring in the Project Area.

Species	Scientific Name	Habitat Type
Mammals		
Abert's Squirrel	*Sciurus aberti*	Coniferous forests
Beaver	*Castor canadensis*	Banks of flowing water
Bighorn sheep	*Ovis canadensis*	Steep, rocky grasslands and shrublands
Elk	*Cervus elaphus*	Semi-open coniferous forests, shrublands
Mule deer	*Odocoileus hemionus*	Semi-open coniferous forests, shrublands
Pine marten	*Martes americanus*	Coniferous forests
Birds		
Black-throated gray warbler	*Dendroica nigrescens*	Coniferous forests
Lewis' woodpecker	*Melanerpes lewis*	Riparian forests
Mallard	*Anas platyrhynchos*	Large bodies of water
Mountain bluebird	*Sialia currocoides*	Open coniferous forests
Red-naped sapsucker	*Sphyrapicus nuchalis*	Aspen forests
Three-toed woodpecker	*Picoides tridactylus*	Coniferous forests
Wild turkey	*Meleagris gallopavo merriami*	Coniferous forests and shrublands
Virginia's warbler	*Vermivora virginiae*	Shrublands
Water pipit	*Anthus spinoletts*	Alpine tundra
Wilson's warbler	*Wilsonia pusilla*	Shrublands

Sources: Andrews and Righter 1992, Fitzgerald et al. 1994.

Threatened, Endangered and Sensitive Species

Many species that potentially occur in the Project Area are protected as threatened or endangered, or are listed on the United States Forest Service (USFS) Region 2 sensitive species list. Table 3-7 presents those sensitive species identified in the Upper South Platte Watershed Landscape Assessment and that potentially occur in the Project Area (Foster Wheeler, 1999). A thorough discussion of the habitat

requirements for these species and likelihood of occurrence in the Project Area can be found in the Biological Evaluation and Biological Assessment in the appendix.

Table 3-7. Sensitive Wildlife Species Potentially Occurring in the Project Area

Species	Scientific Name	State Status	Federal Status	Forest Status
Mammals				
Dwarf shrew	*Sorex nanus*			Sensitive
Fringed-tailed myotis	*Myotis thysanodes pahasapensis*			Sensitive
North American Lynx	*Felis lynx canadensis*	E	T	
North American wolverine	*Gulo gulo luscus*	E		Sensitive
Pine marten	*Martes americanus*			MIS, Sensitive
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	T	T	
Ringtail	*Bassariscus astutus*			Sensitive
Spotted bat	*Euderma maculatum*			Sensitive
Towsend's big-eared bat	*Plecotus townsendii*			Sensitive
Wet Mountians yellow-bellied marmot	*Marmota flaviventris notioros*			Sensitive
Birds				
Bald eagle	*Haliaeetus leucocephalus*	T	T	
Black swift	*Cypseloides niger*			Sensitive
Black tern	*Chlidonias niger*			Sensitive
Flammulated owl	*Otus flammeolus*			Sensitive
Fox sparrow	*Passerella iliaca*			Sensitive
Golden-crowned kinglet	*Regulus satrapa*			Sensitive
Lewis' woodpecker	*Melanerpes lewis*			MIS, Sensitive
Mexican spotted owl	*Strix occidentalis lucida*	T	T	Sensitive
Northern goshawk	*Accipiter gentilis*			Sensitive
Olive-sided flycatcher	*Contopus borealis*			Sensitive
Osprey	*Pandion haliaetus*			Sensitive
Peregrine falcon	*Falco peregrinus*			Sensitive
Purple martin	*Progne subis*			Sensitive
Pygmy nuthatch	*Sitta pygmaea*			Sensitive
Southwestern willow flycatcher	*Empidonax trillii extimus*	E	E	Sensitive
Three-toed woodpecker	*Picoides tridactylus*			MIS, Sensitive
Invertebrates				
Pawnee Montane Skipper	*Hesperia leonardus montana*		T	
Amphibians and Reptiles				
Boreal toad	*Bufo boreas boreas*	E	C	Sensitive
Northern leopard frog	*Rana pipiens*			Sensitive
Tiger salamander	*Ambystoma tigrinum*			Sensitive

MIS = Forest Management Indicator Species, Sensitive = Region 2 Forest Sensitive Species, T = Threatened, E = Endangered, C = Candidate

PAWNEE MONTANE SKIPPER (HESPERIA LEONARDUS MONTANA)

The Pawnee montane skipper occurs in the Project Area in the proposed vegetation treatment areas. One of the goals of this EA is to improve skipper habitat, therefore a brief discussion of the habitat needs of this butterfly is presented here.

The Pawnee montane skipper is found in sparsely wooded grasslands and open pine forests at elevations from 6,000 to 7,500 ft. They are dependent on two plant species, the prairie gayfeather (Liatris punctata), which flowers late summer through early fall and blue grama (Bouteloua gracilis). The butterfly uses liatris for its nectar and the blue grama as larval plant food (U.S. Fish and Wildlife Service 1998). The butterfly has a very limited distribution occurring along a 12-mile stretch of the South Platte River. The Pawnee montane skipper is known to occur in Douglas, Jefferson, Park and Teller Counties in Colorado (Forest Service, 1994). Distribution information from CNHP indicates that the Pawnee montane skipper has been identified at two locations in the Waterton/Deckers Composite watershed and one location near the southeastern corner of the Horse Creek watershed.

RECREATION

OVERVIEW

The Project Area provides regional recreation opportunities for communities along the Front Range, particularly for people in the Denver metropolitan area. Important recreation resources in the Project Area include the South Platte River Corridor, the Buffalo Creek area, the Colorado Trail, and the Gill Trail (Map 3-2). Because of these resources and others, along with the area's proximity to Denver and Colorado Springs, the Project Area is heavily used for recreation. Recreation in the South Platte River has increased annually in the past decade and was estimated at 1,650,000 visitor days in 1995 (U.S. Forest Service, 2000)

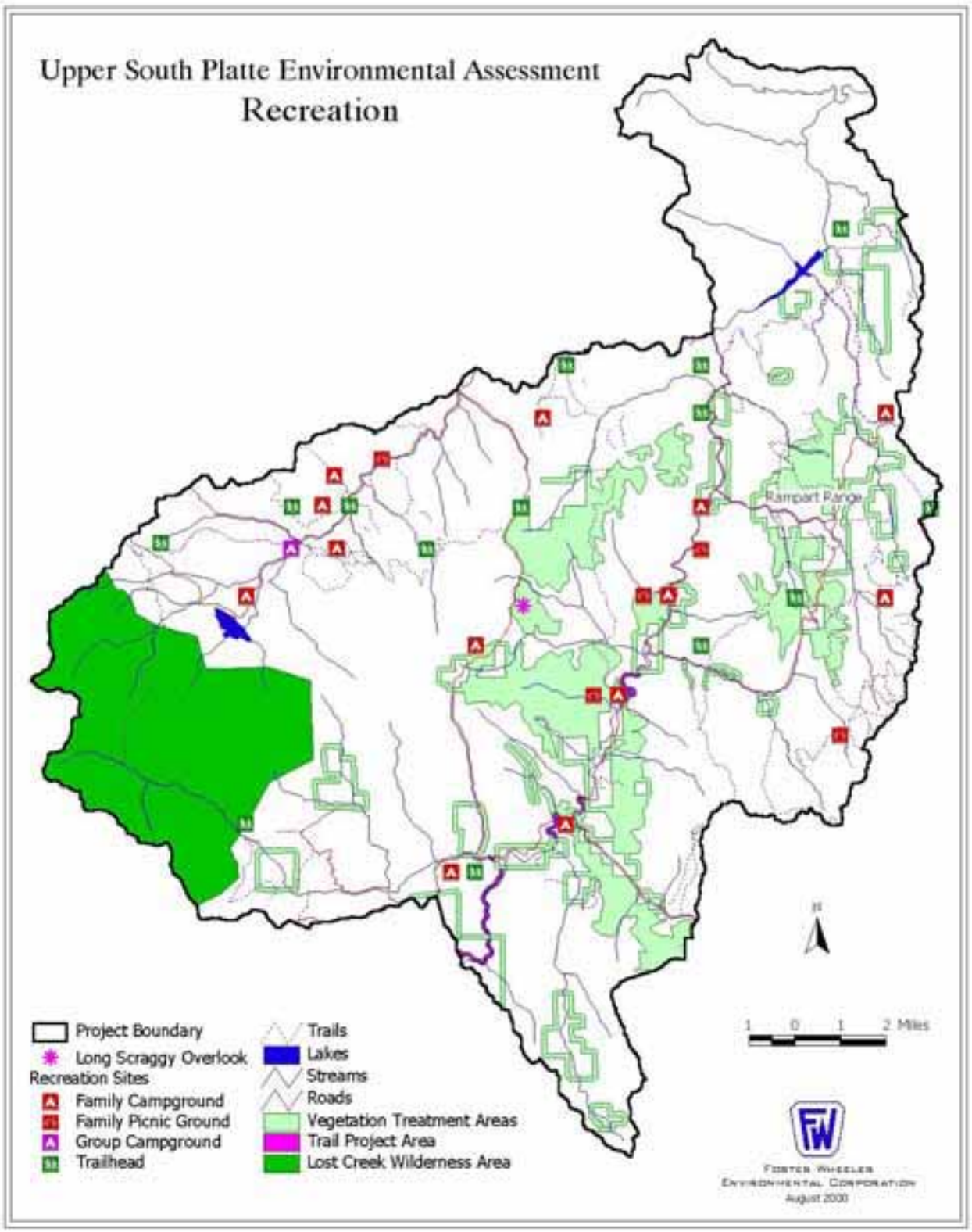
The recent Buffalo Creek fire and subsequent flooding and erosion impacted recreation in the Project Area. As the primary provider and manager of recreation resources in the area, the Forest Service is working with other governmental entities to reestablish lost recreation opportunities. One intent of the action alternatives examined in this Environmental Assessment (EA) is to reduce the likelihood of catastrophic fires and another is to improve trail conditions (see *Chapter 2 - Alternatives*).

MANAGEMENT AREAS & RECREATIONAL OPPORTUNITY SPECTRUM

The Forest Plan designates areas in the Forest that are appropriate for various types of land uses and activities. This is done through the use of Management Area (MA) direction. The emphasis placed on recreation varies between MAs. For example, MA 2B is one of the MAs contained within the Project Area management. The management emphasis for MA 2B is to provide rural and roaded-natural recreational opportunities. By contrast, the management emphasis for MA 7A, also found in the Project Area, is for wood-fiber production and utilization. Even in MA 7A, there is a recreation management component, although the emphasis within the MA is not on recreation.

The Forest Plan has assigned Recreational Opportunity Spectrum (ROS) settings to all MAs. The ROS is a system developed by the Forest Service that classifies recreation settings on National Forest lands according to their physical, social, and managerial characteristics. These ROS settings are formally applied only to National Forest land and not adjacent private lands. However, the presence and condition of private lands influence the ROS settings assigned to National Forest lands.

The ROS classes assigned to National Forest lands in the Project Area are: Primitive, Semi-Primitive Non-Motorized, Roaded Modified; Roaded Natural; and Rural. A description of these ROS settings from least developed, to most, is found below:



Map 3-2. Recreation Facilities in the Project Area.

- **Primitive (P) -** A natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. Motorized used within the area is not permitted.
- **Semi-Primitive Non-Motorized (SPNM) -** A natural, or natural appearing, environment of moderate to large size. The concentration of users is low, but there is often evidence of other users. No roads are present.
- **Semi-Primitive Motorized (SPM) -** A natural, or natural appearing, environment of moderate to large size. Interaction between users in this setting is low, but there is often evidence of other users. Local roads used for other resource management activities may be present.
- **Roaded Natural (RN) -** A natural, or natural appearing, environment of moderate size with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Motorized use is allowed.
- **Rural (R) -** An area characterized by a substantially modified natural environment. The sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities for intensified motorized use and parking area available.

The Roaded Natural ROS setting is the most prevalent in the Project Area with approximately 49,280 acres. It follows the main roads and is interspersed with settings of Rural in areas near communities. Approximately 9,570 acres in the Project Area have an ROS setting of Rural. Semi-Primitive Motorized is the second most common ROS setting. There are large areas of SPM in the western and eastern portions of the Project Area where ORV trails and Forest Roads are plentiful. The ROS designation of Primitive is found in and near the Lost Creek Wilderness and includes approximately 13,000 acres. The Semi-Primitive Non-Motorized ROS settings tend to be near the Primitive areas, in the southern parts of the area. Approximately 2,100 acres are SPNM.

RECREATION RESOURCES IN THE PROJECT AREA

Although the Project Area is quite large, there are several portions that receive the bulk of the recreation use. These areas contain a wide variety of resources and support an array of activities. The following describes the primary areas that contain recreation resources in the Project Area.

Jefferson County Road 126 Corridor

Jefferson County Road 126 serves as the primary transportation route for recreationists going to the Cheesman Reservoir, Wigwam Campground and Picnic Area and the Gill Trail. The corridor passes through National Forest lands that have been assigned a MA of 2B, which emphasizes rural and roaded-natural recreation opportunities. As a result, the ROS settings along the corridor are Rural and Roaded-Natural. Current development and use along the corridor meet the ROS guidelines.

A popular stopping point along the corridor is the Little Scraggy Scenic Overlook. It offers views of the South Platte River valley, the Rampart Range, and the Front Range. The corridor also provides two developed campgrounds, the Kelsey Creek and Wigwam Campgrounds. The Kelsey Creek Campground

has 17 sites and is located approximately three miles south of the highway overlook and is the most popular campground for RVs in the South Platte Ranger District (Strategy 2010). Farther south along County Road 126 is the Wigwam Campground and Picnic Area. There are ten walk-in oriented campsites/picnic areas at Wigwam, along with the trailhead for the Gill Trail.

The occupancy rate of the Kelsey Creek Campground is moderate, ranging between 30 percent during a one week period to a high of 70 percent during the weekends (Table 3-8). The Wigwam Campground and Picnic Area has a much higher occupancy rate, especially on weekends when it is 57 percent beyond designed capacity. Wigwams setting and proximity to the Gill Trail (the trailhead is near the parking area) and South Platte River make it a popular destination.

Table 3-8. Occupancy of Kelsey Creek and Wigwam Campground.

	7 Day Period		Weekend Period	
Facility	Available Sites	Occupancy (%)	Available Sites	Occupancy (%)
Kelsey Creek	1472	30	512	70
Wigwam	920	68	320	157

Source: Strategy 2010, U.S. Forest Service

South Platte River Corridor

The South Platte River corridor in this EA includes the area adjacent to the South Platte River from the Wigwam Club downstream (north) to where the river leaves the Project Area. The ROS settings along the roaded part of the river corridor are Rural and Roaded Natural. Due to scattered residential areas and recreational developments along the corridor, the Rural and Roaded-Natural ROS settings are met.

The corridor has outstanding recreational features and the section of the South Platte River flowing through this portion of the corridor is being evaluated for inclusion into the National Wild and Scenic River System as a Recreation River. The river is a Gold Medal trout stream and is very popular with anglers. This section of the river typically receives between 1,500 and 4,000 angling hours per mile (Wild and Scenic River Study). It is also used by the eight commercial flyfishing guides that have permits to use the South Platte River.

Because of its excellent fishing, other attractions, and close proximity, the river corridor is extremely popular for quick one-day and overnight use by Denver metropolitan area residents. The roads that follow the river provide easy access for people who are camping, picnicking, hiking, fishing, kayaking, tubing, participating in other types of water play, and site seeing. Some of the activity occurs in the developed facilities, but much of it is dispersed along the banks of the river. Recreation use of the corridor is intense, primarily due to easy access and proximity to two major population centers. On summer weekends, all formal parking areas can be full, as can most of the informal pullover areas along corridor roads.

As illustrated in Table 3-9, occupancy of the corridor's developed recreation facilities are very high, reflecting the corridors popularity among recreationists. On weekends, all but one facility (the Osprey group campground) receive higher occupancy than their design capacity. These figures do not reflect the heavy dispersed use that occurs along the corridor.

The popularity of the corridor has caused resource damage, including damage to vegetation and erosion both at recreation sites and along the banks of the river. Dispersed use, especially camping, was particularly damaging to resources (Wild and Scenic River Study Report). As a result, the Forest Service, the Denver Water Board, the Colorado Division of Wildlife and Jefferson and Douglas County Sheriffs Departments established a cooperative management plan. The plan eliminated overnight dispersed camping in the corridor. Campers are now required to camp only in developed campgrounds. Two new campgrounds (Ouzel and Osprey) were built as informal group camps to help accommodate the loss of dispersed camping opportunities along the corridor.

In addition to the Ouzel and Osprey campgrounds, other developed facilities include the Lone Rock Campground (20 campsites), the Bridge Crossing Picnic Area, the South Platte River Campground (10 walk-in sites), the Scraggy View Picnic Area, the Willow Bend Picnic Area, and the Colorado Trail and trailhead near South Platte. All of these facilities are heavily used on weekends and damage to riparian vegetation is evident at all of them (Strategy 2010). Although not open to the public, the Wigwam Club (which is a private fishing club) is a significant recreational facility located in the corridor next to the river upstream from Deckers.

Table 3-9. Occupancy of South Platte River Corridor Developed Recreation Facilities.

	7 Day Period		Weekend Period	
Facility	Available Sites	Occupancy (%)	Available Sites	Occupancy (%)
South Platte (CG)	920	73	320	168
Ouzel (CG)	1196	48	416	111
Osprey (CG)	1196	29	416	67
Lone Rock (CG)	1656	58	576	133
Bridge Crossing (Pic)	460	107	160	107
Scraggy View (Pic)	276	112	96	258
Willow Bend (Pic)	460	46	160	106

The Gill Trail

The Gill Trail provides non-motorized access to Cheesman Canyon and the South Platte River upstream from the Wigwam Club. This section of the river is being considered for inclusion into the National Wild and Scenic River System as a Wild River. It is also a catch and release Gold Medal Trout Stream. The proximity of this section of the river to large population centers coupled with excellent fishing prospects, beautiful scenery, and relatively easy access, makes this section of river very popular. Many pools and riffles will host multiple anglers on weekends and it can be difficult to walk along portions of the trail (particularly the downstream portion) for more that a few minutes without seeing anglers and hikers.

The MA for this portion of the river and Cheesman Canyon is 5B. The primary management direction for this MA is for big game winter range forage and cover. The ROS setting for the portion for this MA is Semi-Primitive Non-Motorized (North Fork of the South Platte and the South Platte River Wild and

Scenic River Study). Despite the popularity of the Gill Trail and Cheesman Canyon, the ROS setting of SPNM is met.

The Gill Trail begins at the Wigwam Campground in the County Road 126 corridor (see above) and soon joins the dirt road to Cheesman Reservoir. After following the road for approximately 0.25 miles, the trail leads up to a ridge overlooking Cheesman Canyon. Numerous dispersed trails that have been created over the years by recreationists leaving the road converge on the trail at this location. Once over the ridge and in the canyon, more dispersed trails leave the Gill Trail and head in a more direct (and steep) route to favorite parts of the river. These dispersed trails spin off the Gill Trail for most of its length up the canyon. However, the greatest concentration is in the first mile or so of the canyon. Due to easily erodible decomposed granite soils and loss of vegetation from trampling, many areas along the Gill Trail have become severely eroded.

After several miles the maintained Gill Trail ends and becomes an unmaintained dispersed trail that leads to an area near the bottom of the Cheesman Dam. Some hikers and anglers continue up another steep dispersed trail that heads up the side of the canyon to a dirt road near the Cheesman Reservoir Dam. They follow the road along the reservoir to a public parking area outside of the fenced in portion of the reservoir. A gate at the parking area restricts access to the road and times the road can be used (during daylight hours).

Buffalo Creek

The Buffalo Creek area includes the Buffalo Creek Mountain Bike Area. This is extremely popular for a variety of recreation activities. Activities include hiking (the Colorado Trail passes through this area), mountain biking (there are many marked routes for mountain bikers and approximately 40 miles of trails in the Buffalo Creek Mountain Bike Area), horseback riding, animal packing, fishing, and camping. Recreationists driving to the privately owned Wellington Lake for day use activities or camping, pass through the area on Forest Road 543 or the Wellington Lake Road (Forest Road 560).

The Buffalo Creek area is large and includes two Management Areas. Most of the area is in an area of MA 2B, which emphasizes rural and roaded-natural recreation. Most of the MA 2B area has been classified as either Semi-Primitive Non-Motorized, or Semi-Primitive Motorized (in the area east towards the South Platte). The other designation is MA 7A, which emphasizes tree stand management. This MA does recognize the importance of roaded natural recreational opportunities along Forest Service arterial and collector roads, semi-primitive motorized recreation opportunities along local roads and trails, and semi-primitive non-motorized recreation opportunities in areas with closed roads. Accordingly, areas adjacent to Forest Roads 543 and 550 (which provide the primary motorized access into the area) and developed campgrounds have been assigned ROS settings Roaded Natural. The facilities within and management of the Buffalo Creek area meet their ROS settings.

The 1996 Buffalo Creek fire damaged part of the Buffalo Creek area. The fire and resulting flooding and erosion destroyed a number of popular recreational facilities. They include the Baldy, Tramway, and Top of the World campgrounds, the Buffalo Creek Picnic Area, and several trails (including part of the Colorado Trail).

The loss of these facilities has placed pressure on the remaining developed facilities. These facilities include three campgrounds, numerous trails, and several trailheads. Of the three remaining campgrounds, the Meadows Group campground is the largest, accommodating groups of between 200 and 300 campers. The Green Mountain campground is smaller, with six campsites, and the Buffalo campground has 41 campsites. Occupancy rates at the campgrounds are lower than other parts of the Project Area (Table 3-

10). Average occupancy at the Buffalo and Green Mountain campgrounds rarely exceeds designed occupancy rates, even on weekends.

Table 3-10. Occupancy of the Meadows, Buffalo and Green Mountain Campgrounds.

	7 Day Period		Weekend Period	
Facility	Available Sites	Occupancy (%)	Available Sites	Occupancy (%)
Meadows	184	na	64	na
Buffalo	3864	13%	1344	31%
Green Mountain	552	41%	192	95%

The Colorado Trail

The approximately 500-mile long Colorado Trail (CT) passes from east to west through the north part of the Project Area. It is a significant state recreation resource and is one of the best known trails in the state. The CT enters the Project Area from the South Platte River canyon. The trail continues in a generally western direction and exits through the Buffalo Creek area on its way into the Lost Creek Wilderness. The Buffalo Creek fire denuded vegetation along part of the CT and the resulting erosion damaged segments of trail and washed out a bridge crossing. The bridge has been relocated and much of the damaged portions of the CT have been repaired or relocated.

The CT passes through areas of MA 2B and 7A. The trail passes through portions of MA 2B area that have both Semi-Primitive Non-Motorized, or Semi-Primitive Motorized ROS settings. The MA 7A areas emphasize tree stand management, but recognizes the importance semi-primitive motorized recreation opportunities along local roads and trails such as the CT. It also supports semi-primitive non-motorized recreation opportunities in areas with closed roads. The assigned ROS settings are met along the trail.

The Rampart Area

The eastern portion of the Project Area abuts the Rampart Range and contains part of the Rampart Range Motorized Recreation Area. The Recreation Area contains more than 120 miles of trails designed for off-highway vehicles (OHVs) and all-terrain vehicles (ATVs). The area is arguably the most popular dispersed motorized area in the Front Range and its popularity increases annually (Strategy 2010). The ROS settings for this area are Roaded Natural along roads (including the Rampart Range Road and State Highways 67 and 40), and Semi-Primitive Motorized (in the part of the area that contains the trail system). Activities and development in these areas are consistent with the ROS settings.

The developed facilities include the Indian Creek Campground (11 units) and trailhead, the Flat Rocks Campground (20 units), the Cabin Ridge Picnic Area, and developed motorized trails such as Russel Gulch (Forest Trail 693), Bear Creek (Forest Trail 692), Cabin Ridge (Forest Trail 675), and Noodle Trail (Forest Trail 677). Occupancy at the Indian Creek Campground is higher than most developed facilities in the Project Area during the week, but still within the designed occupancy level (Table 3-11). On weekends, occupancy of the campground is 55 percent above the designed occupancy rate. The Flat

Rocks Campground is one of few facilities where use does not exceed the designed occupancy rate during the week and on weekends.

Table 3-11. Occupancy of Indian Creek and Flat Rocks Campgrounds and Cabin Ridge Picnic Area.

	7 Day Period		Weekend Period	
Facility	Available Sites	Occupancy (%)	Available Sites	Occupancy (%)
Indian Creek (CG)	1012	68	352	155
Flat Rocks (CG)	1840	20	640	46
Cabin Ridge (CG)	552	na	192	na

Source: Strategy 2010, U.S. Forest Service

Other Recreational Resources

TRAILS

There are additional isolated trails located in various parts of the Project Area. Most are multiple use trails that permit use by hikers, horses and pack animals. Others include ATV and ORV trails.

FLYING G RANCH (GIRL SCOUT CAMP)

The Flying G Ranch is a Girl Scout camp located in the southwestern part of the Project Area. Although it is not open to the public, it is a significant recreational resource. Approximately 2,000 girls attend the summer camp and participate in outdoor activities such as hiking and backpacking trips into the Lost Creek Wilderness (Camp Info, 2000).

LOST CREEK WILDERNESS

Part of the 120,700 acres Lost Creek Wilderness Area is in the Project Area, but the vast majority is adjacent to it. The wilderness is known for it's granite canyons, walls, and domes that range from 8,000 feet to over 12,400 feet in elevation. From the Project Area the Wilderness is accessed trails such as the Colorado, Wigwam, and Rolling Creek. There are approximately 100-miles of hiking trails in the wilderness.

AIR QUALITY

INTRODUCTION

The Upper South Platte watershed is adjacent to the Denver metropolitan area. Because of this close proximity, air pollution produced by urban traffic and industrial sources can affect the Project Area. Conversely, people downwind of the National Forest can be affected by air pollution originating from the Forest such as smoke from wildfires or prescribed burning, and dust from unpaved roads. This section includes a summary of the applicable air quality rules and regulations, a description of the current air quality in Denver and the surrounding area, and an assessment of potential emission sources in the Project Area. The potential for emissions from prescribed burns and wildfires are also included in this discussion.

AIR QUALITY REGULATIONS

Federal Clean Air Act

Congress passed the Clean Air Act in 1960 with major amendments to the Act in 1967, 1970, 1977, and 1990. In 1971 the United States Environmental Protection Agency (EPA) adopted National Ambient Air Quality Standards (NAAQS) under the authority of Section 109 of the Clean Air Act. These standards include acceptable levels of carbon monoxide, hydrocarbons, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide. Two different types of standards have been established. These standards include primary standards, which are levels of pollutants set to protect public health; and secondary standards, which are levels intended to protect public welfare. The standards are expressed in terms of different averaging times, e.g., annual, 24-hour, and 3-hour. The Clean Air Act requires the EPA to review public health standards every five years and update standards, if necessary, to protect public health, based on the latest, best available science.

The Clean Air Act also required the initiation of the Prevention of Significant Deterioration (PSD) program. The goals of this program are to; protect air quality in areas cleaner than that required by the NAAQS, protect air quality in certain National Parks and Wilderness Areas, and insure that economic growth in these areas is consistent with the preservation of the existing air resources. The PSD program established three air quality classes (I, II, III), each with defined allowable levels of air quality deterioration. The Class I increments allow for much less air quality deterioration than the Class II and Class III increments. The Clean Air Act designates certain national Parks and Wilderness areas as mandatory “Class I Federal Areas”. A class I designation imposes the most stringent restrictions and includes protecting visibility within these areas.

State Regulations

The Clean Air Act gives individual states primary responsibility for implementing air quality programs. States carry out this responsibility through a State Implementation Plan (SIP), which is developed at the state level. How states achieve and maintain federal and state standards is described in the SIP. Each State is responsible for bringing non-attainment areas (those areas that do not currently meet NAAQS) into compliance. If an area is not in attainment of an NAAQS, then a SIP must be developed to attain the standard by a certain date by controlling the pollutant emissions from the responsible sources. States must also revise their SIPs to demonstrate attainment of new standards as they are developed.

The state of Colorado regulates air quality through a citizen board. The board is made up of nine commissioners advised by the Department of Health. The Commission was created by the Colorado Air Quality Control Act. The role of the Commission is to; 1) adopt an air quality program for the state, 2) assure the state's program meets the requirements of the Federal Clean Air Act, and 3) issue or deny PSD permits and enforce orders (U.S. Forest Service, 1998).

US Forest Service Air Resource Management Policy

It is Forest Service policy to integrate air resource management objectives into all resource planning and management activities. Air resource objectives for the agency includes

- **Protecting air quality related values within Class I areas.**
- **Controlling and minimizing air pollutant impacts from land management activities**
- **Cooperating with air regulatory authorities to prevent significant adverse effects of air pollutants and atmospheric deposition on forest and rangeland resources.**

All National Forest lands, except for Wildernesses established prior to August 7, 1977, are Class II air quality areas. The National Forest wilderness areas in the Project Area are Class II air quality areas. National Forest Service policy is to manage smoke from prescribed fires occurring in or adjacent to Class I Wilderness areas in a manner that causes the least impact to air quality related values (U.S. Forest Service, 1994). Regional Forest Service policy states that since fire and the resultant smoke is part of the natural process, wilderness users may be provided the opportunity to experience this natural event (U.S. Forest Service, 1998).

The National Forests in the State of Colorado have signed a Smoke Management Memorandum of Understanding (MOU) with the Air Pollution Control Division and other federal and state land managers in Colorado. Under the current smoke management program, permits are issued by the Colorado Air Pollution Control Commission for prescribed burning projects on forest and rangeland. Signatories of the MOU are responsible for ensuring proper smoke management for any prescribed fires they conduct and obtaining a permit from the State before initiating prescribed burning (CAPCD, 2000).

EXISTING AIR QUALITY

Seasonal Effects on Air Quality

The Project Area is located just a few miles southeast of Denver and the local air quality is affected by the urbanization of this adjacent area. Air pollution in the Denver area produces a visible haze during high pollution episodes. This "brown cloud" is caused mainly by airborne particles and occurs most frequently during the winter months, November through March. Calm winds and stagnant conditions during these months can cause pollutants to accumulate in a shallow layer near the South Platte River (Lawson and Smith, 1998).

Topography and weather patterns determine the extent to which airborne particulate matter accumulates within the local airshed. Denver is located in a shallow basin that was carved by the South Platte River. The valley becomes wider as it extends to the north and east. To the west of Denver lies the Front Range of the Rocky Mountains. Prevailing westerly winds over the Rocky Mountains carry pollutants from the Denver metropolitan area away to the east.

Diurnal temperature changes affect how pollutants in the region are dispersed. The cooling of the earth's surface at night creates downslope winds that carry pollutants from higher terrain to low-lying areas where they may concentrate or exit the region along the river valleys to the northeast. The heating of the earth's surface during the day causes pollutants to rise with the heated air where they are diluted and can be carried away with the air that passes over the Rocky Mountains.

During winter months, weather conditions can trap emissions in a layer of cold surface air. This happens when snow covers the ground and keeps the earth's surface from heating or when easterly winds trap cold air in the South Platte River basin. Under these winter conditions, pollutants will concentrate in the local airshed along the foothills.

Particulate Matter and Public Health

Particulate matter is the term used for tiny particles of solid or semi-solid material suspended in the air. Particles can range in size from less than 0.1 microns to 50 microns. Particles larger than 50 microns tend to settle out of the air quickly and are less likely to effect public health. Particles 10 microns and smaller are considered inhalable and have the greatest health effect. Coarse particles, from 2.5 to 10 microns in diameter, come from sources such as windblown dust and dust kicked up on unpaved roads by vehicle traffic. Fine particles, smaller than 2.5 microns in diameter, are generally emitted from activities such as industrial and residential combustion and from vehicle exhaust. Fine particles are also formed in the atmosphere when gases emitted by combustion activities are transformed by chemical reactions in the air (CAPCD, 1998). These fine particles are major contributors to visibility problems because of their ability to scatter light (CAPCD, 1998).

Non-Attainment Designation of the Watershed

The upper South Platte watershed is located in Jefferson and Douglas Counties. These two counties have been designated by the EPA as non-attainment areas for particulate matter smaller than 10 microns (PM 10). This means that these counties do not currently meet National Ambient Air Quality Standards and are required to develop a SIP to bring the area into attainment. A SIP has been developed that sets

emissions budgets for non-attainment areas around the State and limits the pollutant of concern that can be released within these areas. De minimis levels are the amount of a pollutant that can be emitted without requiring formal reporting to the Colorado Pollution Control Commission. If the level of emissions from each emission point at a contiguous site are greater than the de minimis level, then formal reporting is required. The de minimis level for PM-10 in attainment areas within the State of Colorado is 150 tons annually. This level is dropped to 100 tons for PM-10 non-attainment areas.

Emission Sources

In 1995, the Colorado General Assembly established the Northern Front Range Air Quality Study to identify sources of air pollution along Colorado's Front Range (Lawson and Smith, 1998). This research found that during winter episodes of high haze in the Denver area, the primary contributors of directly emitted particulate matter smaller than 2.5 microns (PM 2.5) are mobile sources. Exhaust from cars, trucks, construction equipment and locomotives and dust from roads and construction contributed 75 percent of the directly emitted PM 2.5. Another important winter source included wood burning emissions. The study also found that pollution episodes in Denver during the summer generally do not result in as high a concentration of fine particulate matter as during the winter episodes and that, during the summer months, dust constitutes a greater proportion of the airborne particulate matter.

Colorado's Air Pollution Control Division measures ambient air quality throughout the state with a network of pollution monitors. Data published in the Colorado 1998 Air Quality Data Report indicates that air quality within the Denver area has improved over the last ten years despite record population growth (CAPCD, 1998). No Federal air quality standards were violated in Denver from 1996 through 1998. However, some ambient air quality standards were exceeded during this time but the limits for both concentration and frequency of exceedances as established by the Federal Clean Air Act were not violated.

There are two different levels of standards set for the pollutants addressed in the Clean Air Act. Primary standards are standards set at levels to protect the health of the most susceptible individuals in the population. Secondary levels are designed to protect public welfare. All of the standards are expressed as concentration and duration of exposure. Many standards address both short-and long-term exposure and have several primary standards. The term "violation" and "exceedance" of a standard have different meanings. An exceedance is any single value greater than the standard. A violation occurs when the limits for both concentration and frequency of occurrence as established in the Federal Clean Act are exceeded. Primary standards for PM-10 include an annual level and a 24-hour standard. The annual average concentration for this pollutant is set at 50 micron per cubic meter. The 24-hour standard is 150 micron per cubic meter (CAPCD, 1998). Decreases in automotive emissions and bans on burning wood have helped to control many of the pollutants in the Denver airshed including PM-10. However, rapid population growth will continue to affect the area's air quality.

Emissions Sources within the Project Area

The proposed activities in the Project Area could affect the air quality of the local area as well as downwind communities. Dust and smoke that may be generated from these activities contribute pollutants to the local airshed.

DUST

Dust could be produced from vehicle traffic on unpaved roads and soil disturbance caused by construction and land management operations. Highway 126, which is paved, and highway 67, much of

which is paved, accesses much of the Project Area. However, most of the Project Area's roads are unpaved. Particulate emissions occur when vehicles travel on unpaved roads. When a vehicle travels an unpaved road, the force of the wheels on the road surface causes pulverization of the surface material. Dust is lifted and dropped from the rolling wheels and the road surface is exposed to strong air currents in turbulent shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed. The amount of particulate matter emitted from a given road varies proportionally with the amount of traffic. In addition, the weight and speed of the vehicles, the silt content of the road surface and climatic conditions all affect the amount of dust generated. Heavier vehicles and faster moving traffic create greater volumes of emissions. Emissions increase directly with the proportion of silt in the road surface material. The frequency and amount of precipitation in the area affects the moisture content of the road surface, which affects the amount of dust generated. More road dust would be produced on dry sunny days when recreational use is high, vehicle traffic is heavy, and the moisture content of the road surface is low. On cold wet days when use is low and the moisture content of the road surface is low, less particulate matter is produced.

Controls to reduce particulate emissions from unpaved roads include reducing the amount of traffic and treating and improving the road surface. Since emissions from unpaved roads are directly correlated to the amount of traffic, controlling the amount and type of vehicle use can reduce emissions. Surface treatments include application of water or chemical stabilizers to the road surface. Watering increases the road surface moisture content and conglomerates the silt particles, which reduces the amount of particulate matter that becomes airborne with traffic. The application of chemical stabilizers suppresses emissions by changing the physical properties of the road surface. Chemical dust suppressants form a hardened surface by binding surface particles together. Probably the most effective way to control emissions from unpaved roads is through paving. Paving is a highly effective control, but can be costly. Other surface improvements that can reduce emissions include covering the road with a new material of lower silt content and regular maintenance to help retain larger aggregate sizes on the traveled portion of the road.

SMOKE

Sources of smoke originating from the Project Area include wood burning stoves, wildfire and prescribed burning. Smoke from wood burning stoves and prescribed fire is regulated by the state's smoke management plan. Currently, no burning is allowed in the area from November 1st to the end of February when weather conditions are most likely to produce inversions and poor dispersal.

WILDFIRE

The source that could potentially produce the greatest amount of emissions from the Project Area is smoke from wildfire. Smoke from wildfires can contain high concentrations of fine particulates. Concentrations of 5,000 micrograms per cubic meter for PM 10 have been measured on some wild land fires (U.S. Forest Service, 2000). The EPA 24-hour standard for PM 10 is 150 micrograms per cubic meter.

In 1996, 12,000 acres burned in the Buffalo Creek area. This was a hot fast moving crown fire. Because of the current forest conditions, large crown fires are likely to occur else were in the Project Area over time (see the discussion on wildfire potential *in Chapter 3 - Vegetation*). Smoke from these wildfires could contribute high amounts of emissions to the local airshed for a period of a few days to several weeks. Additionally, smoke can affect airsheds hundreds of miles away. Smoke from the recent Cerro Grande fire near Los Alamos, New Mexico was noticeable for hundreds of miles including in Denver, Colorado.

Much of the Project Area is at risk for large wildfires (Foster Wheeler, 1999). Stands within the Upper South Platte watershed were assigned a fire hazard rating based on historic lightning patterns, proximity to roads, fuel loads and canopy characteristics (Foster Wheeler, 1999). Based on these parameters 60 percent of the area in the Horse Creek, Waterton/Deckers and Buffalo Creek watersheds is ranked as high fire hazard. These high hazard areas form a continuous block spreading from the Horse Creek watershed north. This continuous block of high fire hazard is primarily areas covered by dense ponderosa pine and Douglas fir forest. Areas of low fire hazard are concentrated in the northern and western portions of the Project Area. These low hazard environments are primarily open shrublands, high elevation spruce-fir forest, and recently burned or harvested areas.

The prevention and suppression of fire has contributed to the current high fire hazard. Years of fire suppression have allowed smaller, thin barked trees to proliferate and dense stand conditions to develop over time. The existing small trees serve as ladder fuels permitting surface fires to climb into the tree canopy and become crown fires. Because of the amount of live fuel that can burn, crown fires tend to release high amounts of PM-10. Fuels unburned in one incident may be consumed by some future incident unless the fuels are either biologically decomposed or permanently removed from the site.

Dense stand conditions in the Project Area have reduced the amount of grass and other understory plants that could develop. Historically, these understory plants provided fine fuels that would sustain low-intensity ground fires. Because many of these forest stands have little in the way of fine ground fuels, prescribed fires alone are unable to modify the forest structure and reduce the risk of crown fires. To change the forest structure and reduce the fire hazard, live trees need to be cut to reduce ladder fuels and create more open stand conditions (U.S. Forest Service, 2000). Prescribed fire can then be employed to remove the created ground fuels

PRESCRIBED BURNING

Many management actions can affect emission production from wildfires by intentionally reducing wildfire occurrence, extent, or severity. Fire prevention programs, aggressive wildfire suppression, and fuel treatments can all reduce emissions from wildfires. However, these same programs have contributed to the current high fire hazard in the area (see below), partly by increasing the amount of fuels. Fuels can be removed from a site either through mechanical means (e.g. timber harvest) or by prescribed burning. Physically removing fuels from the site has the advantage of not creating any smoke. However, removal of small unmerchantable material maybe costly. Prescribed burning can be used to remove natural accumulations of fuels from a site, remove fuels created by management activities, and reduce wildfire hazard. However, removing fuels with fire will create emissions.

Currently the Pike National Forest burns approximately 5,000 acres a year through prescribed burning. Estimates of emissions from prescribed fires conducted under conditions intended to minimize emissions range from 20 to 500 pounds of carbon monoxide, 17 to 67 pounds of total suspended particulates, 10 to 40 pounds of hydrocarbons, and 2 to 6 pounds of nitrogen oxides for every ton of fuel burned (EPA, 1978). Actual emissions however, will depend upon the amount, size and condition of the fuel burned, weather conditions, and burning techniques employed. In general however, smoke production will increase with fuel consumption.

Effective prescribed burning requires that burning plans be developed that specify the objectives of each burn and prescribe the conditions, techniques and precautions required to meet those objectives. Important factors that determine fire behavior and the effects of prescribed burning include the ignition pattern employed, local weather conditions at the time of burning, and fuel characteristics. By using smoke management techniques, emissions from prescribed burning can be much lower than those created by wildfire.

VISUAL RESOURCES

INTRODUCTION

This Affected Environment discussion begins with a brief summary of the major physical properties of the Project Area that influence visual quality. The Forest Service Visual Management System is then briefly discussed, followed by a summary of the primary locations or routes from which the proposed actions could potentially be viewed.

PHYSIOGRAPHY

The Project Area is located in the Southern Rocky Mountain Physiographic Region and the "Front Range" Landscape Character Type. Elevations range from approximately 6,000 feet along the South Platte River to almost 9,000 feet at some of the higher peaks. The terrain is extremely varied and includes deep narrow canyons, flat river valley bottoms, broad meadows, rugged mountain foothills, steep slopes, rounded granite peaks, and scattered rugged granite outcroppings. The varied and rugged topography greatly influences vegetation patterns in the Project Area. The variety of terrain also provides a range of possible visual experiences from total enclosure, to broad vistas.

VEGETATION

The Project Area is located in the montane vegetation zone. This zone is typically composed of ponderosa pine mixed with Douglas-fir and smaller amounts of Colorado blue spruce. *Chapter 3 - Forest Vegetation* provides a more detailed description of the vegetation found in the area.

The contemporary vegetation patterns found in the Project Area differ from historic patterns. Fire historically played an important role in the ecosystem and vegetation patterns, thus influencing visual character. Prior to European settlement in the middle of the 19th century, wildfire was the predominant influence on vegetation species and patterns across the landscape. The historic fire regime was mixed severity, which resulted in a mosaic of vegetation patterns across the landscape (Foster Wheeler, 1999). There were more openings than are currently found and stands tended to be less dense. In addition, Ponderosa pine was more dominant with Douglas fir primarily relegated to moister, north facing slopes. Historically, these Douglas fir stands would have been limited by fire except on these types of sites. *Chapter 3 - Forest Vegetation* describes the historic fire regimes in the area.

Two factors are primarily responsible for the current visual character of the forested portions of the Project Area. The first was the timber harvest operations that occurred in the in the late 19th and early 20th centuries. These harvests removed most of the large stands of trees. The second factor was the fire exclusion policy started in the 1940's. The two factors combined to change the visual character of much of the Project Area. By removing the stands of large trees and suppressing fire, the forests were converted to densely canopied ponderosa pine and Douglas-fir stands. As a result, the forest today appears densely uniform, with few interspersed openings. Figures 3-2 and 3-3 show scenes of Buffalo Park and Deckers in 1900 and 1999. Note the significant difference in forest canopy.

Although the forested parts of the Project Area are much more uniformly dense today than they were historically, the project landscape is far from uniform in appearance. Because of the wide variety of topography and soils, there are many natural openings in most of the forest throughout the area. There are also variations of species composition in the forested portions of the area that provide scenic variety. Many of the people who use the Project Area are unaware that the forest they see is not the type of forest that historically existed. This may lead to the perception that the forest is sustainable as it currently exists when actually it has deviated significantly from what is considered a sustainable condition. Fire risk is a dominant concern (Foster Wheeler, 1999).

VISUAL MANAGEMENT SYSTEM

The Visual Management System (VMS) was developed by the Forest Service to characterize, classify, and manage visual resources in National Forests (National Forest Landscape Management Volume 2). This VMS information is taken into consideration when Forest Plans are developed. These plans then establish Visual Management Objectives for Forests that are reflected in the Management Area direction (see *Chapter 2 - Alternatives*, and *Chapter 3 - Recreation*).

The VMS divides the National Forest System lands into several visual categories based on variety class, sensitivity level, and distance zone. Variety classes are obtained by classifying the landscape into different degrees of variety. This determines those landscapes that are most important and those that are of lesser value from a standpoint of scenic quality. Sensitivity levels are a measure of the people's concern for the scenic quality of the Forest. Level 1 is the highest sensitivity and Level 3 is the lowest. Distance zones describe distances from which the landscape is viewed.

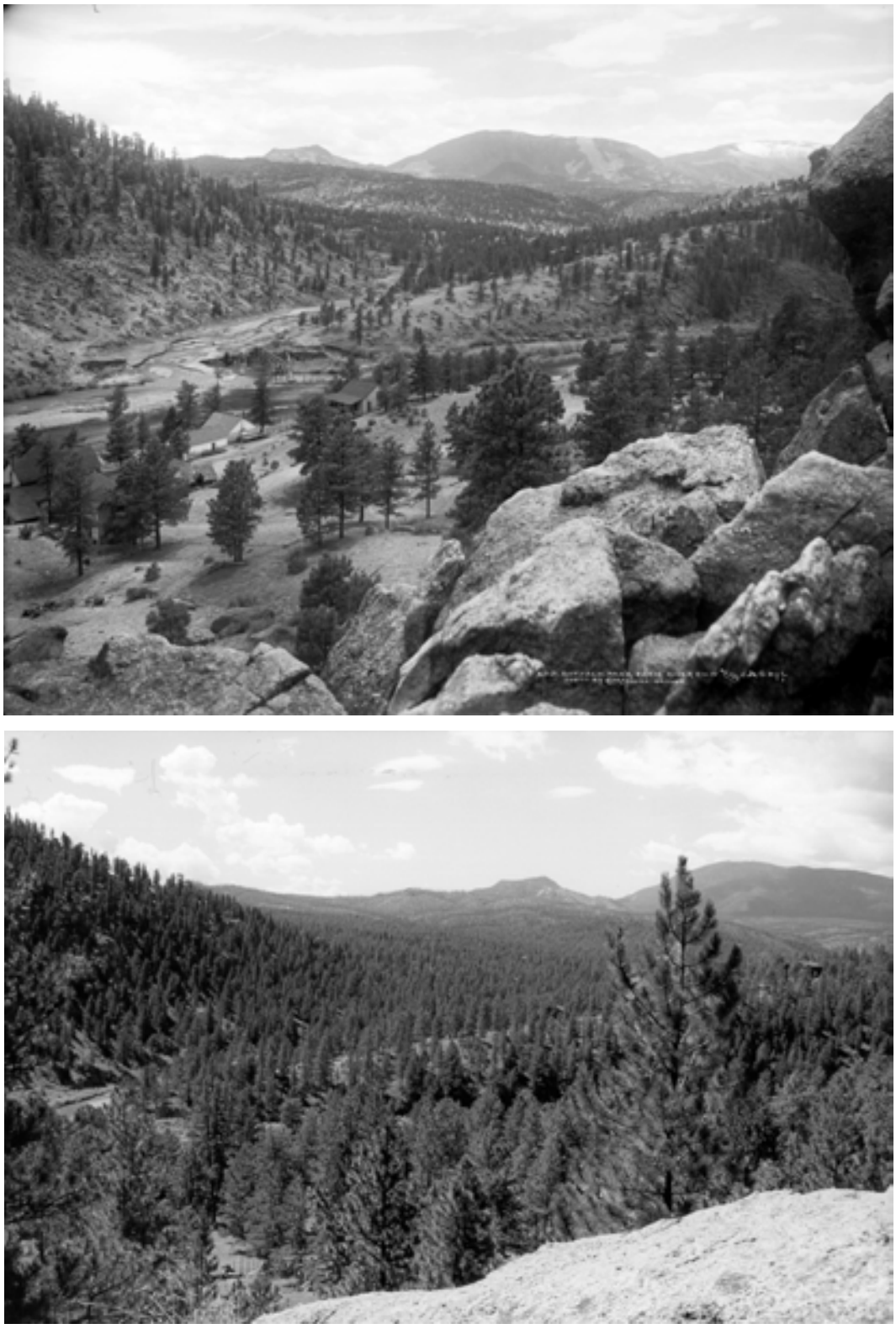


Figure 3-2. Buffalo Park circa 1900 and 1999

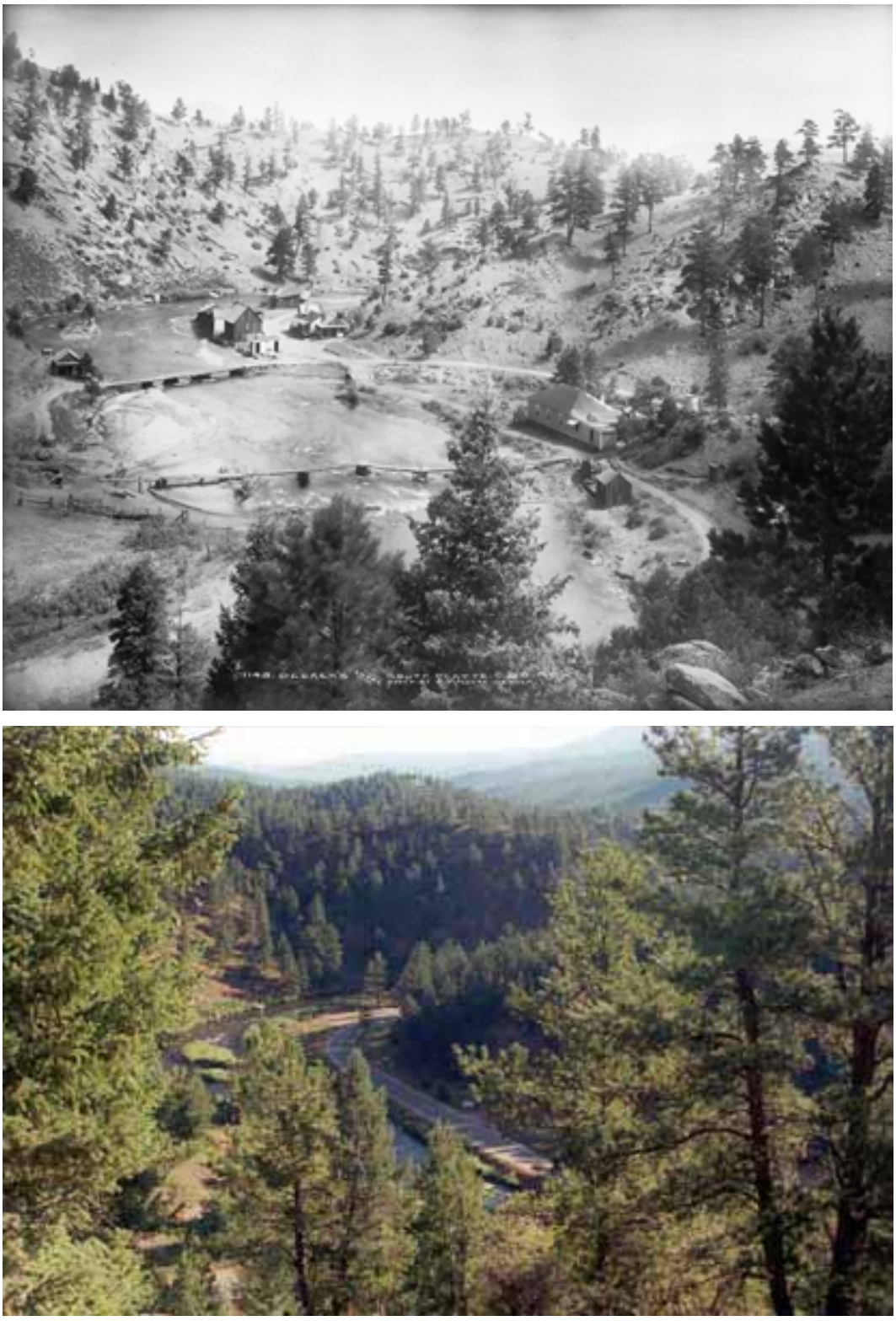


Figure 3-3. Deckers circa 1900 and 1999

After the landscape has been inventoried, Visual Quality Objectives (VQOs) are established for the landscape. The VQOs help to guide management activities within a Forest. There are five VQOs in the current Forest Plan. They are described below.

- **Preservation - allows management activities that are not noticeable**
- **Retention - allows management activities that are not obvious to the casual observer.**
- **Partial Retention - allows management activities that are noticeable, but do not attract attention.**
- **Modification - allows management activities that are obvious, but blend in with the surrounding landscape.**
- **Maximum Modification - allows management activities to dominate the characteristic landscape.**

The Project Area has been partially inventoried for specific projects using the VMS. For example, the Wild and Scenic River Study Report and the Draft Legislative Environmental Impact Statement inventoried areas along the South Platte that flow through the Project Area. However, most of the Project Area has not been inventoried and the VQOs assigned to MAs have been used for this EA. The applicable VQOs for various parts of the Project Area are described below in the description of viewing locations and routes.

VIEWING LOCATIONS AND ROUTES

The primary locations or routes from which the proposed actions could be viewed include: communities; residences; highways; and Forest Service roads, trails, and recreation areas. Several locations and routes have been selected to represent areas from which proposed actions could be viewed. The existing general visual conditions of these locations and routes will be described in this section. The representative locations and routes selected for this EA include the Jefferson County Road 126 corridor, the South Platte River corridor (including the Gill Trail), and the portion of the Colorado Trail near the Jefferson County Road 126 trailhead. A brief description of each location or route, potential viewers from the location or route, and the existing Forest Plan VQO is included below.

Jefferson County Road 126 Corridor

The corridor follows Jefferson County Road 126 from the north edge of the Project Area south to Deckers. The highway passes through both private and National Forest System lands that are largely undeveloped and natural in appearance. Most of the developed areas observable from the highway are on private lands. They include a variety of rural land uses and buildings, several rural residential areas and a commercial area near Deckers. The National Forest System lands that can be observed from the highway are generally natural in appearance, although several recreational facilities can be seen. An area along Buffalo Creek that was burned in the Buffalo Creek fire is a prominent visual feature along the corridor.

Potential viewing areas along the corridor include Highway 126, the Little Scraggy viewpoint, the Kelsey Creek and Wigwam campgrounds, residential areas and the Deckers area. Views along the corridor are varied and can be enclosed by surrounding vegetation and terrain or extremely expansive. Viewers along

this corridor include recreationists using Highway 126 to access recreation areas, travelers passing through the Project Area, campers and/or picnickers, and residents.

The portion of the corridor located in National Forest System lands passes through lands that have been assigned a Management Allocation (MA) of 2B. The 2B allocation emphasizes rural and roaded-natural recreation opportunities and has a VQO directive not to exceed a VQO of Partial Retention for areas seen from significant routes. The Partial Retention VQO has been largely met along the portion of the route located on National Forest System lands.

The Buffalo Creek Area

The Buffalo Creek area is located in the western part of the Project Area near the upper Buffalo Creek drainage and Forest Roads 543 and 550. The area is an extremely popular area for a variety of recreation activities. Activities include hiking (the Colorado Trail passes through this area), mountain biking (there are many marked routes for mountain bikers and approximately 40 miles of trails in the Buffalo Creek Mountain Bike Area), horseback riding, animal packing, fishing, and camping. A variety of views are possible in this area depending upon terrain, nearby vegetation and location. There are many opportunities for extremely expansive, long distance views. The primary viewers in this area are recreationists using one of the areas recreational facilities such trails, campgrounds, and picnic areas, or people driving through the area.

The Buffalo Creek area is within two MAs. Most of the area is contained in a MA of 2B. This MA emphasizes rural and roaded-natural recreation. The VQO direction for this MA is not to exceed Partial Retention. The VQO for this area is met.

The other MA is 7A. It emphasizes tree stand management, but recognizes the importance of roaded natural recreational opportunities along Forest Service arterial and collector roads, semi-primitive motorized recreation opportunities along local roads and trails, and semi-primitive non-motorized recreation opportunities in areas with closed roads. Within MA 7A, management activities are not evident or remain visually subordinate along Forest arterial and collector roads and trails. In these areas the VQO is Partial Retention in the foreground. The rest of MA 7A has a VQO of Modification. These VQOs are met.

The South Platte River Corridor

This corridor starts below the Cheesman Reservoir dam, passes through Cheesman Canyon and continues downstream (and north) along the South Platte River to the northeast edge of the Project Area. The portion of the corridor between Cheesman Dam and the Wigwam Club is contained within the 600-foot deep Cheesman Canyon and is only accessible by trail. This portion of the corridor is located in National Forest System land and is natural in appearance. Views along this section of the corridor are generally confined to within the canyon Viewers in this section of the corridor are primarily recreationists who are fishing or hiking the Gill Trail.

The portion of the South Platte River valley between the Wigwam Club and the abandoned community of South Platte varies in width. Views from within this section of the corridor also vary, ranging from wide and expansive to confined. Land ownership along this section of the corridor is mixed. On private lands, there are private residences, agricultural buildings and other manmade structures. On the National Forest lands, the scenery is largely natural in appearance, although there are scattered developed recreation areas such as campgrounds and picnic areas.

The greatest number of viewers in this section of the corridor are recreationists participating in activities such as camping, picnicking, kayaking, fishing, biking, and water play. Travelers using the county roads, and residents in communities such as Deckers, Trumbull, Oxyoke, Nighthawk, and Foxton also view the Project Area.

Visual conditions in the corridor vary as do the VQOs that have been assigned to the National Forest System lands. The section of the river corridor downstream from the Wigwam Club has a VQO of Partial Retention. If the South Platte River is designated as part of the Wild and Scenic River System, the VQO for the National Forest System lands within the Wild and Scenic corridor (generally within 0.25 miles of the river) would be Retention. The portion of the South Platte River Corridor located in Cheesman Canyon has very little signs of alteration and thus, exceeds the existing VQO designation of Modification. Given the existing visual condition, this portion of the canyon would be considered Retention except where the Cheesman dam and Wigwam Club can be viewed. Most of the undeveloped portions on National Forest System lands downstream from the Wigwam Club would meet the VQO of Partial Retention. However, the developed private lands (which are not required to meet the Forest Service VQO designations) and the Forest Service campground areas would not.

The Colorado Trail

The Colorado Trail passes through the Project Area from east to west and is a significant state recreational resource. People using the trail can view the area from a number of locations along the trail and from trailheads. The trail goes through a wide variety of terrain and vegetation types, and as a result, offers a wide variety of views, from very enclosed, to extremely expansive. The portion of the trail that will be the focus of the analysis in this EA is the portion near the Jefferson County Road 126 trailhead. The area near the trailhead is predominantly forested and somewhat rolling**.** Except for the highway and parking area. The area near the trailhead has a natural appearance. Areas along the trail beyond the trailhead have a natural appearance. The primary viewers from this portion of the Colorado Trail would be people passing along the trail or people using this trailhead to access the trail. .

The trailhead area is located in an area with an MA of 2B (which has an emphasis on rural and roaded natural recreation). The VQO for this area is Partial Retention, which, except for the highway and parking area, has been met along the portion of the CT just beyond the trailhead.

HERITAGE RESOURCES

INTRODUCTION

Heritage resources are districts, sites, buildings, structures, and objects that contain evidence of past human activities. The National Historic Preservation Act (NHPA) of 1966 established the federal government's policy and programs on historic preservation, including the establishment of the National Register of Historic Places (National Register). Heritage resources that are listed or eligible for listing on the National Register are called historic properties. Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on historic properties. The Colorado Office of Archaeology and Historic Preservation (OAHP, Office of the Colorado State Historic Preservation Officer [SHPO]); and the Advisory Council on Historic Preservation (ACHP) are the state and federal agencies responsible for overseeing the management and preservation of heritage resources in compliance with the NHPA. Information specific to the proposed project was gathered using archival research, heritage resource field survey, and consultation with the SHPO, ACHP, affected Native American tribes, and other interested parties.

OVERVIEW

Use of the Project Area by human populations extends at least 10,000 years into the past (Kane 1990). Cultural resources, which provide evidence of this use, include prehistoric archaeological sites (e.g., campsites, lithic scatters, rockshelters), historic archaeological sites (e.g., trash dumps, mining sites, logging camps), and prehistoric and historic isolates. The Pike and San Isabel National Forest defines a prehistoric isolate as one to five artifacts with no associated cultural feature, such as a hearth, rock alignment, or structural remains. Sites, then, consist of a cluster of greater than five artifacts or less than five artifacts in association with a cultural feature. An historic isolate may be defined as structural remains or any number of artifacts that lack variation and do not together or individually represent human occupation, such as a scatter of similar cans or an isolated livestock shelter. Isolated finds are considered categorically ineligible for listing in the National Register.

Past surveys on the Pike and San Isabel National Forest indicate that areas more likely to contain prehistoric archaeological sites tend to be level or with a gentle slope, in proximity to water and with access to migration routes. These areas were more likely to be selected as campsites. Other high potential areas include cliffs or other bedrock exposures (rock shelters) and vertical drops, such as cliffs or ridge edges (game drives). Historic sites are most likely in areas of known and extensive historic development. The natural features that are used to predict prehistoric site locations can be used to predict historic site locations as well.

The north end of the Project Area consists largely of steep mountainous terrain that rises abruptly from deep stream canyons. The likelihood of finding archaeological sites on these slopes is considered low. However, in the southern portion of the area, valleys are wider with gentler slopes. The likelihood of encountering archaeological sites in these locations is higher. As expected, sites recorded during previous surveys are clustered along the major drainages, most notably the Upper South Platte River, in the southern portion of the area.

HERITAGE RESOURCES IN THE PROJECT AREA

The Forest Service has completed intensive heritage resource surveys for the Buffalo Creek rehabilitation Project Area in 1999 and has completed surveys on portions of the areas that could be affected by the other proposed actions. Heritage resource surveys for these other projects are currently underway. The Forest Service has made preliminary determinations regarding the National Register eligibility of most of the recorded sites in the Project Area. However, in most cases, the Forest Service has not yet received SHPO concurrence on these determinations. Heritage resources that have been recorded in the Project Area are discussed below.

Buffalo Creek Rehabilitation

The Forest Service previously conducted an intensive survey that included areas proposed for roller-chopping and intensive rehabilitation treatments. Visibility in the surveyed area was very good following the burn. Heritage resource surveys and background research resulted in the identification of a total of 50 heritage resources within the Buffalo Creek rehabilitation areas. Table 3-12 summarizes the survey and research results. Of the 50 heritage resources recorded, the Forest Service has identified four that appear to meet one or more of the criteria for listing on the National Register. These eligibility recommendations are pending SHPO review.

Table 3-12. Heritage Resources found near Proposed Buffalo Creek Rehabilitation.

Type of Site	Era of Site	# of sites	Forest Service recommendation for listing on National Register?
Camps, seasonal camps, processing stations	Prehistoric	12	yes, 3 campsites
Quarry	Prehistoric	1	yes, 1 quarry
Isolated finds	Prehistoric	12	Not eligible
Refuse dumps	Historic	13	None recommended
Farming/ranching camp	Historic	1	Not recommended
Trapping/hunting camp	Historic	1	Not recommended
Standing structure	Historic	1	Not recommended
Isolated finds	Historic	8	Not eligible
Isolated finds	Dual	1	

Vegetation Treatment

Approximately 30 percent of the areas designated for vegetation treatment have been previously surveyed for heritage resources and survey of the remainder of the harvest area is currently underway. A large portion of the Project Area was previously surveyed in 1985-86, in conjunction with the Two Forks Reservoir project.

Previous surveys that were not completed specifically for this project located 34 sites in the proposed treatment units. Table 3-13 summarizes the sites that have been located to date. The Forest Service has currently identified four that appear to meet the criteria for listing on the National Register (see Table 3-13). The Forest Service site database also indicates that 11 of the properties have either not been evaluated or need additional data to complete an evaluation. SHPO concurred with the Forest Service on the eligibility determination for the rockshelter. Their review of the eligible/not eligible recommendations for the other properties is still pending.

Table 3-13. Heritage Resources found near the Proposed Vegetation Treatment

Type of Site	Era of Site	# of sites	Forest Service recommendation for listing on National Register?
Campsites/lithic scatters	Prehistoric	15	yes, 2 campsites
Processing stations	Prehistoric	4	None recommended
Rockshelter	Prehistoric	1	yes, SHPO concurs
Isolated finds	Prehistoric	1	Not eligible
Trash dumps	Historic	2	
Mining related	Historic	2	
Historic structures	Historic	2	yes, 1 ranch house
Hunting shelter	Historic	1	
Trapper refuse site	Historic	1	
Sawmill	Historic	1	
Transportation themes - bridge and a presumed road	Historic	2	
Isolated finds	Historic	1	Not eligible
Prehistoric and historic site	Dual	1	

In addition to the recorded prehistoric and historic archaeological sites, review of the available literature indicates that there are also a number of historic transportation routes, townsites and ranches, some of which contain buildings with potential historic significance. Transportation routes include historic stagecoach roads and recreational roads along the river valleys of the Project Area. Many of these routes, such as the South Platte Stagecoach Road, Gill Trail, and the Colorado Trail, were likely used as aboriginal travel routes. These routes continued to be used with the arrival of Europeans in the area and have now been replaced by modern highways, Forest Service roads or likely, improved trails for recreation. Such routes are not likely to retain much historic integrity. Townsites and ranches in the vicinity of the vegetation treatments include the towns of Deckers, Trumbull, Nighthawk, and South Platte, as well as the private Wigwam Club, and Grandview and Farber Ranches. A photo-reconnaissance of historic buildings at Deckers, Trumbull, the Wigwam Club, and the two ranches, was conducted as

part of the Two Forks Reservoir survey. It appears that no formal recording of these historic buildings was ever completed (Kane 2000, personal communication).

Trail Improvements

The proposed trail improvements are located along the Upper South Platte River where previous surveys have revealed the highest archaeological site densities for the entire Project Area. Areas near Sugar Creek/Hatch Gulch, Trumbull, and Deckers have already been surveyed in conjunction the Two Forks Reservoir project in 1985-86, and other projects. The Gill Trail remains largely unsurveyed, but surveys of the trail are currently underway and will be completed prior to publication of the Environmental Assessment for this project.

A small number of heritage resources have been identified (see Table 3-14). SHPO review of the Forest Service eligibility recommendations for all of these sites is pending.

Table 3-14. Heritage Resources found near the Proposed Trail Improvements

Trail Improvement Area			
Type of Site	**Era of Site**	**# of sites**	**Forest Service recommendation for listing on National Register?**
Camp	Prehistoric	1	Not recommended
Lithic scatter	Prehistoric	1	Not eligible
Isolated find	Historic	1	Not eligible
Road	Historic	1	Not eligible
Shed	Historic	1	Not evaluated

The towns of Deckers and Trumbull, as well as the Wigwam Club and Grandview Ranch are in the immediate vicinity of the Trumbull, Deckers, and Gill trail segments. As noted above, a photo reconnaissance of historic buildings at these locations was conducted as part of the Two Forks Reservoir survey, although it appears that no formal recording of these historic buildings was ever completed (Kane 2000, personal communication). An historic district that meets the criteria for listing on the National Register of Historic Places has been identified in the townsite of Deckers, adjacent to the Deckers and Trumbull trail segments. The Gill Trail was established as a recreational trail and is less than 50 years old. Though not yet formally evaluated for National Register eligibility, it is not likely to qualify for listing on the National Register due to its relatively recent date of construction.

Road Reclamation

The actual roads proposed for reclamation would be identified at the time of project implementation. At that time a site reconnaissance would be completed to determine the presence of resources. The Effects Analysis Report discusses how this reconnaissance would be completed.

NATIVE AMERICAN CONSULTATION

The Forest Service has solicited comments and concerns from Native American tribes with a potential interest in the Project Area in an early scoping letter (letter dated August 20, 1999 from J. Randal Hickenbottom, South Platte District Ranger). This letter was mailed to representatives of the Southern Ute Tribe, Ute Mountain Ute Tribe, Ute Indian Tribe, Eastern Shoshone Tribe, Cheyenne and Arapahoe Tribes of Oklahoma, Northern Arapahoe Tribe, Northern Cheyenne Tribe, and Sioux Tribe, Ogalalla and Lakota Nations. The Forest Service will continue to update the tribes on the proposed project and will invite the tribes to participate in government-to-government consultation to discuss the tribes' concerns and potential project effects.

SOCIOECONOMICS

INTRODUCTION

The proposed actions have the potential to affect local communities and people who live and work in the Project Area and immediate vicinity, as well as recreationists and Denver Water customers. The primary area of influence of the proposed project includes the portions of Jefferson and Douglas counties that would be directly affected. The Denver metropolitan area - Jefferson, Douglas, Adams, Arapahoe, and Denver counties - represents a secondary area of influence.

Denver metropolitan area residents comprise the majority of the recreation users in the Forest Service's South Platte Ranger District. The Forest Service has found that Americans generally spend 75 percent of their recreation time at locations relatively close to their homes. Measures that affect forest conditions would also affect forest recreation opportunities and, therefore, recreation users from the Denver metropolitan area. Residents of the Denver metropolitan area would also be affected by improvements in water quality. Denver Water supplied a total of 957,000 people in the City and County of Denver and surrounding suburbs in 1999. Raw water from the South Platte collection system, which accounted for 65 percent of the total collected in 1999, is processed in two treatment plants: Foothills and Marston. The Foothills Treatment Plant is located east of the Project Area. The Marston Plant is located immediately north of Marston Lake in southeast Denver (Denver Water Board. 2000a, b). Denver Water's Strontia Springs Reservoir, located in the northern portion of the proposed Project Area, accounts for 19 percent of Denver Water's operating reservoir capacity. The Strontia Springs Reservoir, which settles and regulates water to the Foothills Treatment Plant, as well as Aurora's Rampart reservoir, was severely impacted by the Buffalo Creek Fire and associated floods (Denver Water Board. 2000a, c).

Reductions in sediment transport would save Denver Water money that would otherwise be spent on maintaining reservoir capacity and water treatment. Denver metropolitan area residents would continue to have low water bills and high quality drinking water.

COMMUNITIES

The South Platte watershed is sparsely populated with several small towns located near historic mining and recreation areas. Many of the small communities have a mixture of seasonal and permanent and seasonal residents. Bailey (population 9,100) and Woodland Park (population 9,000) located west and southeast of the Project Area, respectively, are the largest communities in the Basin. Residents in the Project Area are concentrated in a series of small, unincorporated communities or located in other unincorporated areas adjacent to the river and its tributaries. The South Platte River forms the county line separating Douglas and Jefferson counties to the east and west, respectively.

Unincorporated communities located on the South Platte River within the Project Area include Trumball, Oxyoke, Nighthawk, Deckers, Twin Cedars, and South Platte. About two-thirds of the properties in these areas are owned by Denver Water, which leases out the buildings for year-round residence, summer homes, and other recreational use. The remaining one-third of the properties are privately owned residences.

Deckers consists of about 20 structures leased from Denver Water including cabins, a store, a fishing shop, and a restaurant that is currently closed. Trumbull contains over 300 lots and more than 50 structures, mostly homes. Land ownership in Trumbull is mainly split between Denver Water and private individuals but Jefferson County also owns several lots. A volunteer fire department is located in Trumbull. The community of Oxyoke consists of about 20 houses, while the Nighthawk and Twin Cedars communities contain about 40 structures, mostly houses or summer homes. The community of South Platte, located at the confluence of the South Platte and North Fork of the South Platte rivers, includes about 10 houses and the historic South Platte Hotel, which is listed on the National Register of Historic Places. More recent residential development in the area includes the Spring Creek Ranch Subdivision located northwest of the town of South Platte.

The small communities of Sprucewood and Moonridge are located east of the South Platte River at the intersection of County Roads 67 and 40 with State Highway 67 and further north along State Highway 67, respectively. Both communities include about 10 structures.

Other communities in the Project Area are located adjacent to the North Fork of the South Platte River (North Fork). These communities include Buffalo Creek, which is located near the confluence of Buffalo Creek and the North Fork, as well as the intersection of county roads 96 and 126. Buffalo Creek includes a church, several houses, and a combination store/gas station/post office, as well as a Forest Service work center. East of Buffalo Creek, there are several small settlements scattered on the hillsides on both sides of the North Fork. These include Riverview, Ferndale, Argyle, Foxton, Dome Rock, and Longview. The first and largest is Riverview with about 30 structures, mostly residences. Foxton, Argyle, Dome Rock, and Longview are mostly on lands that are owned by Denver Water and leased back to the residents.

Structures on the National Forest System lands in the Project Area are limited to bridges, developed and dispersed campgrounds, stream monitoring stations, abandoned mining cabins, and private summer homes authorized under special-use permits. A total of 21 special-use permit-authorized recreation residences were identified in three summer home groups near Nighthawk, Lazy Gulch, and Shadybrook in 1997 (U.S. Forest Service, 1997).

Jefferson and Douglas counties provide emergency services in the immediate vicinity of the Project Area. The North Fork Fire District in Jefferson County includes 25 volunteer personnel, three fire engines, one 15,000-gallon tender, and two ambulances. A single Sheriff's Deputy is assigned to the area. In Douglas County, two to three fire units are available in the project vicinity, with five wildland fire teams available within the county. Volunteer search and rescue teams are also available. Ambulance service in the project vicinity is from the city of Woodland. Two Douglas County Sheriff's Deputies are assigned to the area, with one always on duty.

TRANSPORTATION

Primary access through the Project Area is provided by Jefferson County Road 126 and State Highway 67, which runs north-south through the area. The road has separate designations in Douglas and Jefferson

counties. County Road 126 intersects with US Highway 285 at Pike Junction, north of the Pike National Forest in Jefferson County. State Highway 67 continues south-southeast from the Douglas/Jefferson county boundary to Woodland Park.

County Road 97 is a gravel road that continues south from South Platte to just north of Oxyoke where it joins County Road 67, which has a blacktop surface. A number of the communities in the Project Area are located along County Road 97/67, which parallels the South Platte River from Deckers north to South Platte. County Road 126 and County Road 96/97/67 form a broad loop drive through the Project Area.

Traffic count data for the area's roads are presented in Table 3-15.

Table 3-15. Traffic Count Data

Location and Traffic Count Year[1]	Daily Traffic Count[2]	Single Unit Trucks[3]	Combin-ation Trucks	Total Number of Trucks	Trucks as a Percent of Total
US 285/CR 126 (1998)	15,274	597	459	1,056	6.9
CR 126 (South of US 285) (1999)	1,877	-	-	-	-
CR 126/Deckers Road (Buffalo Creek) (1999)	960	-	-	-	-
Platte River Road (North of Buffalo Creek) (1999)	624	-	-	-	-
Platte River Road (East of Foxton) (1994)	334	-	-	-	-
CR 67 (North of Deckers) (July 1991)	436	-	-	-	-
SH 67 (South of Deckers) (1998)	521	29	9	38	7.3
CR 67/CR 97/Sugar Creek Road (July 1991)	1,005	-	-	-	-
CR 97 – location 1	722	-	-	-	-
CR 97 – location 2	366	-	-	-	-
CR 97 – location 3	124	-	-	-	-
SH 67/Rampart Range Road (1998)	939	63	20	83	8.8
SH 67/SH 105 (1998)	4,905	341	20	361	7.4
SH 67/US 85 (Sedalia) (1998)	6,419	417	20	437	6.8
SH 67/CR 78 (1998)	1,095	56	18	74	6.8

1/ The Colorado Department of Transportation (CDOT) provided data for federal and state highways. These data are compiled for sections of road between intersections. The table identifies one of the intersections. Jefferson and Douglas counties provided county road data. The letters correspond with the approximate locations shown on Figure 1.
2/ Data provided by CDOT and Jefferson County are annual average daily traffic (AADT) counts. The data provided by Douglas County are counts taken in July of 1991 or 1995, not annual averages.
3/CDOT defines single unit trucks as "two or more axle trucks contained within a single chassis with a rated capacity of one ton or more".
4/These data are from weekend counts.
5/These counts are located between the CR 67/CR 97/Sugar Creek Road intersection and the town of South Platte but their approximate location along this 8 mile stretch of road is unknown.
6/These locations are located east of Location L and the Project Area. Figure 1 does not extend this far.
Source: Colorado Department of Transportation, 2000a, b; Douglas County, Department of Transportation. 2000; and Jefferson County, Department of Transportation. 2000.

Jefferson and Douglas counties maintain the county and local roads in the Project Area. State and U.S Highways are maintained by the State of Colorado.

POPULATION

Population Change

The population of Colorado has grown steadily over the past two decades increasing from about 2.9 million in 1980 to just over 4 million in 1999, an increase of 40.4 percent (Table 3-16). The population in the five county Denver metropolitan area increased by 38.5 percent over this period, growing from about 1.4 million in 1980 to 2 million in 1999. Population increases were particularly notable in Douglas County, which was the fastest growing county in the US from 1990 through 1999 (Douglas County, 2000). Douglas County's population grew from 25,153 in 1980 to 156,860 in 1999, an increase of 523 percent. Jefferson and Arapahoe counties also experienced large absolute gains over this period. Denver County, in contrast, lost population in the 1980s and experienced a relatively modest increase in the 1990s (Table 3-16).

Table 3-16. Population 1999 and Population Changes

		1980-1990	1990-1999
	1999	Percent Population Change	Percent Population Change
Douglas	156,860	140.1	159.7
Jefferson	509,222	17.9	16.1
Adams	331,045	7.8	24.9
Arapahoe	482,089	33.3	23.1
Denver	499,775	-5.0	6.9
Colorado	4,056,133	14.0	23.1

Source: Colorado Department of Local Affairs, 2000a; US Census Bureau, 2000a.

People moving to Colorado from other states and, to a much lesser extent, other countries accounted for about 62 percent of the state's growth between 1990 and 1999, with the remaining 38 percent resulting from natural increase. Migration accounted for slightly less of the population growth in Jefferson, Adams, and Arapahoe counties than for the state as a whole, while Denver County experienced net out-migration. About 85 percent of the population increase in Douglas County resulted from net in-migration (U.S. Census Bureau, 2000a).

Continued population growth is projected for Colorado and the Denver metropolitan area, with absolute increases comparable to those experienced in the 1980s and 1990s. The population of Colorado is projected to increase to nearly 6 million people by 2020. Population in the Denver metropolitan area is anticipated to increase by about 676,000 people, with Douglas and Adams counties accounting for about 27 and 13 percent of this total, respectively (Colorado Department of Local Affairs, 2000b). This projected growth in population will likely increase recreation demand in the South Platte Ranger District, as well as increasing demand for water. These increases in population may also exert development pressures on presently undeveloped lands in the vicinity of the Pike National Forest and the Project Area.

Several major factors have contributed to the rapid population growth in Douglas County. These include improvements in highway infrastructure, including construction of the 470 beltway around Denver and the widening of State Highway 83, east of I-25. The 1974 "Poundstone Amendment", which severely limited land annexations by the City and County of Denver, also played a significant role by directly contributing to suburban development in Douglas and other surrounding counties. Over 70 percent of the county's population lives in unincorporated areas, with more than 80 percent of the labor force commuting to jobs in Denver or Colorado Springs (Douglas County, 2000).

The population of Jefferson County increased by 137,469 people between 1980 and 1999, with slightly more than half of this increase occurring between 1990 and 1999 (Table 3-14). Net in-migration accounted for 51 percent of the 1990 to 1999 increase. About 55 percent of Jefferson County's population resides in three cities (Arvada, Lakewood, and Westminster) that are adjacent to the city of Denver. Approximately 35 percent of the population resides in unincorporated areas (US Census Bureau, 2000b).

Data compiled by the U.S. Census at the census tract and block group level suggests that about 600 people resided within or in the immediate vicinity of the Project Area in 1990 (US Census Bureau, 2000c). Recent residential developments, such as the Spring Creek Ranch subdivision north of the town of South Platte, suggest that the number of people residing in the project vicinity may have increased over the past decade, but population levels in the Project Area itself are unlikely to have changed significantly.

Race and Ethnicity

Approximately 90 percent of the Denver metropolitan area's 1998 population was Caucasian, with 15 percent of the population identifying Hispanic origins. Denver County was the most diverse of the five counties, with minority groups accounting for 19 percent of the population. Douglas and Jefferson counties were the least diverse, with 98 and 96 percent identifying as Caucasian, respectively (US Census Bureau, 1999).

This lack of diversity was also evident in the Project Area in 1990, with census tract and block group populations ranging from 97 to 100 percent Caucasian. The Douglas County portion of the Project Area did, however, exhibit a larger population of Hispanic origin than Douglas County as a whole, 13 percent to 3 percent (US Census Bureau, 2000c). Data for 1998 are not available at the census tract or block group level.

EMPLOYMENT

Total full- and part-time employment in the Denver metropolitan area was 1,030,884 in 1997, an increase of 328,538 jobs or 32 percent from 1987. The largest employment sectors were services, retail trade, and government. Denver County accounted for 39 percent of this employment. Douglas and Jefferson counties accounted for about 4 and 20 percent, respectively, with services and retail trade the largest employers in these counties. Employment in Douglas County increased by 37,322 jobs or 221 percent over the preceding decade. Jefferson County saw an employment gain of 64,804 jobs or 31 percent over the same period (US Department of Commerce, 1999).

Services and retail trade were also the largest employers in the Douglas County portion of the Project Area in 1990, accounting for 30.6 and 15.6 percent of 147 employed residents, respectively. Manufacturing and transportation and public utilities were the largest employers in the Jefferson County portion, employing over 50 percent of the 87 residents with jobs. Twelve people residing in this block group area worked at home, with the remainder commuting at least 10 minutes to work and 33 percent commuting 90 or more minutes (US Census Bureau, 2000c).

The Timber Industry

The lumber and wood products sector employed 1,915 people in the Denver metropolitan area in 1998. Lumber and wood products establishments located in Douglas and Jefferson counties employed 153 and 137 individuals, respectively. Average annual wages in this sector were $28,090 in the Denver metropolitan area and $33,325 and $23,691 in Douglas and Jefferson counties, respectively. There were 125 lumber and wood products establishments in the Denver metropolitan area in 1998, 11 in Douglas County, and 24 in Jefferson County (Colorado Department of Labor and Employment, 2000).

These data suggest that there is limited wood processing and logging capacity along the Front Range. The majority of operators in the area tend to be small and rely on less mechanized harvesting techniques than those identified in the proposed action alternatives for this project. The Colorado State Forest Service is presently working on a number of demonstration projects on Denver Water lands within and near the Project Area. These projects include a 90-acre fuel break restoration thinning project along the entrance road to Cheesman Reservoir, as well as an additional 60-acre restoration thinning project located near Trumbull.

A logger from western Colorado is removing and transporting the wood from these areas under contract with a large forest products corporation with a facility in western Colorado. Denver Water is donating this wood to the logger as part of a demonstration project intended to test and document the economics of using highly-mechanized harvesting techniques to accomplish restoration activities in the South Platte Drainage. This project will also assess the cost effectiveness of western Colorado firms working along the Front Range.

Income

Per capita personal income, which is calculated by dividing total income by total population, was $30,743 in the Denver metropolitan area in 1997. The average annual income growth rate from 1987 to 1997 was 5.5 percent, compared to a national average of 4.7 percent. Per capita incomes in Douglas and Jefferson counties were higher and slightly lower than the metropolitan area average, respectively. The average annual growth rate between 1987 and 1997 was lower in these counties than in the metropolitan area as a whole (US Department of Commerce, 1999). Per capita incomes in the Douglas and Jefferson county portions of the Project Area were about half and three-quarters of their respective county averages in 1990 (US Census Bureau, 2000c).

Median household income data also indicate that residents in the Project Area have lower incomes than the Douglas and Jefferson County averages. The median divides the income distribution into two equal parts, one having incomes above the median and the other having incomes below the median. The 1990 median household income in the Douglas County portion of the Project Area was $28,472, just over half the county median. The median income for the Jefferson County portion was $24,457, just over 60 percent of the county median (US Census Bureau, 2000c).

In 1989, 11.4 percent of the population of Colorado lived below the poverty level. This percentage was much lower in Douglas and Jefferson counties where 3.2 and 5.8 percent of the population were below

the poverty level, respectively. Although Project Area populations had significantly lower per capita and median incomes than their respective counties, a comparable or lower percentage of this population was below the poverty level (US Census Bureau, 2000c).

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter discloses the environmental consequences of implementing the alternatives described in *Chapter 2 - Alternatives*. The analysis discloses the physical and biological impacts to resources that are potentially affected by activities proposed by the alternatives and provides the scientific and analytical basis for the comparison of alternatives.

Impacts to the environment are considered in terms of their direct, indirect, and cumulative effects. Definitions for these effects are as follows (40 CFR 1508.7 and 1508.8):

- Direct effects **- Effects caused by the action and occurring at the same time and place.**
- Indirect effects **- Effects caused by the action but occurring later in time or further removed in place.**
- Cumulative effects **- Effects that result from the incremental impact of the action when added to other past, present and reasonably foreseeable actions.**

CUMULATIVE EFFECTS

The cumulative effects analyses includes the effects of future or concurrent activities that have been identified in the area. The cumulative effects area for analysis varies depending on the resource and the issue. Therefore, the activities included in each cumulative effects analysis also varies. The sizes and definitions of the areas for which cumulative effects were analyzed was based on two factors: the spatial scale at which the effects of an alternative on a given resource are known; and the spatial scale at which the effects of an alternative on a given resource are significant.

VEGETATION

INTRODUCTION

This section describes the effects of the proposed actions and alternatives on the forest structure and wildfire potential. The current structure of the Project Area's forest is homogenous and does not reflect historical landscape patterns (see *Chapter 3 – Affected Environment*). The proposed restoration projects would change the structure of the forest both at the stand level and landscape level.

Because of the current stand conditions in the area, much of the assessment area is at risk for large wildfires (Foster Wheeler, 1999). Sixty percent of the area within the Horse Creek, Waterton/Deckers and Buffalo watersheds is ranked as high fire hazard. The proposed vegetation treatments and prescribed burning would alter the amount and arrangement of available forest fuels, influencing the potential for future wildfire in the area.

MANAGEMENT DIRECTION – FOREST VEGETATION

The Forest Plan provides guidance for the management of forested area on the Pike and San Isabel National Forests through its stated goals and objectives and through the objectives for each Management Area (MA). The Forest Plan also sets standards and guidelines that apply to the entire Forest. A detailed list of these can be found in the Forest Plan. The standards and guidelines that apply to the proposed actions are given below.

Forest-Wide Direction

FOREST-WIDE GOALS

- **Practice vegetation management to provide multiple benefits using a comprehensive timber management program as a tool**
- **Provide to increased production and productive use of wood fiber while maintaining or improving other resources**
- **Improve age class and species distribution of tree stands forest-wide**
- **Improve the health and vigor of all vegetation types**

FOREST-WIDE STANDARDS AND GUIDELINES

- **Apply a variety of silvicultural systems and harvest methods which best meet resource management objectives. For ponderosa pine stands these methods include shelterwood, clearcut, seedtree, group selection, and single tree selection methods.**
- **Assure that all evenaged stands scheduled to be harvested during the planning period will generally have reached the mean annual increment of growth**
- **The maximum size of openings created by the application of evenaged silviculture will be 40 acres regardless of forest cover types**
- **Establish a satisfactory stand on cutover areas, emphasizing natural regeneration, within five years after final harvest except: for permanent openings that serve specific management objectives; when other resource objectives dictate a different period.**

Management Area Direction

MANAGEMENT AREAS 2A, 2B, 7A & 7D DIRECTIONS (95 PERCENT OF VEGETATION TREATMENT AREA)

- **Manage forest cover types using shelterwood in interior ponderosa pine**
- **Apply intermediate treatments to maintain growing stock level standards**

MANAGEMENT AREA 4B DIRECTION (4 PERCENT OF VEGETATION TREATMENT AREA)

- **Manage forest cover types to provide variety in stand sizes, shape, crown closure, edge contrast, age structure and interspersion**
- **Manage forest cover types using shelterwood in interior ponderosa pine**
- **Use selection harvest method where the objective is to perpetuate unevenaged stand structure, use clearcut method in evenaged stands located on north and east aspects or in evenaged stands with above average windfall risk**
- **Apply intermediate treatments to maintain growing stock level standards**

MANAGEMENT AREA 5B DIRECTION (1 PERCENT OF VEGETATION TREATMENT AREA)

- **Manage forest cover types to achieve and maintain desired thermal and hiding cover**
- **Manage forest cover types using shelterwood in interior ponderosa pine**

MANAGEMENT DIRECTION – FUELS

Forest-Wide Direction

FOREST-WIDE GOALS

- **Provide a cost-effective level of fire protection to minimize the combined costs of protection and damages and to prevent loss of human life**

FOREST-WIDE STANDARDS AND GUIDELINES

- **Provide a level of protection from wildfire that is cost efficient and that will meet management objectives for the area.**
- **Maintain fuel conditions that permit fire suppression forces to meet fire protection objectives for the area.**
- **Use prescribed fire to accomplish resource objectives such as reducing fuel load buildup, wildlife habitat improvement, etc.**
- **Limit use of prescribed fires on areas adjacent to riparian areas to protect riparian and aquatic values.**

Management Area Direction

MANAGEMENT AREAS 2A, 2B, 7A & 7D DIRECTIONS (95 PERCENT OF VEGETATION TREATMENT AREA)

There is no specific management area direction for these MAs.

MANAGEMENT AREAS 4B, 5B DIRECTION (5 PERCENT OF VEGETATION TREATMENT AREA)

- **Maintain fuel conditions which permit fire suppression and prescribed fire to maintain habitat needed for selected species or species population levels.**

EVALUATION CRITERIA

Future or on-going Actions for Cumulative Effects Analysis

There are several future foreseeable, or on-going, activities that could create cumulative effects for forest structure and wildfire potential when combined with the proposed actions. These include the on-going and proposed harvesting and prescribed burning on adjacent lands owned by Denver Water, and on-going prescribed burning in stands affected by the Douglas-fir Tussock Moth on National Forest land. *Chapter 2 – Alternatives* provides a general description of the activities for these projects. On Denver Water's lands, 55 acres have been harvested to-date and are planned for prescribed burning. An additional 190 acres have been prepared for harvest in the near future. Vegetation management plans have been developed for an additional 2,000 acres. These lands could be treated in the next 5 to 10 years. In areas affected by the Douglas-fir Tussock Moth, approximately 11,000 acres of prescribed burning remains to be completed in the Project Area. Approximately 1,000 acres would be completed outside the Project Area, to the north and east.

Approximately half of the 11,000 acre Lower Elk Creek Management Unit is being considered for treatment to reduce fire risk. These lands are a mixture of private and State owned lands. At this time it is unknown how many of the private landowners would elect to have the proposed treatments completed. Although the exact acreage of treatment is not yet determined, it is likely that there would be a reduction in the area of high fire risk across this Unit due to the proposed management activities such as thinning and created fire breaks.

Forest Structure

DIRECT AND INDIRECT EFFECTS

The change in forest structure is evaluated by assessing the change in habitat structural stages and crown closures of the existing forest and comparing that with post-treatment conditions. This is done at both the individual forest stand level and across the landscape. The post-treatment conditions are also compared to the historical forest structure and landscape vegetation patterns. The evaluation also describes how the change in structure may influence the disturbance regimes within the individual stands and across the landscape.

CUMULATIVE EFFECTS

The analysis of cumulative effects compares the cumulative area of proposed vegetation treatments and prescribed burning on all lands within the three watersheds in the Project Area. This evaluation includes examining the cumulative change in landscape patterns and disturbance regimes that may result from these activities.

Wildfire Potential

DIRECT AND INDIRECT EFFECTS

The proposed actions that would have the greatest effect on wildfire potential are the effects of the tree cutting and prescribed burning. The proposed road reclamation would not change access for fire fighters

and therefore, would have no effect on the potential for spread of wildfire. The roads proposed for reclamation are mostly short spur roads that were created for temporary access associated with timber harvest, mineral exploration, or are of unknown origin. These are unclassified roads that are closed to the public and in poor condition. Other system roads access these same areas and can be used for fire suppression. The proposed revegetation of the Buffalo Creek burn area and the Gill Trail improvements would have little direct effect on wildfire potential and are therefore, discussed only briefly in general terms.

The wildfire potential is evaluated both in the short-term and long-term. Short-term effects are evaluated by comparing the amount of area that may have increased fire danger following tree cutting and prior to prescribed burning. In areas that are harvested, there would be an increase in ground fuels due to woody debris or slash created by the activity. Prior to prescribed burning, these ground fuels could increase fire risk for a period of one to two years.

Another short-term effect on wildfire potential is the risk of escape during prescribed burning. A detailed burn plan is required prior to prescribed burning on National Forest land. These plans outline specific requirements for carrying out the burning operations. Included in these plans are the specific weather conditions under which the burning maybe conducted, the personnel and equipment requirements for lighting and containing the burns, and the type of fire lines and fuel breaks needed to contain the fire. These types of plans are intended to reduce the risk of escape as well as insure the desired burn results are achieved. However, there are factors that influence the risk of escape that cannot be predicted with absolute certainty. There would always be some degree of risk of escape. The risk of escape for each alternative is evaluated by comparing the total area of prescribed burning and estimated amount of fuels to be burned.

Long-term effects on wildfire potential are evaluated by comparing the area and arrangement of high wildfire hazard following silviculture treatment and prescribed burning. The arrangement of fuels and stand conditions across the landscape influences the potential for wildfires. Large, inaccessible areas of continuous high hazard conditions have a higher potential for large wildfires than isolated, but easily accessed pockets of heavy fuels.

CUMULATIVE EFFECTS

The cumulative effects are evaluated by qualitatively evaluating the overall change in wildfire potential due to harvests and prescribed burning on all lands based on estimated post treatment conditions.

ALTERNATIVE COMPARISON

Alternative A

FOREST STRUCTURE

Direct and Indirect Effects

Alternative A would have no direct short-term effect on the structure of the forest stands in the Project Area. However, there would be indirect and long-term effects. The existing trend away from the historical forest structure as discussed in *Chapter 3 – Vegetation*, would continue. As stands in the

Project Area continue to mature, trees in those stands would become increasingly susceptible to attack by insect and disease. This would increase the potential for an epidemic and large areas of tree mortality. This type of disturbance, especially when combined with the fire risk created by large homogeneous areas of closely spaced trees, would increase the likelihood of a large hot fire developing in the Project Area.

This kind of disturbance regime, where large areas of forest are disturbed by high intensity and large scale events, is not typical of the historical pattern in the ponderosa pine stands of the area (Brown et al., 1999). This type of disturbance regime creates contiguous blocks of land in the same habitat structural stage, rather than a mosaic of stand ages and structures that existed prior to European settlement.

Although, historically, insects played a role in the ponderosa pine stands, fire appears to have been the dominant disturbance agent. By maintaining the current stand conditions and suppressing wildfire, insects and disease may become the major disturbance agent in the Project Area. A long-term effect of Alternative A would be to perpetuate a trend towards a "boom and bust" cycle of disturbance between insects and disease and fire in the ponderosa pine and Douglas-fir forests. This kind of disturbance regime and the resulting landscape pattern is much different from the historical landscape.

Cumulative Effects

The forest structure in the Project Area would be altered by prescribed burning in stands affected by the Douglas-fir tussock moth, and by timber harvest on adjacent lands owned by Denver Water. There are 10,870 acres of prescribed underburning planned over the next 5 to 6 years. The objective of these burns is to reduce ground fuels in the burned stands. While some understory seedlings and saplings would be killed during the burning, many of the stands would retain a well-developed understory. The burns would not create new openings and most of the larger trees would remain. Although the burning would reduce ground fuels, most of the stands would still have higher stand densities and fewer openings that existing prior to European settlement. Approximately 7 percent of the total land area and about 9 percent of the Douglas-fir and ponderosa pine forest would be burned in the Project Area.

Activities planned on the Denver Water lands could include 2,000 acres of thinning followed by prescribed burns. These activities would be completed over the next 5 to 10 years. The objective of these treatments would be to create stand conditions that resemble historic conditions and to reduce wildfire hazard.

The cumulative area treated by these projects would be approximately 12,870 acres, or about 9 percent of the Project Area. As discussed above, the burning in Douglas-fir Tussock Moth stands would only minimally change the affected stand's structural characteristics. The thinning and burning on Denver Water lands would significantly change the structure of the treated stands, but would only treat 2 percent of the montane forest in the Project Area. Therefore, this alternative would not provide a significant cumulative change in the structure or disturbance regimes in the Douglas-fir and Ponderosa pine forests of the area.

WILDFIRE POTENTIAL

Direct and Indirect Effects

Alternative A would have no direct effect on the wildfire potential in the Project Area. An indirect long-term effect would be an continual increase in wildfire hazard. Currently, the wildfire hazard of many of the stands in the area is high, even though ground fuels are generally low. However, the standing green fuels are plentiful and the existing stand structures create a high risk of crown fires. Overtime, as ground fuels accumulate from natural mortality due to stand maturity or insect and disease, the risk of a wildfire

increases. Because of the dense stand structures, should a fire ignite, the risk of a large catastrophic crown fire also increases.

Cumulative Effects

This alternative does not propose actions to reduce the wildfire potential in any of the forest stands in the Project Area. However, the cumulative effects from prescribed burning on 10,870 acres of National Forest land and timber harvest and burning on 2,000 acres of Denver Water land would slightly reduce wildfire risk in the Project Area. The prescribed burning on the Tussock Moth areas would reduce the smaller ground fuels in these stands, reducing the chance of a wildfire igniting. However, most of the larger ground fuels and standing green fuels would remain on these sites. Some areas would be more open with a greater proportion of ponderosa pine in the overstory but most areas would still have ladder fuels (smaller understory trees). The prescribed burns would reduce the fire hazard in these stands from a high to a moderate hazard. Because many ladder fuels would remain and stand densities would not be significantly reduced, the hazards of a crown fire, if a fire ignites, would remain.

The actions expected on Denver Water Lands would significantly reduce wildfire hazard on the treated areas. These treatments would reduce stand densities, remove the ladder fuels and burn the created ground fuels. These activities would reduce both the possibilities of a fire igniting and the development of a crown fire should a fire ignite. The hazard rating of these stands would be low following treatment.

The cumulative effect of these foreseeable future actions would be a slight reduction in the wildfire hazard on 10,870 acres and a significant reduction in wildfire hazard on 2,000 acres. However, 80 percent of the high and the moderately high wildfire hazard areas would remain in the Project Area.

Treatment of high fire risk area in the Elk Creek Management Unit would further reduce the risk of wildfire in the larger area. The Elk Creek Management Unit is outside of the Project Area, but its proximity is such that a fire that ignites in the Unit could easily spread to the Project Area. This was seen in the Hi Meadow fire which burned a small portion of both the Elk Creek Management Unit (135 acres) and 55 acres in the Project Area. The exact number of acres of risk reduction is unknown at this time because of uncertainty as to which landowners would chose to treat their lands. The amount of treatment could be approximately half of the 11,000 acre unit. The overall cumulative effect of this and other actions would be a further reduction in the wildfire risk across the combined Project Area and the Elk Creek Management Unit.

The Hi Meadow fire burned approximately 55 acres of the Project Area. On the burned areas, the risk of wildfire is now very low. However, less than half a percent of the 140,000 acre Project Area was burned and the resulting reduction in overall wildfire risk would be considered negligible. However, the fire did burn 10,700 acres in the immediate vicinity of the Project Area. This fire would reduce the risk of subsequent wildfire across the larger area, although not within the Project Area.

Alternative B

FOREST STRUCTURE

Direct and Indirect Effects

Alternative B would treat 12 percent of the Project Area, changing the structure of many forest stands. The proposed actions would reduce canopy closures from a range of 40 to 80 percent to an average of 25 percent in the 13,000 acres of thinned forest. Openings from 1 to 40 acres would be dispersed among the thinned areas and would convert a total of 4,400 acres of forest to openings.

In the thinned areas, smaller understory trees would generally be selected for removal, leaving larger more dominant trees. The exception would be in stands where there are only younger/smaller trees or stands with an overstory infected with mistletoe. In these stands, some of the healthier young trees would be left. The resulting stands would be composed primarily of mature trees with patches of immature trees scattered throughout the area, as well as many large openings. In the forested areas, canopy closure would average 25 to 30 percent. Prescribed burning, which would follow the tree cutting, would remove some of the smaller trees as well as reduce woody fuels. The proposed treatments would create patches of different structural stages in a mosaic pattern across the treated areas.

Table 4-1 presents the change in structural stages for the treated stands. Prior to treatment, almost 69 percent of the area is covered by mature stands with closed canopies. Only 1 percent is in the grass-forb stage. Following treatment, 25 percent of the area would be grass-forb (openings) and there would not be any closed mature or sapling-pole stands. The treated areas would be converted to open mature and sapling-pole forest interspersed with openings. The ponderosa pine and Douglas-fir forests in these stands would begin to resemble those that historically existing in the area. The open stand conditions in thinned stands would encourage the development of understory grasses and shrubs. Overtime, this type of understory, combined with the thinned conditions, would create light ground fuels and a stand structure that could carry a low intensity fire with only occasional torching of individual crowns. If ground fires were allowed to burn through these stands over time, the more open environment could be maintained by discouraging the establishment of understory trees. However, if fire is suppressed and no other means is used to maintain open conditions, stands would eventually grow back to the denser more uniform conditions that exist today.

Table 4-1. Change in Structural Stages in the Treated Stands

Structural Stage	Area before treatment (%)	Area after treatment (%)
Grass-forb	1	25
Seedling-Sapling	1	1
Open Sapling-Pole	5	13
Closed Sapling-Pole	8	0
Open Mature	14	59
Closed Mature	69	0
Old Growth	2	2

Over in the long term, trees in the thinned stands would be under less competitive stress and therefore, less susceptible to attack by insects and disease. Insect and disease mortality would likely be limited in extent by the mosaic of structural stages on the landscape and the increased vigor of the trees due to lower stand densities. In the short-term, however, there would be an increased risk of insect attack in the residual trees after the thinning and prescribed burning is completed. The ground disturbance from the thinning and the heat from the burning can put the trees that remain on-site under stress and more susceptible to bark beetle attack. This effect can last up to two years.

Through opening up the stands, creating a mosaic of structural stages across the treated stands and removing much of the existing woody fuels, historical disturbance regimes would be re-introduced into the area. The changes presented in Table 4-1, above, represent changes in treated stands only, not the structural change across the Project Area. Table 4-2 displays the change in structural stage on National Forest Lands in the Waterton-Deckers and Horse Creek watersheds. These watersheds are used because the majority of the mature montane forest in the Project Area can be found in these two watersheds.

Table 4-2 shows the changes of the proposed vegetation treatments on a broader, landscape scale. The proportion of closed mature forest across these two watersheds would be reduced from 66 percent of the area to 54 percent. The amount of the grass-forb stage would increase by 4 percent. While the changes in forest structure would be significant in the treatment areas. However, the majority of the landscape would still be dominated by closed mature forest stands.

This alternative proposes revegetation with ponderosa pine seedlings of 1,000 acres in the Buffalo Creek burn area. Riparian areas would also be revegetated using native species. Across the Project Area, this would increase the amount of area in the shrub-seedling structural stage by less than one percent. However, locally, this would add to the structural stage diversity within this part of the Project Area.

Reclaiming existing unclassified roads would slightly increase the area of the grass-forb structural stage (50 acres). However, the result would be narrow ribbons of grass cutting through a variety of habitat types and would result in little change in the overall forest structure.

Table 4-2. Change in the Habitat Structural Stages in the Waterton-Deckers and Horse Creek Watersheds.

Structural Stage	Area before treatment (%)	Area after treatment (%)
Grass-forb	2	6
Seedling-Sapling	1	1
Open Sapling-Pole	4	5
Closed Sapling-Pole	8	7
Open Mature	16	24
Closed Mature	66	54
Old Growth	3	3

Cumulative Effects

The cumulative effect includes the effects resulting from actions proposed by this alternative, prescribed burning in Tussock moth defoliated stands and thinning and burning on Denver Water lands. Alternative 1 provides a discussion of the individual effects of the future foreseeable actions. The cumulative effects of these combined actions would be a change of forest structure on 22 percent of the total Analysis Area and 28 percent of the Douglas-fir and ponderosa pine forest types. The combined effect would be a further reduction of the chance in crown fires and insect and disease epidemics in these stands and adjacent areas. However, more than 60 percent of the area's montane forest would remain unchanged and at risk for crown fires and insect and disease attack.

WILDFIRE POTENTIAL

Direct and Indirect Effects

The slash that is created by thinning would increase ground fuels in the affected areas and would, therefore, increase the short-term wildfire potential. The logging slash left on-site would remain for a period of one to three years. On 11,600 acres the, trees larger than 5 inches in diameter would be removed from the site, leaving only smaller slash. On the remaining 5,800 acres, none of the cut trees or slash would be removed. In both areas the potential for ignition of a fire would increase until prescribed burning could be completed. However, the thinning would be scheduled over several years so that a large, contiguous block of slash and high fuels would not be created.

The amount of fine fuels created in areas of tree removal and those without would be similar. Because these fuels are at the highest risk of ignition, the risk of wildfire ignition would be similar in both areas. However, in the areas where trees are left on-site, the larger available ground fuels would generate more heat and burn longer, increasing the risk that a fire, once ignited, could spread into a larger area. For all areas, a variety of methods would be used to keep the created slash close to the ground and away from the crowns of the remaining trees. The woody fuels would also be arranged to minimize the risk of a crown fire.

Harvested trees would be left on-site in areas with poor access, steep slopes, or small (unmerchantable) tree size. Areas with poorer access and steeper slopes, combined with higher fuels would have an increased risk of escape when these areas are burned. This analysis assumes that control measures to prevent escape are effective.

This alternative would have beneficial long-term effects on the risk of wildfire in the Project Area. Wildfire potential would be decreased by reducing the density of many stands and removing the fuels. Nearly 13,000 acres, or 15 percent, of the high hazard stands in the Project Area would be treated. This treatment would break up the contiguous high hazard blocks and create some fire breaks throughout the area. An additional 4,400 acres of medium and low wildfire hazard areas would be treated and be rated at low hazard following treatment and prescribed burning. The combined treatment areas would reduce the risk of wildfire in the Project Area and on adjacent lands by limiting the extent of wildfires that might develop in the area.

As stands in the vegetation treatment areas continue to grow, stand densities would again increase and woody fuels would accumulate. This would, overtime, diminish the effects of the actions unless fire or silvicultural methods were used to maintain the open stand conditions.

Cumulative Effects

The cumulative effect within the Project Area resulting from actions proposed by this alternative, prescribed burning in Tussock moth defoliated stands, and thinning and burning on Denver Water land would be a reduction of the high wildfire hazard area of about 32 percent, or 27,800 acres. The risk of wildfire across a larger area would be further reduced due to actions in the Lower Elk Creek Management Unit. The Hi Meadow fire has also reduced wildfire risk across the larger area. Alternative 1 provides a discussion of the individual effects of the future foreseeable actions.

Alternative C

FOREST STRUCTURE

Direct and Indirect Effects

The effects on forest structure for this alternative would be very similar to those discussed for Alternative B. In this alternative, trees would be left on-site for a greater proportion of the treated areas. Approximately 8,400 acres would not have the larger fuels removed prior to burning, an increase of 2,600 acres from Alternative B. The incidence of heat related stress would be higher in stands where fuels are not removed so the overall potential for stress and bark beetle attack would be greater in this alternative. This would not be expected to be a large impact on the long-term forest structure and disturbance regimes.

This alternative would not use biosolids for revegetation in the Buffalo Creek burn area. This could indirectly affect forest structure by reducing the area that is successfully regenerated over Alternative B. However, in areas where revegetation is successfully accomplished, the result as compared to the No Action alternative would be the same as discussed for Alternative B.

Except for the differences discussed above, the effects of this alternative would be the same as those discussed for Alternative B.

Cumulative Effects

The cumulative effects on forest structure for this alternative would be the same as the effects of Alternative B.

WILDFIRE POTENTIAL

Direct and Indirect Effects

Alternative C would have the same effects on wildfire potential as discussed for Alternative B except as discussed below.

In this alternative, trees would be left on-site for a greater proportion of the treated areas. Approximately 8,400 acres would not have the larger fuels removed prior to burning, an increase of 2,600 acres from Alternative B. This would increase the risk of escape during prescribed burning and increase the potential for fire in the short-term over Alternative B. Poor access, steeper slopes and a higher fuel loading in these areas would increase the difficulty of control.

Like Alternative B, this alternative would have the net effect of a short-term increase in wildfire potential but a decrease in the long-term potential. The long-term effects would be the same for both alternatives.

Cumulative Effects

The cumulative effects on forest structure for this alternative would be the same as the effects of Alternative B.

Forest Plan Compliance

The Forest Plan Goals, Standards and Guidelines and Management Area direction would not necessarily be followed by the action alternatives. As discussed in Chapter 1, this EA presents a proposal that was not anticipated at the time of the Forest Plan (1984). The concept of this project is landscape restoration and wildfire risk reduction rather than maximization of timber production, which was the focus of the Forest Plan. The types of activities proposed are not guided by the management prescriptions designed at the time of the Forest Plan. The following direction of the Forest Plan would not be followed by the action alternatives.

FOREST VEGETATION

Forest Plan Goals

The first two goals for managing vegetation on forest lands are:

- Practice vegetation management to provide multiple benefits using a comprehensive timber management program as a tool
- Provide to increased production and productive use of wood fiber while maintaining or improving other resources
- Improve age class and species distribution of tree stands forest-wide

The proposed project's objectives are not oriented towards increased production of wood fiber. The intent is not to maximize the yield from the treated areas, therefore, the above goals are not part of the proposal. The structural stage diversity would improve (see Table 4-1) but species diversity would be reduced by selective harvesting for ponderosa pine in most areas. The intent of the selective harvest would be to emulate historical forest conditions.

The final goal,

- Improve the health and vigor of all vegetation types

would be followed in the stands that are thinned, as thinning can improve the vigor of the remaining trees. Across the Project Area, the actions would reduce fire risk, which indirectly would improve the long-term health and vigor of the area.

Forest-wide Standards and Guidelines

The following Standards and Guidelines would not be followed by the action alternatives because of the specific resource objectives of this project.

- Apply a variety of silvicultural systems and harvest methods which best meet resource management objectives. For ponderosa pine stands these methods include shelterwood, clearcut, seedtree, group selection, and single tree selection methods.

Thinning is the dominant vegetation treatment proposed by the action alternatives and is not a selected method for harvest in ponderosa pine stands according to the Forest Plan.

- Assure that all evenaged stands scheduled to be harvested during the planning period will generally have reached the mean annual increment of growth.

The stands were selected for treatment primarily due to fire risk rather than their maturity for timber production.

These standards are oriented towards timber production and maximizing yield across the forest. As discussed above, this is not the goal of the proposed actions and thinning combined with created openings are the methods best suited to the restoration objectives.

Management Area Direction

The following management area directions would not necessarily be followed by the action alternatives.

Management Areas 2A, 2B, 4B, 7A & 7D Directions (99 percent of Vegetation treatment Area)

- Manage forest cover types using shelterwood in interior ponderosa pine
- Apply intermediate treatments to maintain growing stock level standards

Management Area 5B Direction (1 percent of vegetation treatment area)

- Manage forest cover types using shelterwood in interior ponderosa pine

As discussed above for the Forest Standards and Guidelines, these direction are primarily oriented towards timber production. The alternatives do not propose the use of shelterwood harvesting because this type of harvest does not meet the restoration objectives.

FUELS

The action alternatives meet the forest-wide goals, standards and guidelines, and the management area direction, for fuels as outlined above under Management Area Direction. Alternatives B and C do the most to meet the following forest-wide standards and guidelines by reducing fire risk in the Project Area.

- **Maintain fuel conditions which permit fire suppression forces to meet fire protection objectives for the area.**

- **Use prescribed fire to accomplish resource objectives such as reducing fuel load buildup, wildlife habitat improvement, etc.**

SOILS

METHODOLOGY

The environmental consequences of the proposed actions will be evaluated based upon the erosion risks and hazards associated with each activity.

REGULATIONS AND POLICY

Pike-San Isabel Forest Plan

The Pike-San Isabel National Forest Management Plan has general standards and guidelines regarding soils and erosion. The general direction involves the maintenance of soil productivity, reduction in human-caused soil erosion, and maintenance of the integrity of associated ecosystems. The standards and guidelines include:

- **Limit intensive ground disturbing activities on unstable slopes and highly erodible sites.**
- **Apply guidelines in Packer's guides in FBH 7709.11, "Access Road Requirements for Oil and Gas Exploration and Development on National Forest lands", and Region 2 1982 design for cross-drain spacing and buffers.**

Road maintenance is as follows:

- **All arterial and open collectors-Level 3 maintenance**
- **All open local roads-Level 2 maintenance**
- **All closed roads- Level 1 includes the upkeep of drainage structures and vegetation necessary to prevent erosion.**

Region 2 Standards and Guidelines

Region 2 of the National Forest System, which includes the Pike-San Isabel National Forest, has soil quality monitoring guidelines and soil quality standards. Soil quality standards exist for detrimental compaction, displacement, erosion that includes sheet erosion and rills and gullies, effective ground cover, and soil puddling related to management activities. The soil quality standards state that no more

than 15 percent of any activity area would be left in a detrimentally compacted, displaces, puddles, severely burned, and/or eroded condition. This does not include roads. In addition, there is a required minimum effective ground cover for the first and second year after disturbance (Table 4-3):

Table 4-3. Region 2 Ground Cover Requirements

Erosion Hazard Class	1st Year (%)	2nd Year (%)
Very High	30	50
High	30	50
Moderate	40	60
Low	50	70

These soil standards apply to cumulative effects of management over time. If a standard is exceeded in an initial entry, future entries must have no additional detrimental effect unless mitigative measures have been applied or natural recovery has taken place between entries.

Project plans which propose to exceed Regional standards for detrimental compaction, displacement, puddling, severe burning, and erosion should contain justification and planned mitigation, and be approved by the Forest Supervisor (U.S. Forest Service, 1992).

DIRECT AND INDIRECT EFFECTS

Alternative A

VEGETATION TREATMENT

Under Alternative A, there would be no prescribed vegetation treatment. The greatest erosion risk (over 80 percent of the watershed with high to extreme erosion risk) occurs in the Bear Gulch and Cottonwood Gulch subwatersheds of the Waterton-Deckers watershed. In the Upper South Platte Watershed Landscape Assessment (Foster Wheeler, 1999), fifty-percent of the Waterton Deckers watershed, 56 percent of the Horse Creek watershed, and 42 percent of the Buffalo Creek watershed were determined to have a high to extreme susceptibility to soil loss following wildfire. Because of the large fire risk, the potential for erosion and subsequent delivery to streams in the short-to-long term is very high.

TRAIL ACCESS

The primary soil type on the Gill Trail is the Sphinx-outcrop soil mapping unit. This soil has a severe erosion potential and a severe recreational development limitation. The soil is unfavorable for recreation and that limitation can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures. Currently, erosion is a major problem on the Gill Trail and would continue under this alternative.

BUFFALO CREEK BURN AREA REVEGETATION

Under Alternative A, there would be no stream restoration activities along Buffalo Creek . Natural processes such as bank sloughing from peak flows and channel migration would destabilize the streambanks. The higher flows would route sediment movement downstream. However, vegetation would become reestablished on the banks naturally and eventually stabilize the streambanks.

In the short-term, there is a higher risk of bank erosion and sediment deposition into Buffalo Creek. Over the long-term it is expected that banks would be stabilized and the system would have reached equilibrium of sediment movement with anticipated flows. Currently, the lower gradient reaches of Buffalo Creek are storing excessive amounts of sediment from the 1996 floods that would eventually move downstream when higher flows occur.

ROAD RECLAMATION

Under Alternative A, the 25 miles of closed road proposed for reclamation would be maintained as Level 1 road maintenance. Level 1 road maintenance requires the maintenance of road drainage structures and vegetation as necessary to control erosion. Because these 25 miles of road have yet to be identified, the current conditions of these roads cannot be addressed.

Alternative B

VEGETATION TREATMENT

Under Alternative B, approximately 33 and 42 percent of vegetated treatment areas have a severe to extreme erosion hazard in the Waterton/Deckers and Horse Creek watersheds, respectively. The subwatersheds of the Waterton/Deckers watershed with greater than 35 percent of the vegetated areas with a severe to extreme erosion rating include Lower Basin, Pine Creek, Upper Basin, Stevens Gulch, and Sugar Creek. The removal of trees would involve timber harvest ground-disturbing activities that increase the risk of management-related erosion. These activities would be required to have minimum effective ground cover following disturbance. Minimum effective ground cover includes all living and dead herbaceous and woody materials in contact with the ground and all rocks greater than ¾ inch in diameter (U.S. Forest Service, 1992). There would be a minimum of 30 and 50 percent effective ground cover the first and second years after ground disturbance. In the short-term (5-years), there is still a moderate risk of soil erosion from those sites that are not mitigated. However, the risk is reduced because treatment would not occur on slopes greater than 30 percent. However, in the long-term the erosion risk would be substantially reduced because of the reduction in fire prone areas as a result of the treatment. The vegetation removal would reduce the fire hazard in these areas, the susceptibility of the soils to form hydrophobic layers, and subsequent post-wildfire erosion.

The application of biosolids would also reduce the erosion potential in the short-term depending upon the slope steepness of the application area. The beneficial effects of biosolid applications were recently reported by Meyer (2000). Soil moisture holding capacity and nitrogen availability were enhanced two years after the application of biosolids for soils within the Buffalo Creek Drainage. The author also reported increases in canopy cover and biomass of grasses with little response from forbs within the same treatments. The application of biosolids did not affect total runoff during simulated rainfall events. Sediment concentrations, however, were significantly less on biosolid plots, with 80 Mg/ha rate showing the lowest level. Runoff concentrations of NO_3-N and NH_4-N showed no response in biosolid versus non biosolid plots suggesting rapid uptake of available nitrogen. Some increases in metal concentrations of runoff were observed but were below drinking water standards for live stock.

Biosolid application may be a suitable alternative for restoration of severely burned areas, and road reclamation or restoration. Application rates would need to be determined based on sub-watershed hydrological conditions. There would likely be few restrictions for the use of biosolids regarding soil types because most soils are coarse textured.

BUFFALO CREEK BURN AREA REVEGETATION

Alternative B would reestablish 60 acres of riparian areas along Buffalo Creek and 1,000 acres of forest communities within the Buffalo Creek Burn Area with vegetation. The stabilization of banks with vegetation may reduce streambank erosion in the short-term. However, excessive sediment is being stored in the lower reaches of Buffalo Creek. Streambank stabilization may reduce bank erosion but may increase channel incision if the banks are unable to slump. Plantings in the burn area would reduce erosion in those areas where vegetation becomes reestablished. However, if the soils are still hydrophobic, as noted in Jarrett and Browning (1999), the vegetation may not reduce erosion in these areas.

ROAD RECLAMATION

Under Alternative B, 25 miles of unnecessary closed roads would be obliterated by removing culverts, creating self-maintaining drainage, removing subsoil to reduce compaction, seeding for erosion control, and the application of biosolids to increase soil fertility and reduce surface erosion. The removal of the roads would reduce road surface erosion and potential road failures. There is a potential for short-term erosion if the road reclamation occurs on steep slopes (greater than 30 percent). The road reclamation would achieve the greatest resource benefit if all 25 miles are reclaimed in the same subwatershed.

TRAIL ACCESS

Under Alternative B, the upgrades of the original Gill Trail to safer and sustainable conditions, and the construction of a new trail between the end of the Gill Trail and Cheesman Dam, would reduce the risk of erosion depending upon trail design, location, and maintenance plan of the trail. The trail upgrades would reduce erosion and the potential for sediment delivery to streams, specifically the South Platte River. In addition, the construction of the new trail below Cheesman dam would reduce surface erosion because it would reduce the number of unmaintained trails. Barriers would be constructed on the downslope portions of erosion areas to prevent delivery of sediment downstream .

Alternative C

VEGETATION TREATMENT

The short-term effects would be similar to Alternative B; however, there would be a reduced risk of short-term surface erosion from ground disturbance because 5,414 acres of roadless area that would not be treated. As a result, there is a decrease in the percentage of the vegetated treated areas that have a high to severe erosion hazard. Approximately 12 and 21 percent of vegetated treatment areas have a severe to extreme erosion hazard in the Waterton/Deckers and Horse Creek watersheds, respectively. The subwatersheds of the Waterton/Deckers watershed with greater than 35 percent of the vegetated areas with a severe to extreme erosion rating include Gunbarrel Creek, Lower Basin, Upper Basin, Pine Creek, and Sugar Creek. Because biosolid application would not occur, other erosion control agents (i.e., effective groundcover) would need to be applied in the disturbed areas.

In the long-term, there may be a greater risk of fire hazard in these watersheds and potential of erosion following wildfires. The greater risk of fires in these areas increase the potential of increasing hydrophobicity of soils in affected areas and potential for severe surface erosion following a post-wildfire storm event.

BUFFALO CREEK BURN AREA REVEGETATION

The effects would be the same as Alternative B.

ROAD RECLAMATION

Under Alternative C, the effects would be similar to Alternative B. However, biosolids would not be used to increase soil fertility or reduce surface erosion.

TRAIL ACCESS

The effects would be the same as under Alternative B.

CUMULATIVE EFFECTS

Alternative A

Under Alternative A, vegetation management plans on Denver Water lands would reduce the potential for a catastrophic fire to start on Denver Water lands. However, the risk of surface erosion following a catastrophic fire would remain severe in those watersheds with the greatest fire hazard; The greatest fire hazard (over 80 percent of the watershed area with a high hazard) occur in the Horse Creek watershed, and Pine Creek, Stevens Gulch, Sugar Creek, and Upper Basin subwatersheds of the Waterton-Deckers watershed.

Alternative B

Under Alternative B, vegetation treatment on Denver water lands and the proposed vegetation treatment on National Forest lands would further reduce the wildfire risk and the subsequent potential for major surface erosion following a post-wildfire storm event. The treatments on Denver water lands may be susceptible to short-term erosion similar to that of the treatment on National Forest System lands. If any delivery of sediment occurs on Denver water lands, there could be adverse cumulative effects of management –related surface erosion on National Forest lands deliver to the stream system.

Alternative C

Under Alternative C, approximately 5,414 acres would not be treated on National Forest lands. However, the treatment on Denver water lands and National Forest lands would reduce the risk of catastrophic wildfires in the Waterton/Deckers watershed. The reduction in wildfire risk reduces the risk of major surface erosion that may result from post-wildfire storm events.

CONSISTENCY WITH FOREST PLAN

The proposed actions under Alternatives B and C are consistent with the Forest Plan for soils. The actions should in the long-term maintain or increase soil productivity, reduce in human-caused soil erosion, and maintain the integrity of associated ecosystems.

HYDROLOGY

METHODOLOGY

Background

The Proposed Action is designed to create a more "sustainable" forest condition. The forest condition that would be created is much more open and would resemble the historic condition as described in the Upper South Platte Landscape Assessment (Foster Wheeler, 1999). Most, if not all, analytical techniques for evaluating impacts of forest management activities on water resources assume that the forest's current state is close to the "natural" condition and functions well. This assumption is not true for the Upper South Platte Project Area. A more "natural" condition is what would be created by the Proposed Action.

Water Yield and Floodplains

Alternatives B and C would likely increase water yield, due to the reduction of evapotranspiration and subsequent increase in available water. Consequently, peak flows may increase which could result in impacts to floodplains. For this analysis, water yield and floods will not be addressed because they are issues that have been addressed at the Forest Plan level (36 CFR 219.23 and FEIS for the Forest Plan). The effects of forest management on these issues are disclosed in that EIS.

Peak Flow

Peak flows may increase as a result of the proposed actions. Reduction of tree density would reduce evapotranspiration that would result in higher soil moisture content. The higher soil moisture may result in more runoff during runoff events. Higher peak flows could result in changes in channel dynamic equilibrium. If the channel is moved out of dynamic equilibrium, the integrity of pools and riffles may be compromised and fish habitat could decrease. Increases in peak flows by themselves do not constitute an adverse impact. However, when they adversely impact the beneficial uses of a stream they would be considered a violation of the Forest Plan.

Sediment Yield

The primary source of sediment from forest management activities in the western United States is the roads required to access the forested stands rather than the forest harvesting practices (Megan and Kidd, 1972; Ice, 1985; Swanson et al., 1987). Buffer strips are especially important below forest roads in areas of granitic soils because of their high erodibility (Megahan and Ketcheson, 1996). The road reclamation proposed in this EA would result in lower road density that would reduce the sediment yield from roads. The focus of the sediment yield assessment will be on applying appropriate best management practices (BMPs) to minimize the sediment yield increase potential of the harvesting activities. Increases in

sediment yield by themselves do not constitute an adverse impact. However, when they adversely impact the beneficial uses of a stream they would be considered a violation of the Forest Plan.

REGULATIONS AND POLICIES

The Forest Plan has some specific goals, and standards and guidelines that are directed at water resources.

Forest Plan

GOALS

- **Maintain or improve water quality to meet Federal and State standards and increase the average annual water yield.**
- **Increase water yield through land treatment measures consistent with other resource and water quality standards.**
- **Protect riparian areas and wetlands from degradation.**

GENERAL DIRECTION, STANDARDS AND GUIDELINES

Water Resource Improvement and Maintenance (F05, 06)

01 Maintain instream flows and protect public property and resources

02 Improve or maintain water quality to meet State and Federal water quality standards. However, where the natural background water pollutants cause degradation, it is not necessary to implement improvement actions. Short-term or temporary failure to meet some parameters of the State standard, such as increased sediment from road crossing construction or water resource development may be permitted in special cases.

03 Develop a schedule of water yield treatments within fourth-order watersheds which attains desired water yield increases while maintaining stream channel stability.

a. Provide mitigation measures necessary to prevent increased sediment yields from exceeding "threshold limits" (as determined by "State of the Art" modeling [HYSED] or actual measurements) identified for each (fourth-order) watershed.

04 Rehabilitate disturbed areas that are contributing sediment directly to perennial streams as a result of management activities to maintain water quality and re-establish vegetation cover.

SPECIFIC MANAGEMENT AREA 3A DIRECTION

1. Permanent openings may be employed to enhance water production

OTHER REGULATIONS

WATERSHED CONSERVATION PRACTICES HANDBOOK

The Rocky Mountain Region (R2) has a Watershed Conservation Practices Handbook (FSH 2509.25) that provides standards for activities on the Pike National Forest. Best Management Practices (BMP's) or "Watershed Conservation Practices" (WCP's) are intended to control non-point source pollutants. The specific practices are presented in Appendix A. The following are the standards that are applicable to this project.

FP Standard: In watersheds containing aquatic TES species, allow activities and uses within 300 feet or the top of the inner gorge (whichever is greatest), of the perennial and intermittent streams, wetlands, lakes (over 1 acre) only if onsite analysis shows that long-term hydrologic function, channel stability, and stream health will be maintained or improved.

11.1 Standard (1) - Manage land treatments to conserve site moisture and to protect long-term stream health from damage by increased runoff.

11.2 Standard (2) - Manage land treatments to maintain enough organic ground cover in each land unit to prevent harmful increased runoff.

12.1 Standard (3) - In the water influence zone next to perennial and intermittent streams, lakes and wetlands, allow only those land treatments that maintain or improve long-term stream health and riparian ecosystem condition.

12.2 Standard (4) - Design and construct all stream crossings and other instream structures to provide for passage of flow and sediment, withstand expected flood flows, and allow free movement of resident aquatic life.

12.3 Standard (5) - Conduct actions so that stream pattern, geometry, and habitats are maintained or improved toward robust stream health.

12.4 Standard (6) - Maintain long-term ground cover, soil structure, water budgets, and flow patterns of wetlands to sustain their ecological function, per 404 regulation..

12.5 Standard (7) - Maintain enough water in perennial streams to sustain existing stream health. Return some water to dewatered perennial streams when needed and feasible.

13.4 Standard (12) – Reclaim roads and other disturbed sites when use ends, as needed to prevent resource damage.

14.1 Standard (13) - Manage land treatments to limit the sum of severely burned and detrimentally compacted, eroded, and displaced land to no more than 15% of any land unit (FSH 2509.18)

14.2 Standard (14) - Maintain or improve long-term levels of organic matter and nutrients on all lands.

EXECUTIVE ORDERS

Executive orders 11988 and 11990 direct federal agencies to avoid impacts to floodplains and wetlands, respectively. Agencies are directed to avoid construction and development in floodplains and wetlands whenever there are feasible alternatives.

CLEAN WATER ACT

The Clean Water Act's goal is to maintain the chemical, physical and biological integrity of the nation's waters. Compliance with state and federal pollution control measures is required. It contains an antidegradation clause, and control of nonpoint pollution through the use of best management practices.

FOREST SERVICE MANUAL

The Forest Service Manual (FSM) 2500 series provides regulations and guidance for watershed management on National Forest lands.

ALTERNATIVE A

Direct and Indirect Effects

Alternative A (no-action) would have no direct or indirect effects because no actions would be taken. In the short-term peak flow and sediment yield would continue at the present level. In the long-term, the increased fire risk could result in another catastrophic wildfire such as the Buffalo Creek fire. The effects of the Buffalo Creek fire were dramatic on water resources, including basically covering segments of both Buffalo and Spring Creeks with extensive sediment deposits. Similar effects may result in other portions of the Project Area if a wildfire would occur. Stream bank stabilization and restoration of Buffalo Creek would not occur. Sections of the Gill Trail and access trails to the South Platte River near Deckers would continue to generate sediment to the river. The roads that would be reclaimed in the action alternatives would continue to generate increased sediment yield.

Cumulative Effects

Denver Water Board and the Colorado State Forest's activities on 2,845 acres would reduce the fire risk within the Waterton/Deckers watershed. The Douglas-fir/Tussock moth EA project has reduced fire risk on about 1,000 acres and will use prescribed burns to reduce fuel loads on another 13,000 acres in the Waterton/Deckers and Horse Creek watersheds. The Elk Creek Management Unit project will complete vegetation treatments similar to the proposed action for this EA on over 1,000 acres. The Elk Creek Management Unit is outside of the Project Area. All of the projects mentioned above have and/or will reduce the fire risk in the Project Area or adjacent to it. Total treated area is about 4,000 acres with another 14,000 scheduled for treatment in the future. Table 4-4 shows a comparison of cumulative actions in the Project Area. The cumulative effect of Alternative A would be almost 18,000 acres of land treated in the Project Area. This alternative would have the highest long-term fire risk of the alternatives, and the lowest short-term sediment yield.

Table 4-4. Project Area Cumulative Effects Comparison

	Current Vegetation Treatment (acres)	Future Vegetation Treatment (acres)	Current Prescribed Burns (acres)	Future Prescribed Burns (acres)	Total Future Treated Area (acres)
Alternative A	2,845	1,000	1,000	13,000	17,845
Alternatives B&C	2,845	18,400	1,000	30,400	35,245

ALTERNATIVE B

Direct and Indirect Effects

Alternative B (proposed action) may cause some minor sediment yield increases at road crossings or where road reclamation work occurs near streams. The indirect effects would include short-term sediment yield increases due to ground disturbance and prescribed fires. The areas that would be the most sensitive to increases in sediment are highly erodible soils within sediment source zones. Sediment source zones are approximately 10 percent of the treatment areas (Table 4-5). The sediment source zones that contain sensitive soils would be the most important areas to implement BMPs. Riparian buffer zones as specified in the WCP (Appendix A) would minimize sediment from entering the streams. The vegetation treatments are addressing the most sensitive areas by targeting areas below 7,500 feet, sediment source zones and high erosion soils (Table 4-5). These areas would have the highest sediment yield following a catastrophic wildfire. The treated areas would have a lower risk of sustaining a hot burn and would have a lower risk of catastrophic sediment yield events such as the one that followed the Buffalo Creek fire.

Long-term sediment yield would decrease from the 25 miles of roads that would be reclaimed, the riparian planting in Buffalo Creek and the sections of the Gill Trail and South Platte River access that are currently contributing sediment to the river (Table 4-6). The overall sediment yield effects would be a tradeoff of some short-term sediment yield increases for a reduction of risk of a catastrophic sediment yield event.

Peak flow increases would be most important below 7,500 feet because of the potential for large rainstorm generated peakflows. The average annual peak flows may increase as a result of Alternative B, however the effect of the vegetation treatment would have a minor effect on peak flows from larger events. The less frequent peak flows are less influenced by forest management than more frequent peak flows (Beschta, 2000). This alternative has over 60 percent of the treated area below 7,500 feet.

The biosolids proposed in this alternative do contain nutrients that could potentially increase nutrient loading to streams. However, as described in the *Soils* section, recent applications in Buffalo Creek showed no increase in nutrients in runoff from treated areas. It is likely that the nutrients would be utilized very quickly in this relatively nutrient poor environment. Special care would be needed in the use of biosolids in the riparian rehabilitation efforts in Buffalo Creek. Appropriate mitigation measures are described in the *Soils* section.

Table 4-5. Sensitive Areas Associated with the Vegetation Treatment Areas

Watershed Name	Vegetation Treatment Area (acres)	Area below 7500 feet (acres)	Sediment Source Zones (acres)	High Erosion Soils (acres)
Buffalo Creek	0	0	0	0
Bear Gulch	0	0	0	0
Cottonwood Gulch	0	0	0	0
Mill Gulch	147	147	35	39
Stevens Gulch	373	373	135	232
Sugar Creek	615	260	108	214
Bear Creek	653	269	123	216
Spring Creek	814	83	30	63
Wigwam Creek	888	266	134	277
Horse Creek	1,505	1,505	143	632
Lower Basin	2,198	1,578	215	770
Gunbarrel Creek	2,461	1,033	140	565
Pine Creek	2,590	1,302	106	945
Upper Basin	4,809	3,628	612	1,750
Total	17,053	10,444	1,781	5,703

Table 4-6. Alternative B Sediment Yield Trends

Proposed Action	Short-term Sediment Yield Trend	Long-term Sediment Yield Trend
Vegetation Treatment	↑	↓
Road Reclamation	-	↓
Buffalo Creek Rehabilitation	↑	↓
Trail Projects	↓	↓

Cumulative Effects

The cumulative effects of Alternative B would result in more than 35,000 acres of high fire risk forest treated in the Project Area. The cumulative effect of these actions would be to reduce the fire risk in the Project Area. There may be some sediment yield and peak flow increases associated with activities on private land and the other Forest Service projects in the Project Area, however all of the cumulative

effects would generate positive effects similar to Alternative B. The potential sediment yield and peak flow increases from the connected actions combined with the proposed action would not cause streams to move out of dynamic equilibrium or not fully support their beneficial uses. This conclusion is based upon the direct and indirect effects discussed above, the use of BMPs, the evaluation of the magnitude and locations of the actions and professional judgement. This alternative would have the lowest long-term fire risk of the alternatives, and the highest short-term sediment yield.

ALTERNATIVE C

Direct and Indirect Effects

Alternative C (roadless) would have similar effects to Alternative B.

Cumulative Effects

Alternative C would have similar cumulative effects to Alternative B. This alternative would have a slightly higher long-term fire risk than Alternative B because of the fuels left in the roadless areas, however it would have a lower short-term sediment yield than Alternative B because the logs would not be removed from the roadless areas.

CONSISTENCY WITH FOREST PLAN

Alternatives B and C would be consistent with the Forest Plan. Alternative A would not be consistent with the guideline of "Rehabilitate disturbed areas that are contributing sediment directly to perennial streams as a result of management activities to maintain water quality and re-establish vegetation cover".

FISHERIES

INTRODUCTION

The primary concern for fisheries is the risk of a large-scale fire, consequential flooding and erosion, and extreme sediment loading in stream habitat. Proposed restoration activities may slightly accelerate erosion and sediment transport, but the potential impacts on fisheries would be minor compared to another major fire in the Project Area. Vegetation treatments could increase erosion potential and remain elevated until natural processes gradually stabilize sediments in the treated area.

The negative effects of suspended sediments on fish as well as other aquatic biota have been well documented. Newcombe and Macdonald (1991) documented that the degree of impact on fish communities due to suspended sediments varies greatly depending on concentrations, time of exposure, and species. Even short-term pulses of suspended sediments have been found to inhibit feeding and social behavior of salmonids at certain life-stages (Berg and Northcote 1985). In general, 200 mg/l causes physiological stress, reduced feeding and growth, and avoidance; chronic exposure to 1,000 mg/l or acute exposure to 10,000 mg/l is lethal. In addition to turbid water effects on fish, increased bedload sediments can change stream bottom habitat. Increased sediment loading could cause shifting fine and coarse material to be more prominent over much of the stream substrate. Increased deposition of fine material on the river bottom would increase egg mortality because of burying and less intra-gravel flows resulting in low dissolved oxygen. Adult and juvenile fish would be affected by reduced prey (macroinvertebrates) and by the filling of pools and areas between cobble and boulders that provide important cover habitat for fish. These impacts can occur far downstream form the sediment source.

Despite evidence of adverse effects from high concentrations of suspended sediment, fish often thrive in naturally turbid environments. Some of the largest salmonid-producing rivers in North America have very high sediment yields. For example, the South Platte River within the Project Area is an abundant producer of trout and considered a Gold medal fisheries, yet has very high natural sediment concentrations during high runoff periods.

Two species of fish that are considered MIS have been reported within the Project Area. They include the greenback cutthroat trout, and brook trout. Cutthroat trout have been reported from the headwaters of Wigwam Creek, however there is no current evidence or genetic testing to indicate that greenback cutthroat trout still exists within the Project Area. Brook trout populations are established in headwater areas or high elevation reaches of most tributaries in the Project Area. Few brook trout occur at the lower elevations that may be influenced by project activities. Activities from the proposed project are not likely to have a measurable affect on brook trout populations.

REGULATIONS AND POLICIES

The Forest Plan has some specific goals, and standards and guidelines that are directed at fisheries. They include the following that apply to fisheries.

- **Improve fish habitat on suitable streams and low elevation ponds and lakes**
- **Protect riparian areas and wetlands from degradation.**
- **Manage fish habitat, which is providing a fishery at or near its potential, to maintain fish populations at existing levels. Manage fish habitat that is determined to be limiting a fish population to a level below its potential to improve habitat conditions that may be limiting.**
- **Maintain habitat for viable populations of all existing vertebrate wildlife species.**

ALTERNATIVE A

Direct and Indirect Effects

Under the no action alternative, the vegetation treatment areas would not be changed. The current risk of catastrophic fire and consequential erosion would remain high throughout much of the Project Area. Fish populations in the study area could be devastated as a result of an erosion event that may result after a major fire. The severe reduction in aquatic habitat and fish populations in Buffalo Creek provides an example of this exact chain of events. Currently, fish populations in much of the Project Area are at high risk from catastrophic fire and consequential erosion.

Under Alternative A only natural revegetation processes would occur in the Buffalo Creek Burn Area. The highly erosive conditions that currently exist in much of this area would likely continue for several years while the natural revegetation process gradually increases sediment stability. The aquatic habitat in Buffalo Creek is currently degraded due to erosion of the burned area . Until the revegetation process is complete, aquatic life in Buffalo Creek would continue to be impaired by sedimentation caused by soil erosion. This sediment would continue to degrade aquatic habitat and reduce natural fish production.

Alternative A would not complete road reclamation. Aquatic systems associated with the 25 miles of permanently closed, low standard roads would continue to be impacted by road-related erosion. Currently, the area proposed for road reclamation is a contributor of sediments to associated reaches of streams in the Project Area. The accumulation of fine sediments in these stream reaches is responsible for habitat loss and general reduction in fish populations.

Alternative A would not include trail improvements, upgrades or expansion. Currently, the Gill Trail represents a relatively minor source for sediments entering the South Platte River.

Cumulative Effects

The effects of this alternative combined with past activities and the future foreseeable actions would not have any negative cumulative effects on fisheries. Fire risk would remain high and some minor inputs of fine sediment may occur, but the population viability of fish in the Project Area would not be affected.

Consistency with Forest Plan

This alternative would be consistent with the population viability standard and the goal of maintaining fish populations at or near its potential, as outlined in the Forest Plan. However, it would not be consistent with the goal of improving habitat conditions that may be limiting or improving fish habitat in suitable streams because it does not propose to improve fish habitat in Buffalo Creek. Therefore, this alternative would be consistent with the standards in the Forest Plan but inconsistent with some of the specific goals.

ALTERNATIVE B

Direct and Indirect Effects

Vegetation treatments planned under Alternative B include thinning, and burning of 17,400 acres of densely forested area (including 5,414 acres of roadless area) in this watershed. Treatment activities could cause minor short-term increases in sediment in the small tributaries including Pine Creek, Sugar Creek, Gunbarrel Creek, Horse Creek, and several other small or intermittent streams. Fish habitat in these streams is marginal because of low flows, steep gradients, and high sediment loads. Therefore, the proposed action would likely have little observable effect on the already degraded aquatic conditions and fish populations in these streams.

The effects of this alternative would likely be a short-term increase in sediment (see Hydrology). This increase would be relatively small due to the riparian buffers proposed, no new road construction, and the use of forwarders to minimize soil disturbance. The stream systems have evolved with these types of minor disturbances. The long-term effects would be positive due to fire risk reduction, and the corresponding reduction in the risk of catastrophic sedimentation that may result from a major fire. An increase in sediment deposits in associated stream reaches could cause loss of habitat, egg mortality or physiological stress to fish communities depending on rain events and the extent of disturbance.

The Buffalo Creek Burn Area Revegetation includes planting vegetation, strategic placement of woody debris and boulders, reshaping sediments using conventional equipment, and using biosolids to amend soils and enhance vegetative growth. These procedures could cause minor short-term stress on the aquatic environment. The use of conventional equipment may disturb surface soils and increase erosion. Additionally, the reshaping of sediment deposits using conventional equipment would likely cause a short-term increase in the erosion potential. However, This would rapidly decrease as the revegetation process increases soil stability.

The use of biosolids would accelerate revegetation resulting in less erosion/sediment loading, however, they may provide a possible source of impact to the associated aquatic habitats because of the nutrients (nitrogen or phosphorus) they contain. A precipitation event that occurred shortly after the application of biosolids could result in runoff from treated areas containing concentrations of nitrogen that approach

toxic levels for some aquatic life forms (R. Brobst Pers. Comm., 2000). High concentrations of nitrogen would only present a threat near the source of runoff from the treated areas. Runoff with high concentrations of nitrogen would be diluted downstream of the source. There are several measures that may be taken to reduce the risk of nitrogen runoff in treated areas near drainages. Some of these measures include; using mulch in treated areas, hand-placing biosolids, and placing logs parallel to contours to slow erosion. Areas proposed for treatment should be evaluated for slope and proximity to a stream before application because areas of high gradient have a greater risk of impacting aquatic environments.

An addition to the Buffalo Creek subproject may include the use of a suction dredge as part of the monitoring program to remove some of the fine sediments that have accumulated at specific locations in the stream. It is likely that this operation would produce only short-term impacts at specific locations. Large sediment deposits that indirectly resulted from a fire currently degrade habitat in Buffalo Creek. The source of these sediments includes a vast area of the Buffalo Creek drainage that has a high potential for erosion due to the lack of vegetation. Although the system is degraded it maintains an equilibrium with the available hydrological dynamics and physical features of that watershed. Removing sediments could result in local scour, degradation and aggradation (Simons and Senturk 1977). If the fine sediment could be removed without causing a negative impact to the existing stream conditions, it is likely that there would be some localized impact to macroinvertebrates and possibly fish. The minor impacts caused by the limited use of suction dredging as part of a monitoring program should have only a minor effect on fish habitat.

Proposed road reclamation work potentially affecting the aquatic environment includes surface tilling and applying biosolids. Road tilling would cause a short-term increase in erosion potential that may increase sediment nearby streams. Erosion potential would gradually decrease as the revegetation process increases soil stability. The biosolids used to amend the soils could impact fish if used in close to streams. Impacts to fish would be very unlikely, but could consist of stress and egg mortality from sedimentation and/or mortality due to toxic concentrations of nitrogen.

The river access trail improvement activities may cause minor erosion and consequent sediment input to the South Platte River during the construction process. Over the long-term, revegetating eroding social trials within riparian areas, and improving trail alignment and drainage would reduce stream sediment input. Improved riparian conditions and reduced sediment would have a beneficial effect on fish or other aquatic life.

Cumulative Effects

The effects of this alternative combined with past activities and the future foreseeable actions would not have any negative cumulative effects on fisheries. Fire risk would be reduced and some inputs of sediment may occur but the overall population viability of fish communities in the Project Area would not be affected. The proposed action plus the Colorado State Forest Service and Denver Water efforts to reduce fire risks would reduce the erosion risks and therefore have a beneficial cumulative effect on fish habitat

Consistency with Forest Plan

This alternative would be consistent with the Forest Plan goals and standards listed above.

ALTERNATIVE C

Alternative C is similar to the proposed action except that there would be no heavy off-road equipment used to remove logs from roadless areas. Felled trees in off-road areas would be allowed to degrade for one to two years and then burned. The risk of excessive erosion resulting from this operation is the primary concern of Alternative C, however, the threat of erosion in roadless areas would be decreased temporarily. The process of burning degraded trees in roadless areas may result in an increased risk of erosion at that time. Potential negative impacts to aquatic environments would be similar to those described for Alternative B. Areas that may initially receive less sediment under Alternative C include Horse Creek, Saloon Gulch and the South Platte River. The current risk of catastrophic fire and consequential erosion would remain high in roadless areas until the felled trees are burned or removed. At that time the threat of erosion and sedimentation in the associated streams would increase until the soils are stabilized by vegetation.

The Buffalo Creek Burn Area Revegetation would be similar to Alternative B except that reshaping of sediments would be conducted using hand tools only, and biosolids would not be used to enhance vegetative growth. The use of conventional equipment during any portions of this subproject may result in disturbance of surface soils causing an increase in erosion potential. The reshaping of sediment deposits using hand tools would not eliminate the threat of erosion, however the potential would be less than what could be caused by conventional equipment. The potential for erosion would decrease as the revegetation process increases soil stability.

The road reclamation would be the same as Alternative A, but no biosolids would be used. The impacts would be similar to alternative A, except that the revegetation process would be slower and erosion potential last longer, and there would be no potential for nitrogen entering streams. The South Platte River Access Trail Improvements include the same actions as Alternative B. Risks to the aquatic environment for Alternative C are the same as Alternative B.

WILDLIFE

METHODOLOGY

The effects of the alternatives on wildlife were based in part on expected changes in habitat. Some specific criteria are contained in the Forest Plan for the Pike and San Isabel National Forests (USFS, 1994a). Where those criteria are applicable they were used to assess compliance with the Forest Plan. Table 4-7 lists the Management Indicator Species for the Pike National Forest. These species are evaluated in this section of the EA. Other wildlife species are addressed in the Biological Assessment and Biological Evaluation (see Appendices B and C).

Table 4-7. Pike National Forest Management Indicator Species (MIS)

Common Name	Scientific Name	Other Special Status
Mammals		
Abert's Squirrel	*Sciurus aberti*	
Beaver	*Castor canadensis*	
Bighorn sheep	*Ovis canadensis*	
Elk	*Cervus elaphus*	
Mule deer	*Odocoileus hemionus*	
American marten	*Martes americanus*	Region 2 Sensitive Species
Birds		
Black-throated gray warbler	*Dendroica nigrescens*	
Lewis' woodpecker	*Melanerpes lewis*	Region 2 Sensitive Species
Mallard	*Anas platyrhynchos*	
Mountain bluebird	*Sialia currocoides*	
Red-naped sapsucker	*Sphyrapicus nuchalis*	
Three-toed woodpecker	*Picoides tridactylus*	Region 2 Sensitive Species
Virginia's warbler	*Vermivora virginiae*	
Water pipit	*Anthus spinoletts*	
Wild turkey	*Meleagris gallopavo merriami*	
Wilson's warbler	*Wilsonia pusilla*	

REGULATIONS AND POLICIES

The Forest Plan identifies goals for wildlife. These goals include the following:

- **Increase diversity for wildlife and habitat improvement**
- **Increase winter range habitat capability for deer and elk**
- **Protect riparian areas and wetlands from degradation.**

The Forest Plan also established general management direction including;

- **Provide for the habitat needs of management indicator species on the National Forest**
- **Manage and provide habitat for recovery of endangered and threatened species**
- **Maintain habitat for viable populations of all existing vertebrate wildlife species**
- **Establish elk, bighorn sheep and threatened and endangered species on sites that can supply the habitat needs of the species and the population levels and distribution agreed to with the States**

Additionally specific criteria are contained under the general direction and under specific Management Area direction. These criteria are discussed and evaluated where they apply in the analysis.

ALTERNATIVE A

Direct and Indirect Effects

This alternative would have no direct effects to general wildlife. The mixed conifer forest habitat would continue the current trend of increasing crown density. Douglas-fir would continue to increase. Habitat quality in the Buffalo Creek burn area would gradually increase as natural revegetation occurs. In forested areas that would become more dense, the current level of understory that exists would continue or decrease. The lack of understory would reduce the availability of cover types required by wildlife to use for escape, hiding, feeding, nesting, and warmth. The potential for a catastrophic fire event would continue to increase due to the increasing fuel load. A wildfire of the intensity of the 1996 Buffalo Creek wildfire could effectively remove vegetation, degrade watershed conditions, and result in altered streambeds and increased sediment input to streams.

The habitat capability for the Pike National Forest Management Indicator Species (MIS) would stay at the current level in this alternative in the short-term. Under the current conditions, the mountain bluebird, bighorn sheep (summer and winter habitat), mule deer (summer and winter habitat), elk (summer and

winter habitat), red-naped sapsucker, Abert's squirrel (summer and winter habitat), and Merriam's turkey (summer habitat) meet the habitat capability goals required by the Forest Plan for the entire Project Area. The Abert's squirrel, red-naped sapsucker, and the winter habitat for Merriam's turkey may possibly increase in this alternative. However, many of these species do not meet habitat capability goals for specific Management Areas on the Pike National Forest.

Cumulative Effects

Denver Water Board and the Colorado State Forest's activities on 2,845 acres would reduce the fire risk within the Waterton/Deckers watershed. The Douglas-fir/Tussock moth EA project has reduced fire risk on about 1,000 acres and would use prescribed burns to reduce fuel loads on another 13,000 acres in the Waterton/Deckers and Horse Creek watersheds. The Elk Creek Management Unit project would complete vegetation treatments similar to the proposed action for this EA on over 1,000 acres. The Elk Creek Management Unit is outside of the Project Area. All of the projects mentioned above have and/or would reduce the catastrophic fire risk in the Project Area or adjacent to it. Total treated area is about 4,000 acres with another 14,000 scheduled for treatment in the future.

This alternative would have no additional cumulative effect when considered with the current and future projects in the Project Area. This alternative would have the greatest long-term catastrophic fire risk of all of the alternatives. Bighorn sheep (both summer and winter), elk (winter in Management Area 7a) and mountain bluebird (Management Area 7d) habitat capability would continue to be below the Forest Plan standard. However, for Alternative A, Abert's squirrel would remain above its habitat capability standard in the Forest Plan.

ALTERNATIVE B

Direct and Indirect Effects

VEGETATION TREATMENTS

Direct impacts from the Proposed Action include immediate loss of cover, forage, nests and possibly some young birds. Indirectly, noise from equipment could impact wildlife, especially birds. Logging activities and prescribed fires also could create opportunities for noxious plants to invade the Treatment Areas.

A short-term direct negative impact of the Proposed Action is temporary displacement of wildlife while the Proposed Action is being implemented. Larger, more mobile wildlife, such as deer and coyotes, would be temporarily displaced by the equipment used to start and control the fire, by the fire itself, by human presence within the Project Area, and by logging activities. The length of their displacement would vary depending on the species. Shy species such as mountain lions may remain out of the area for an extended period of time, whereas more social species, such as the coyote, may return after a relatively short time. Wildlife could also be killed during the prescribed fire, by smoke inhalation, or by vehicles used to haul equipment and personnel into the Project Area. Spring burns could impact birds, especially ground nesters. Animals with limited mobility living above ground appear to be the most vulnerable to fire-caused injury and mortality (USDA Forest Service, 2000). Small mammals and reptiles, that are unable to avoid the prescribed fire or vehicles, may be killed by the prescribed action. However, fire

effects on habitat, such as forage loss, may influence a species' population much more dramatically than direct mortality (USDA Forest Service, 2000).

There would be a long-term positive effect on wildlife that benefit from more open forest conditions due to the increase and improvement of habitat. The Proposed Action would have the desired effect of reducing tree density, allowing for increased understory. Habitat improvements from prescribed fires on fire dependent vegetation communities are increased browse and forage, increased habitat diversity, and a continuation of natural vegetation community development. Prescribed fires can renew plant growth and increase natural biological diversity as vegetation composition and structure are improved.

In the Management Areas of the Project Area, the habitat capability of the beaver, mountain bluebird, bighorn sheep, mule deer, elk, green-tailed towhee, turkey, and Virginia's warbler all either show an increase or no-change due to this alternative (Table 4-8). The only MIS that shows a downward trend in habitat capability due to this alternative are the red-naped sapsucker, Abert's squirrel (summer and winter habitat), and the turkey (winter habitat). The decrease of the habitat capability of these MIS is because closed canopy habitats provide more of the habitat needs of those species. Many of these MIS still do not meet or exceed the habitat capability requirements for the specific Management Areas, but this alternative does bring these MIS closer to the requirements. In the case of the bighorn sheep (summer and winter habitat) and elk (winter habitat) in Management Area 7a, and the mountain bluebird and turkey (summer habitat) in Management Area 7b all would exceed the corresponding habitat capability requirements due to this alternative. The HABCAP results do not account for the 25 miles of reclaimed roads, the riparian rehabilitation and upland planting in Buffalo Creek or the trail access subprojects which would all improve wildlife habitat.

Alternative B would impact areas classified as elk and mule deer habitat (Map 4-1). Of the elk habitat in the Project Area, this alternative would impact approximately 110 acres of winter concentration area; 4,500 acres of winter range; and 16,000 acres of summer range. Of the mule deer habitat in the Project Area, this alternative would impact approximately 120 acres of winter concentration area; 17,000 acres of winter range; and 7,400 acres of severe winter range. Summer range for the mule deer encompasses all of the Treatment Areas. Alternative B would not impact any bighorn sheep habitat.

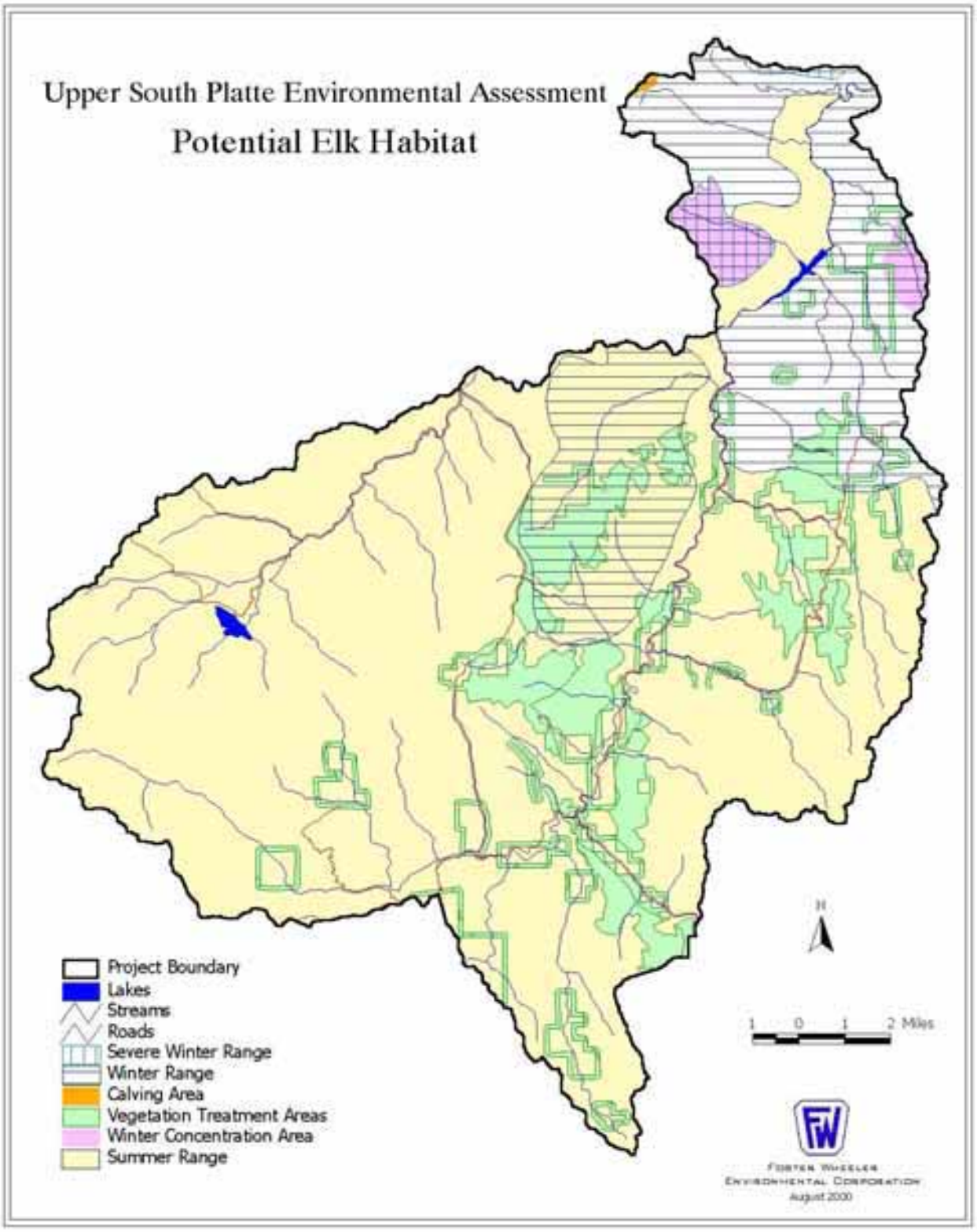
The Forest Plan requires that approximately 60—70 percent of areas along openings, streams, and roads be hiding cover for elk and mule deer. The current database used for analyses does not allow for this specific type of analysis. Even if hiding cover would decline, forage areas would increase due to this alternative. This would provide more feeding opportunities for elk and mule deer that could possibly offset the loss of hiding cover. The Colorado Division of Wildlife (CDOW) has determined summer and winter range for elk and deer in the Project Area.

Table 4-8. Habitat Capability (HABCAP) Trend Predictions by Management Area

		Management Areas					
Common Name	Overall	2a	2b	4b	5b	7a	7d
Abert's Squirrel	↓	↓	↓	↓	↓	↓	↓
Beaver	-	-	-	-	-	-	-
Bighorn sheep	↑	↑	↑	↑	↑	↑	↑
Elk	↑	↑	↑	↑	↑	↑	↑
Lewis' woodpecker	↓	↓	↓	↑	-	↓	↑
Mallard	↑	↑	↑	↑	↑	↑	↑
Mountain bluebird	↑	↑	↑	↑	↑	↑	↑
Mule deer – summer	↑	↑	↑	↑	↑	↑	↑
Mule deer – winter	↑	-	↑	↑	↑	↑	↑
Pine marten	↓	-	↓	↓	↓	↓	↓
Red-naped sapsucker	↓	↓	↓	↓	↓	↓	↓
Three-toed woodpecker	↓	↓	↓	↓	↓	↓	↓
Virginia's warbler	-	-	-	-	-	-	-
Water pipit	-	-	-	-	-	-	-
Wild turkey – summer	↑	↑	↑	↑	↑	↑	↑
Wild turkey – winter	↓	↓	↓	↓	↓	↓	↓
Wilson's warbler	↑	↑	↑	↑	↑	↑	↑

↑ upward trend as predicted by the HABCAP model
↓ downward trend as predicted by the HABCAP model
- level trend as predicted by the HABCAP model

The Forest Plan requires that 20 percent of the forest remain as thermal cover for elk and mule deer. Thermal cover is generally defined as 70 percent or greater crown closure (Hoover and Wills 1987). This provides adequate protection for winter habitat for these species. At current conditions, thermal cover in the winter range of these species in the Project Area ranges from 5.4 to 7.7 percent for mule deer and elk, respectively. The proposed action would decrease the amount of thermal cover in the winter ranges of these species to 4.6 to 6.8 percent for mule deer and elk, respectively. To remove excess elk and mule deer, the CDOW intensely manages these species by issuing hunting permits. Therefore, the level of thermal cover reduction due to the proposed actions does not indicate a significant reduction of population. In addition, the capacity of the RIS database to accurately reflect thermal cover conditions in the Project Area is questionable. It is probable that the amount of thermal cover that actually is present is underestimated in the RIS database and presented above. This is due to the fact that when information was gathered for the database, small pockets of thermal cover that occur within a larger area of less dense stands were grouped with the less dense stands. Therefore, the thermal cover for elk and mule deer is likely noticeably higher than the above percentages indicate. The habitat capability calculated by the HABCAP model shows an increase in elk and mule deer winter habitat capability.



Map 4-1. Elk Habitat in the Project Area.

ROAD RECLAMATION

The road reclamation work would have a short-term negative impact from the noise and disturbance associated with the use of a bulldozer ripping and seeding the roads. However, the road reclamation project would have positive effects on wildlife habitat in the Project Area. The reclaimed roads would reduce habitat fragmentation for some species and provide additional habitat for others. These roads are currently closed but it is likely that some human use occurs. Travel on these roads would be difficult to impossible following reclamation, therefore human disturbance would decrease.

BUFFALO CREEK BURN AREA RESTORATION

The upland planting in the Buffalo Creek burn area would ultimately provide additional forested habitat where regeneration was not occurring naturally. The additional forest habitat would be a positive impact to wildlife habitat in the Project Area. The riparian rehabilitation work would provide additional riparian habitat and increase stability of stream banks. This would provide additional riparian habitat for those species that rely on riparian habitats.

TRAIL ACCESS

The trail access projects would have minimal to no negative effects to wildlife and would have minimal positive impacts. If the projects are successful in discouraging use of social trails then some small amounts of riparian habitat would be improved habitat compared to the current condition.

Cumulative Effects

The current and future actions considered in this cumulative effects analysis are discussed in Alternative A. This alternative would have the cumulative effect of creating substantial areas of open ponderosa pine forest when considered with the current and future projects in the Project Area. This alternative would create habitat trends for MIS that would be very positive for the majority of the species and negative for others. This alternative would lower the long-term catastrophic fire risk.

Bighorn sheep (both summer and winter), elk (winter in Management Area 7a) and mountain bluebird (Management Area 7d) habitat capability would move from below to above the Forest Plan standard. However, Abert's squirrel and American marten (Management Area 7d) would move from above to below the Forest Plan standard. There would still be large areas of dense forest in the Project Area and throughout the Pike National Forest that would provide habitat for American marten and Abert's squirrel.

Mitigation

- **Protect elk and mule deer calving and fawning concentration areas from habitat modification and disturbance from May 15 – June 30.**
- **Insert contract clauses for noxious weed clean vehicles for all contractors.**
- **Encourage aspen regeneration where possible.**
- **Retain snags for habitat for cavity-dependent wildlife at a rate of 3-5 snags/acre of varying and larger diameter tree classes.**
- **Noise control devices should be employed to reduce ambient noise levels during logging activities. Sound boards, mufflers, and other engineering devices can limit noise and reduce it to acceptable levels, which is generally below 60 dba.**
- **A pre-treatment raptor survey would be conducted, specifically for northern goshawk and the flammulated owl. The survey would identify any active nest sites within the treatment areas. If an active northern goshawk nest is identified, then the Forest Service Biologist would be notified immediately. Work in the area of the nest would stop until the Forest Service Biologist has made a determination of the impacts to the nest. The Forest Service Biologist would apply a 30 acre buffer around the active goshawk nest area. No activity in this area is recommended. A larger, post-fledgling-family area, buffer may also be applied to the original buffer. The size of this buffer is approximately 420 acres from the active nest. Timing restrictions would also take place in the post-fledgling-family area. Activity can take place in this area from October through February.**
- **If, during the pre-treatment raptor survey, an active flammulated owl nest is discovered, the Forest Service Biologist would be contacted immediately. As with the mitigation measures taken for the Northern goshawk, work would stop until a determination of impacts is made by the Forest Service Biologist.**
- **If a large stand of aspen is discovered a Forest Service Botanist would do a survey for the Great-spurred violet or Webers' monkey-flower in spruce-fir forests above 8,500 feet.**

ALTERNATIVE C

Direct and Indirect Effects

Under Alternative C, direct and indirect impacts to wildlife in areas where thinning and removing trees and prescribed fires would occur are similar to those discussed for Alternative B (Proposed Action). The only important difference would be that there would be an increase in short-term fire risk for the areas in roadless areas that would not have tree removal. Some of these areas would have tree removal in Alternative B. The effects of the road reclamation, trail access and Buffalo Creek burn area rehabilitation projects would be the same as those described for Alternative B.

Cumulative Effects

The Roadless Alternative would have a cumulative effect on wildlife similar to those discussed for Alternative B (Proposed Action).

Mitigation

Mitigation measures for this alternative would be similar to those identified for Alternative B.

CONSISTENCY WITH FOREST PLAN

Alternative A

Alternative A would not be consistent with the goal of increasing diversity of wildlife and wildlife habitats. However, it would not violate any Forest Plan standards and guidelines, where current conditions meet those standards and guidelines. Several species are currently below their habitat capability and other standards.

Alternative B

Alternative B would be consistent with most of the goals of the Forest Plan described above. This alternative would increase the diversity of wildlife and wildlife habitats. It is not consistent with a Forest Plan standard if habitat capability (as determined by the HABCAP model) is below the standard and decreases or if it is above the standard and drops below. Aberts squirrel (summer and winter), Turkey (winter) are below Forest Plan standards and would decrease under this alternative. American marten is below the standard and would decrease in all but one Management Area, for Management Area 7d it is currently above and would decrease below the standard. For several Management Areas Northern three-toed woodpecker and Lewis' woodpecker are below the standard and would decrease.

The current condition for thermal cover for both elk and mule deer does not meet the Forest Plan standard of 20 percent. This alternative would decrease thermal cover further below the standard, where thermal cover is defined as canopy closure greater than 70 percent.

POPULATION VIABILITY

The population viability for MIS that have a positive or level habitat capability trend as predicted by the HABCAP model would have the same or improved population viability compared to the current condition. The following discussions on population viability are presented only for those species that have negative habitat capability trends as predicted by the HABCAP model.

Abert's Squirrel

The principal habitat of Abert's squirrel is ponderosa pine woodlands, but may range into other forest types (Armstrong, 1987). Currently, about 27 percent of the entire Upper South Platte Landscape (640,000 acres) is suitable habitat for the Abert's squirrel. The action alternatives would decrease the amount of ponderosa pine woodlands within the Project Area. Although the Abert's squirrel's principal habitat is this forest type, the population viability would not be dramatically affected by these actions.

The percentage of suitable habitat within the vegetation treatment areas is approximately 6 percent of the suitable habitat in the Upper South Platte Landscape. This means that the Abert's squirrel population would have adequate suitable habitat during and after the action alternatives.

Lewis' woodpecker

Lewis' woodpecker is a year-round resident of the foothills of southern Colorado and occurs in lowland and foothill riparian areas, agricultural areas and urban areas with tall deciduous trees. It sometimes avoids riparian forests because of competition with the red-headed woodpecker. It is known to occur in the Wet Mountains and Custer and Pueblo Counties (USFS, 1994). Based on the known locations of Lewis' woodpecker, it is not expected to occur within the Project Areas. Therefore, the populations of Lewis' woodpecker is not anticipated to be affected by the action alternatives. In addition, although the HABCAP model shows a downward trend, the anticipated future condition does not bring the result below the Forest-wide standard of 40 percent.

American marten

The American marten's range of habitats in Colorado is fairly broad, including tundra rockpiles and talus slopes as well as montane woodland (Armstrong, 1987). In Colorado, American martens occur at elevations of 8,000 to 13,000 ft. They are associated with spruce-fir and lodgepole vegetation types with mature to old growth structural stages. They prefer moderate to high canopy cover (USFS, 1994c). Currently, about 69 percent of the Upper South Platte Landscape (640,000 acres) is potential habitat for the American marten. No populations of this mammal are known to occur within the Project Area. However, suitable habitat for the animal does occur within the Project Area. The percentage of suitable habitat within the Project Area is approximately 0.4 percent of the suitable habitat in the Upper South Platte Landscape. If an American marten population was present in the Project Area, it would have adequate suitable habitat during and after the action alternatives.

Red-naped sapsucker

The red-naped sapsucker (*Sphyrapicus nuchalis*) is a Forest Management Indicator Species for Pike and San Isabel National Forests. The red-naped sapsucker was previously considered a subspecies of the yellow-bellied sapsucker (*S. varius*), but is now considered a separate species (CBBA, 1998; Peterson 1990). They are most common in aspen or deciduous forests and can be spotted in Colorado during the summer. They do not venture far from the typical aspen groves that they nest in (*Field Guide to the Birds of North America*, 1983). Currently, about 0.44 percent of the Upper South Platte Landscape is suitable habitat for the red-naped sapsucker. Although the HABCAP model shows that the habitat for the red-naped sapsucker is in a downward trend, this is possibly due to the lack of aspen groves naturally occurring in the Project Area. The action alternatives do allow for the regeneration of aspen groves. In addition, the HABCAP model does show a downward trend, but the anticipated future condition does not bring the result below the Forest-wide standard of 40 percent. Currently there is no suitable habitat for the red-naped sapsucker within the Project Area, therefore the population is not anticipated to have adverse effects due to the action alternatives.

Three-toed woodpecker

The three-toed woodpecker primarily occurs in spruce-fir forests. At all seasons and elevations, this species is most common in years and areas where trees have high insect populations due to disease or fire. Where insect populations are high it may also occur in ponderosa pine, Douglas-fir and lodgepole pine forest (Andrews et al., 1992). Currently, about 59 percent of the Upper South Platte Landscape is suitable habitat for the three-toed woodpecker. Although the action alternatives would decrease the

chance of catastrophic fire, smaller fires would inherently be present, which would allow for an insect preybase to be exist. Additionally, the suitable habitat within the Project Area is approximately 0.3 percent of the suitable habitat in the Upper South Platte Landscape. The three-toed woodpecker population would have adequate suitable habitat during and after the action alternatives.

Alternative C

Alternative C would be similar to Alternative B in compliance with the Forest Plan.

RECREATION

MANAGEMENT DIRECTION

The Forest Plan provides guidance for the management of forested areas on the Pike and San Isabel National Forests through its stated goals and objectives, and through the objectives for each Management Area (MA). The Forest Plan also sets standards and guidelines that apply to the entire Forest. A detailed list of these can be found in the Forest Plan. The standards and guidelines for recreation that apply to the proposed actions are given below. A list of the management area objectives can be found in the Forest Plan.

Forest-Wide Direction

FOREST-WIDE GOALS

- **Provide a broad spectrum of developed and dispersed recreation opportunities in accordance with identified needs and demands.**
- **Maintain approximately the current ratio of Recreation Opportunity Spectrum classes for dispersed recreation.**

FOREST-WIDE STANDARDS AND GUIDELINES

- **Provide a broad spectrum of dispersed recreation opportunities in accordance with the established Recreation Opportunity Spectrum classification for the management area.**
- **Close or rehabilitate dispersed sites where unacceptable environmental damage is occurring.**
- **Manage dispersed recreation activities to not exceed the established ROS PAOT/acre capacity.**
- **Manage use of trails in dispersed areas to not exceed the established PAOT/mile of trail guidelines.**

EVALUATION CRITERIA

Future or on-going Actions for Cumulative Effects Analysis

Several of the future foreseeable actions discussed in *Chapter 2 – Alternatives* have the potential to affect the Recreational Resource. Within the Project Area, vegetation treatments on Denver Water lands and prescribed burning in Tussock Moth stands are considered. The Rampart Range motorized trail plan would also be an improvement to recreation that would provide beneficial cumulative effects. The activities in the Lower Elk Management Unit would be unlikely to directly affect recreation because the activities would be primarily on private lands and not around existing recreational facilities or resources.

Direct, Indirect and Cumulative Effects

The effects of the alternatives are compared by evaluating the change in the recreational experience by forest visitors both in the short and long-term. This is a qualitative analysis based on expected changes in the environment. The effect of the proposed activities on the designated ROS settings is also discussed.

ALTERNATIVE COMPARISON

Alternative A – No Action

DIRECT AND INDIRECT EFFECTS

Alternative A would not have any direct effects on the recreational resource. An indirect effect of the alternative would be a continuation of the trend towards increasing forest fuel loads and fire risk. This alternative would have the greatest potential for a large, catastrophic fire that could substantially damage recreational resources in the Project Area (see *Chapter 4 – Forest Vegetation*). The Buffalo Creek fire and floods damaged some recreational facilities such as trails and campgrounds, and destroyed others. Recreational use of these areas has been banned or restricted, reducing the recreational opportunities in the Project Area. The Hi Meadow fire burned only 55 acres of the Project Area, but caused major damage in other areas. If another major fire were to occur in the Project Area, it could further reduce the recreational use of the area, depending on the size and location of such an event.

A major fire in the Project Area could result in the temporary or permanent loss of recreational facilities. This area is heavily used for recreation and individuals who use the area could be displaced to other facilities in other locations. Because the Project Area is so close to the Denver metropolitan area, it can be assumed that recreationists would go to other similar facilities close to Denver to recreate. This would put additional pressures on other facilities. However, the Project Area offers a unique combination of recreation opportunities close to a major metropolitan area and replacement recreational opportunities may not exist for some. Recreationists might return to the Project Area if facilities impacted by a fire had been rebuilt and the nearby landscape was beginning to revegetate.

Alternative A does not propose improvements for recreational access along sections of the South Platte River. Recreationists using these areas who wander off the main trails onto the various social trails would continue to disturb riparian areas, erode stream banks and hillslopes, potentially degrading water quality and fish habitat. Over time, the increasingly degraded conditions would negatively affect the recreation experience and, due to an uncontrolled and dangerous undeveloped access trail, could put some recreationists in danger of injury.

Alternative A does not propose to reclaim roads or revegetate parts of the Buffalo Creek burn area. These proposals would have only a minor effect on recreation as discussed for Alternatives B and C.

CUMULATIVE EFFECTS

Future foreseeable actions in the Project Area include vegetation treatment on Denver Water lands and prescribed burning in stands with defoliation from a Tussock Moth infestation. These activities would primarily affect recreation by increasing management activity in the Project Area and by creating smoke, which could negatively affect the recreation experience. These effects are minor and short-term.

CONCLUSION

This alternative (no action) would not have any direct effects on recreation. Indirectly, the alternative would continue the trend toward increasing fire risk and potential damage to recreational resources. Resource damage due to a dispersed trail system would continue.

Alternative B

Alternative B proposes to thin the forest and create openings in the treatment areas. A number of these treatment areas surround, or are in the vicinity of, recreation facilities or areas where recreation occurs. The trail improvements that are proposed by this alternative would directly affect, and improve, recreational resources. The proposed road reclamation, and revegetation of Buffalo Creek would have only a minor affect on recreation.

DIRECT AND INDIRECT EFFECTS

Effects of Vegetation Treatment on Recreation

The proposed vegetation treatments would have the greatest long-term, direct effect on recreation by changing the character of portions of the Project Area in which recreation takes place. When the project is completed, the appearance of the treatment areas would be different from the appearance of the existing forest. However, the treatment areas would still have a natural appearance, but the forest would be less dense and there would be numerous created openings. *Chapter 4 - Visuals* discusses the visual changes associated with Alternative B.

Effects on ROS Settings

The actions proposed by Alternative B would not change the ROS settings of the Project Area. No new roads would be constructed and the vegetation treatments would not change the long-term recreational use (see below for a discussion on the effects of road reclamation). Alternative B would use forwarders or skidders to access 3,000 acres in areas without existing roads, which would prevent the opening of unroaded areas to roaded access. This activity would not change the ROS settings. However, it would be obvious to many recreationists that forwarders had been used. In some areas, the forwarders would leave

a "path" of disturbed ground (and vegetation). The paths would remain noticeable until they reverted to pre-treatment conditions.

Effects on Recreation Resource Areas

The following discussion presents the likely effects that vegetation treatment would have on areas in the project areas that support high concentrations of recreational facilities and activity.

State Highway 126 Corridor Several vegetation treatment areas are proposed along the State Highway 126 corridor. Facilities along the corridor that could be affected include the trailhead for the Colorado Trail (and part of the trail), the Long Scraggy Scenic Overlook, the Kelsey Creek Campground and the Wigwam Campground. These areas are near an existing road and therefore easily accessible. The forest near these facilities that are within treatment areas would be thinned to leave a 25 percent canopy.

Short-term effects of the harvest activity would include noise, visual activity, smells, and smoke that could affect the experience of people using these facilities. Traffic associated with the harvest and prescribed burning would also affect recreationists along this corridor. The primary effect of the increase in traffic would be noise heard at nearby recreational facilities. Prior to the subscribed burning, logging slash would be noticeable to visitors. Although these effects would be considered minor, some recreationists may chose to avoid the affected areas while harvest activities are being conducted.

Prescribed burning would be a short-term effect in the treatment areas. The burning of individual areas would take one to two days to complete. During this time, recreationists would likely avoid the areas being burned because of smoke. This would temporarily reduce the use of these facilities. However, the duration of the effect is short and therefore the overall effect of the burning would be considered minor.

The primary long-term effect to visitors of these facilities would be visual (see *Chapter 4 – Visual Resources*). Areas where the forest has been thinned would have a different visual character than the existing, dense forest. The effect of this change would depend upon the sensitivity of the individual. The overall difference in appearance would be a change to a more open condition, which would more closely emulate the historic forest conditions. The treated areas would retain a natural character. The change in appearance of the treated areas may be noticeable but would not cause an adverse effect to recreationists.

South Platte River Corridor Much of the South Platte River Corridor is located between proposed vegetation treatment areas. The Lone Rock Campground, the Platte River Campground, the Scraggy View Picnic Area, the Ouzel Campground, and the Osprey Campground are located very close to vegetation treatment areas. Because of this close proximity, it is likely that these facilities would be temporarily closed during harvest and prescribed burn activities. Closing these campgrounds would likely cause some displacement of recreationists to other facilities. This could increase crowding in other areas, potentially negatively affecting the recreation experience at other facilities. However, the closures would be temporary and result in only minor, short-term effects.

Other short and long-term effects to these facilities would be similar to those discussed above for State Highway 126.

Buffalo Creek This alternative does not propose thinning or creation of openings in the Buffalo Creek area. Therefore, there would be no affect on recreation due to vegetation treatments.

The Colorado Trail The Colorado Trail would not pass through any treatment areas. The closest it would come to a treatment area would be near the State Highway 126 trailhead, where the treatment area would be on the east (and opposite) side of the highway. Recreationists might notice some of the treatment areas from the trail, depending on the sensitivity of the individual. The overall difference in appearance of the treatment areas would be a change to a more open condition. The appearance would more closely

emulate the historic forest conditions and would retain a natural character. Therefore, this change in appearance of the area may be noticeable but would not be an adverse effect to recreationists. In the short-term, recreationists may notice the harvest activities and, prior to the prescribed burning, they may also notice slash in the treated areas. This may create some minor, short-term adverse effects.

The Rampart Area Several of the treatment areas would be located in the Rampart Area, primarily affecting motorized trails. Some of the most popular of these trails, including the Cabin Ridge, Flat Rock, Noodle, and Russell Gulch trails, would pass through treatment areas. During treatment, trails would probably be closed for varying periods of time. After treatment, ATV and ORV riders using the portions of trails that pass through treatment areas would observe a more open forest. The treatments would not affect their ability to use the trails or adversely affect their recreational experience (see above for a discussion of the change in visual character).

Developed facilities in the area such as the Flat Rocks and Indian Creek Campgrounds are not located near proposed treatment areas. The only effects to these facilities would be noise related to the increased traffic from logging trucks and treatment activities, and possibly smoke from the prescribed burns.

Other Recreational Resources If the owners of The Flying G Ranch choose to participate in vegetative treatments around their property, a strip of land as wide as 500 feet could be treated around the ranch. Trails leading from the ranch to the Lost Creek Wilderness and other areas would pass through the treated strip. Recreationists, including the Girl Scouts, who use this area, would notice a change in the forest conditions. The effect would be the same as discussed for the Colorado Trail.

There are no treatment areas proposed near the Lost Creek Wilderness. The wilderness would not be directly affected by Alternative B.

Other Effects

An indirect effect of the vegetation treatments would be the reduction in the potential for damage to recreational resources due to a catastrophic fire. As discussed *in Chapter 4 – Forest Vegetation*, there would be a short-term increase in fire risk prior to prescribed burning. However, once the burning is completed, the thinned forest and created openings would reduce the potential for a large fire in the Project Area as compared to the No Action alternative (see Alternative A – No Action discussion, above, for a discussion of effects to recreation from a large fire). This alternative would have a lesser short-term increase in fire risk as compared to Alternative C.

Effects of Trail Improvements

The improvements on the South Platte River Access Trails and the Gill Trail would have a positive effect on the recreational resource. The safety for hikers would be improved and the trail system would be more adequately maintained. Additionally, the measures would provide protection to the local environment from resource damage. There could be some short-term disruption for recreationists while the work is being completed. These disruptions would include noise, traffic, and rehabilitation activities on the trails and at parking areas. These disruptions would be considered minor. Details of the proposed improvements are discussed below.

South Platte River Corridor Access Trails Alternative B would develop and improve access trails on five sections of the South Platte River. The five sections are on National Forest lands and total 7.5 miles. The improvements would involve upgrading existing trails, improving dispersed trails, providing stairs where necessary, improving trail safety, and restoring dispersed trails and areas damaged by overuse.

All sections proposed for improvements have networks of informal or "social" trails, which provide access to and along the river. Overuse has damaged riparian vegetation, caused erosion and damaged

aquatic habitat. The new access stairs and trails will direct and control the flow of recreationists and allow safer access. In addition to providing new and safer access, many of the existing informal trails will be blocked to discourage use and allow vegetation to become reestablished. The new access system will help reduce erosion and damage to riparian and aquatic habitat.

Gill Trail Improvements to the Gill Trail are proposed by this alternative including; a new trailhead parking area, a new trail route from the trailhead to the current trail route to avoid following the road to Cheesman Reservoir, rehabilitation of trail sections in Cheesman Canyon, and a new route from Cheesman Canyon to the parking area near Cheesman Reservoir. The new expanded trailhead parking area near the Wigwam Campground would permit the closure of a number of unauthorized and dangerous parking spaces next to roads, improving safety.

The new trail routes would improve hiker safety by moving the existing trail from the road. This would also improve the hiking experience. Closure and revegetation of dispersed trails would prevent resource damage and also improve safety. In Cheesman Canyon, new trails, steps and established routes to the river would also improve safety and prevent further resource damage. Closures and revegetation of dispersed trails, rock retaining walls and drainage improvements would not only prevent further damage but help rehabilitate areas that have been damaged by overuse.

Effects of Road Reclamation

Alternative B would reclaim 25 miles of road in the Project Area. Specific roads for this action have not been identified at this time. However, some general assumptions and conclusions can be made to estimate the effects on recreation. None of the roads that would be reclaimed are currently designated for motorized or non-motorized recreational use. Therefore, there would not be a loss of designated recreational opportunities for motorized and non-motorized recreationists in the Project Area.

Reducing these roads would not change the ROS settings as the roads that would be closed are not currently available for motorized use and are rough non-system roads, some of which have no known origin. The reclamation could affect any individuals who may use the roads for hiking or mountain biking but there are many other opportunities in the area for these activities so the effect would be minor.

Effects of Buffalo Creek Burn Area Revegetation

The proposed revegetation of riparian and upland areas in the Buffalo Creek burn area would have no short-term effects on recreational use of the area. Prior to the fire, portions of the burn area were used by recreationists. However, facilities in this area such as campgrounds and trails, have been closed and there are no plans to reopen them. Given the limited use of the area, the revegetation activities would not be likely to impact recreationists.

The restoration activities would have a positive long-term effect on recreation by improving the visual environment and accelerating the return of recreation to the burn area. If some of the revegetated areas are visible from roads that lead to recreational facilities, drivers would have a more appealing drive to those facilities. If revegetation efforts occur near any of the recreational facilities that were destroyed by the fire, it may be possible to reopen those facilities when the surroundings are more attractive and stable.

Additional Indirect Effects of the Proposed Actions

An additional indirect effect of the proposed activities would be the possible temporary displacement of recreationists while the activities are completed. Recreationists using facilities both within and out of the Project Area that are not affected by this alternative could notice more use, which could negatively affect their recreation experience. This type of displacement could occur during harvest activity, rehabilitation

efforts and prescribed burning. However, the effect would be minor as all of the activities would be scheduled over a number of years, which would dilute the displacement effect.

CUMULATIVE EFFECTS

Vegetation treatments on Denver Water lands and prescribed burning in stands with Tussock moth infestation combined with the proposed actions would result in a cumulative increase in management activity in the Project Area. For a period when activities are concurrent, the cumulative effect may increase the feeling of crowding and negatively affect the recreation experience. This effect would be short term while activities are completed. The long-term cumulative effect of these combined actions would be a reduction in fire risk and therefore, a reduction in the potential for adverse effects to recreational resources due to a large catastrophic fire.

The Rampart Range Motorized trail plan would combine with proposed trail improvements to benefit the long-term recreational trail resources in the Project Area. These combined actions would provide substantial improvements to a heavily used trail resource.

CONCLUSION

Alternative B would have only minor, short-term adverse effects due to the proposed activities. These effects would primarily be due to the actual harvest activities and prescribed burning.

In the long-term, the recreational resources would be improved by this alternative. The harvest treatments would reduce the long-term fire risk which would reduce the potential for damage of recreational resources due to a large, catastrophic fire. Alternative B would improve the safety and aesthetics of the trail system in the Project Area, prevent further resource damage due to a dispersed trail system, and rehabilitate some of the areas already damaged by overuse.

This alternative is consistent with the Forest Plan direction for management of recreational resources.

Alternative C

DIRECT AND INDIRECT EFFECTS

Alternative C would have the same direct and indirect effects on recreation as Alternative B except as discussed below.

Alternative C proposes to leave harvested trees on-site across 5,414 acres in the roadless areas. Instead, the cut trees would be left in place and burned. This would result in an increase in the amount of smoke produced from these sites. However, these areas would still be subject to prescribed burning in Alternative B, and the additional smoke produced from the downed trees may not be noticeable to most visitors.

Alternative C does not use forwarders or skidders as extensively in the Project Area as compared to Alternative B. Therefore, the potential effect of recreationists observing the machines or "paths" or hearing them, would be less with Alternative C.

An indirect effect of this alternative is the short and long-term effects on recreation due to the change in wildfire risk. Because of the increased woody debris and trees left on the ground, this alternative would have a greater increase in short-term fire risk as compared to Alternative B. The long-term reduction in fire risk would be the same for both alternatives.

CUMULATIVE EFFECTS

The cumulative effects on forest structure for this alternative would be the same as the effects of Alternative B.

Recommendations

It is recommended that to improve recreationists' understanding of the change in the character of the forest in treated areas, that signs be posted along trails, in campgrounds and at highway overlooks explaining the harvest activities and the projects main goals. It is also recommended that in areas where dispersed trails are to be closed, signs be posted to request that hikers not use the old trails and explaining the purpose of the new trail systems, including safety features, and resource protection measures.

AIR QUALITY

INTRODUCTION

This section evaluates the direct, indirect and cumulative effects of the alternatives on air quality. Smoke from proposed prescribed burning, dust from vehicle traffic on unpaved roads and silvicultural treatment operations could all affect air quality. Smoke generated from the proposed prescribed burning could reduce visibility and negatively affect air quality in the Project Area and nearby airsheds. However, in the long-term, the combination of harvest and prescribed burns would reduce the potential for larger wildfires, which would likely create more significant air quality impairment than prescribed burning.

The Project Area is in a federally designated non-attainment area for particulate matter less than 10 micrometers (PM-10). Therefore, the amount of smoke and PM-10 emissions generated from burning operations is a concern.

MANAGEMENT DIRECTION

Regulations and Policies

As discussed in *Chapter 3 – Air Quality*, the National Forests in the State of Colorado have signed a Smoke Management Memorandum of Understanding (MOU) with the Air Pollution Control Division and other federal and state land managers in Colorado. Under the current smoke management program, permits are issued by the Colorado Air Pollution Control Commission for prescribed burning projects on forest and rangelands. Signatories of the MOU are responsible for ensuring proper smoke management for any prescribed fires they conduct and obtaining a permit from the State before initiating prescribed burning (CAPCD, 2000). This program makes it possible for the State to predict the amount of smoke produced in each airshed and to control the amount of burning conducted. When there is a concern that air quality problems will develop, burning operations that would cause impacts can be shut down.

USFS Forest-Wide Direction

The Forest Plan provides guidance for the management of forested areas on the Pike and San Isabel National Forests through its stated goals and objectives and through the objectives for each Management Area (MA). The Forest Plan also sets standards and guidelines that apply to the entire Forest. The standards and guidelines that apply to the proposed actions for air quality are given below.

FOREST-WIDE GOALS

- **Maintain air quality compatible with State and Federal laws.**

FOREST-WIDE STANDARDS AND GUIDELINES

- **In Wilderness Areas – Protect air quality related values from adverse effects from air pollution.**
- **Comply with State and Federal air quality standards.**

Management Area Directions

There are no specific management area directions that apply to this resource.

EVALUATION CRITERIA

Direct and Indirect Effects

The direct and indirect effects of the alternatives are estimated using two criteria. The first is an estimate of the emissions produced by the burning. The second is a more qualitative analysis of the effect of the burning on local communities and smoke sensitive areas.

EMISSIONS FROM BURNING

The potential effect of each alternative on air quality was assessed by estimating the amount of total suspended particulates (TSP) and PM-10 emitted from the proposed prescribed burning on an annual basis. Estimated emissions are then compared with the de minimis level for PM-10 non-attainment areas (see *Chapter 3 – Air Quality*). The de minimis level for Colorado PM-10 non-attainment areas is 100 tons per year. The SASEM computer model (USDI-BLM, 1991) was used to estimate emissions from the proposed prescribed burning (see Scotford, 2000).

For alternative A, an estimate of emissions from potential wildfires is included in the analysis. This estimate is based on average emissions factors for wildfire in forests (Hardy, et al, 1992) and estimates of fuel consumed by wildfires in the Rocky Mountain Region published by the EPA. Potential emissions should wildfire occur in Alternatives B and C are compared to these emission levels.

SMOKE SENSITIVE RECEPTORS

One of the potential effects of the prescribed burning is reduced visibility in smoke sensitive areas. The degree to which these effects are noticeable would depend on atmospheric conditions at the time and other activities in the airshed. These factors cannot be predicted at this time. However, it is assumed that higher emissions would mean more smoky days and a greater chance that smoke sensitive areas would be affected.

The Mount Evans Wilderness lies to the northwest of the Project Area and the Lost Creek Wilderness is just to the west. These are both Class II wilderness areas for air quality (see *Chapter 3 – Air Quality*). In general, areas to the south and west of the proposed burning would not receive much of the generated smoke because the prevailing winds tends to blow smoke away from these areas. The analysis assumes that these wilderness areas would not be affected by the proposed burning.

Several small communities within the project area could be affected by smoke during prescribed burning. These include the communities of Deckers, Trumbull, Oxyoke, Nighthawk, and Sprucewood. The analysis focuses on the potential effects of on these local communities.

Cumulative Effects

Impacts on the local air quality are not usually evident once the emission source is removed due to dispersion. The cumulative effects from past emissions would be negligible. This is also true for future emissions released after emissions from the proposed actions have dispersed. The greatest cumulative effects would be from activities that releasing emissions at the same time as the proposed actions or from sources that continually emit PM-10 into the local airshed. Activities that could have a cumulative effect on air quality include other prescribed burning scheduled for the same time period. These future foreseeable activities include proposed prescribed burning on adjacent lands owned by Denver Water and ongoing prescribed burning within stands affected by Douglas-fir Tussock Moth (DFTM) on National Forest land.

The procedures and burning restrictions imposed by the State's smoke management program would limit any cumulative impacts of the action alternatives and any foreseeable future actions. Since the analysis area is in a non-attainment area for PM-10, there are stricter limits set for emissions of PM-10 and the amount of burning that can be conducted in the area. The ultimate cumulative effects of a greater amount of burning within the area would be a delay in burning and an increased chance of natural ignition of wildland fuels prior to prescribed burning.

The cumulative effects on air quality are assessed by comparing the estimated emissions produced under each alternative and the total area of future foreseeable burning across the analysis area. The more emissions released, the greater the demand for burning during "good burning" weather. This increase in demand for "air space" could result in delays in fuel treatment operations. In addition the total area proposed for prescribed burning within the analysis area over the next ten years could affect the scheduling of burns and possible delays. The possible cumulative effects of the alternatives are qualitatively assessed in relation to the potential demand for airspace.

ALTERNATIVE COMPARISON

Alternative A

DIRECT AND INDIRECT EFFECTS

Emissions from Burning

This alternative would have no direct adverse effect on air quality. However, this alternative has the highest risk of a large wildfire occurring in the area (see *Chapter 4 – Forest Vegetation*). This type of fire

could release large quantities of emissions due to an abundance of fuels in the area. As stands continue to mature and produce additional ground fuels, the potential for a wildfire would increase. A large wildfire has the potential to emit large amounts of smoke that could remain in the local airsheds for a few days to several weeks depending on the size and intensity of the fire.

Fires similar to the Buffalo Creek and Hi Meadows burns could develop in the area. This burn covered 12,000 acres of forest. A wildfire of this size could release 5,400 tons of PM-10 over a period of a few days. This is 54 times the annual de minimis level for PM-10 in Colorado non-attainment areas.

Smoke Sensitive Receptors

There would be no direct effects to local communities. However, many of the small communities in and around the Project Area would be affected by smoke generated by a wildfire. Depending on the size of the fire, the Denver Metor Area could also be adversely affected. Unlike prescribed burning, wildfires can occur when weather conditions are not good for dispersal. Smoke could be caught in an inversion layer along the Upper South Platte River, reducing visibility in the area. Depending on the size of the fire and weather conditions, these effects could last anywhere from one night to several weeks.

Smoke from the recent Hi Meadow fire in the South Platte watershed affected not only the local communities but the Denver metro Area as well. Although emissions data is not yet available for this fire, warnings were given in Denver for people with respiratory conditions to stay indoors to avoid the particulates. Many of the small communities in the area were evacuated for over a week

CUMULATIVE EFFECTS

Since no prescribed burning is proposed by this alternative, there would not be a cumulative increase in the demand for airspace when combined with other projects. Alternative A would have no effect on the scheduling of the prescribed burns on Denver Water and National Forest lands. The future foreseeable prescribed burning would include 2,000 acres on Denver Water lands and 13,000 acres on National Forest land. The burning on National Forest land is in the implementation stage and will likely be completed over the next 5 to 7 years. On Denver Water lands 15 acres of piles are ready to be burned and an additional 175 acres are being harvested. These areas will probably be burned in a couple of years. The remaining area is only in the preliminary planning stages. If these areas were burned, burning would most likely take place in 4 to 8 years.

Alternative B

DIRECT AND INDIRECT EFFECTS

Emissions from Burning

The prescribed burning that is proposed by Alternative B would have a direct, short-term effect on air quality in the Analysis Area. Modeling results estimate that 1,300 tons of TSP and 1,050 tons PM-10 could be released from the burning. If these burns were conducted over a 12-year period, an average of 87 tons per year of PM-10 would be released. The de minimis level is 100 tons per year. The estimates for emissions are based on the conservative assumption that all areas proposed for silvicultural treatment will be under-burned and that ground fuels are continuous across the area burned. In reality, there would be natural openings in some areas, other areas with lighter fuels. Actual emissions would likely be less than these estimates because there are natural openings, areas of light fuels, and areas that will not be burned.

By conducting the burning over a 11 to 12-year period and burning outside the high pollution period (November 1st to the end of February), this alternative would meet the guidelines and standards for PM-10 non-attainment areas in Colorado. Since the amount of burning conducted in any one airshed is monitored and controlled by the State, this alternative would not be expected to result in violations of air quality standards.

An indirect effect of Alternative B is a reduction in the emissions that would be released should a wildfire occur in the area. Crown fires tend to release high amounts of PM-10 because of the amount of live fuel that can burn. As discussed *Chapter 4 – Forest Vegetation*, this alternative reduces the risk of a crown fire by changing the stand structure. Should a crown fire still occur, there would be less green fuel available to burn due to the thinning treatments, and its ability to spread could be limited by created openings. The stands that are proposed for thinning are spread out in several blocks throughout the Deckers-Waterton and Horse Creek watersheds. Following treatment, these areas would act as fuels breaks and help to limit the extent of wildfires that may develop. The created openings would also reduce the emissions produced during a wildfire by removing fuels.

As discussed above, the areas of prescribed burning would produce 87 tons per year of PM-10 emissions. If the same areas were to burn in a wildfire, 7,830 tons of PM-10 could be released over a period of a few days.

Smoke Sensitive Receptors

The prescribed burning proposed by this alternative would increase the number of smoky days in the local area, affecting several of the local communities including Deckers, Trumbull, Oxyoke, Nighthawk, and Sprucewood. Smoke would stay in the local airshed a relatively short time (a few hours to several days depending on the weather). Generally, areas to the west and south of the burns would not be affected due to the prevailing winds that would blow smoke away from these areas. However, there could be some smoke settling into the river valley along the Upper South Platte River during the evenings. Smoke trapped in low-lying areas would be expected to dissipate once morning temperatures rose and the nighttime inversion lifted. Prescribed burning would be conducted when weather conditions are predicted to be good to excellent for smoke dispersal. Under these conditions, the smoke would rise up and be taken aloft out of the local airshed.

CUMULATIVE EFFECTS

This alternative proposes over 17,000 acres of prescribed burning. In addition, future foreseeable prescribed burning includes 2,000 acres on Denver Water lands and 13,000 acres on National Forest land. The combined activity would be 32,400 acres that could be prescribed burned over the next 15 years. The activities proposed by this alternative may cause delays in burning due to the increased demand for air space.

The burning on National Forest land is in the implementation stage and will likely be completed over the next 5 to 7 years. On Denver Water lands 15 acres of piles are ready to be burned and an additional 175 acres are being harvested. These areas will probably be burned in a couple of years. The remaining area is only in the preliminary planning stages. If these areas were burned, burning would most likely take place in 4 to 6 years. The burning proposed by Alternative B would not begin for 2 to 3 years after the first areas have been thinned. Since it would take a year or more to prepare the sites for cutting and at least one more year for the thinning operations to begin, the earliest the burning could take place would be in four years. During this time much of the burning on the DFTM areas and the 190 acres of Denver Water lands will have been burned. However, in about 5 to 6 years when the proposed burning would be taking place there could be some delays as a result of the demand for “air space”. During this period

there could be some overlap of the areas left to burn in the DFTM units, new areas harvested on Denver Water lands and the areas created from the proposed project. The cumulative effect of these burns would be an increased chance of delay in burning and an increase in the chance of natural ignition of the fuels prior to prescribed burning.

Alternative C

DIRECT AND INDIRECT EFFECTS

Alternative C would have the largest direct effect on air quality in the analysis area. Under this alternative an estimated 1,500 tons of TSP and 1,200 tons PM-10 could be released as a result prescribed burning operations. If these burns were conducted over a 12-year period an average of 100 tons of PM-10 would be released annually over this period. Estimated emissions are higher for alternative C than alternative B because of the greater amounts of fuels burned. Under this alternative a greater proportion of the thinned area would not have the logs removed. Without log removal, the amount of fuels to be burned in these stands would be higher. The higher emissions are a reflection of this higher fuel loading. The effects on air quality would be short-term because once the smoke has dispersed, the emissions are diluted and removed from the local airshed.

Based on the SASEM computer model outputs for this alternative, the amount of total suspended particulate (TSP) and PM-10 emitted yearly will be at de minimis levels. The de minimis level is 100 tons per year. The predicted annual emissions for PM-10 for this alternative are 100 tons. Like alternative B, these estimates represent the high end of the potential emissions released under this alternative because of the assumptions used in the analysis. By conducting the burning over a 12-year period and burning outside the high pollution period (November 1st to the end of February), this alternative would be within conformity guidelines and standards for PM-10 non-attainment areas in Colorado. Since the amount of burning conducted within any one airshed is monitored and controlled by the State, this alternative would not be expected to result in violations of air quality standards. However, because there would be higher emissions under this alternative fewer acres could burned on an annual basis. In order not to exceed de minimis levels set for the area, the burning under alternative C would probably have to be conducted over a greater number of years than under alternative B.

Smoke Sensitive Receptors

As with alternative B, several small communities within the project area could be affected by smoke during prescribed burning proposed under alternative C. Since a greater amount of smoke and emissions would be produced under this alternative, these effects would be greater. Burning would be conducted over a greater number of days under this alternative. This would increase the number of smoky days in the local area. Because more days would be needed to burn these fuels, there would be and increased chance of smoke getting caught within an inversion layer and residing within the low lying areas overnight.

Like alternative B, an indirect effect of alternative C is a reduction in the emissions that would be released from wildfires in the area. This alternative would treat the same areas as alternative B, and similar stand structures would result from this alternative. Because of the change in stand structure, the potential of a crown fire developing within these stands would be reduced. The post treatment stand structures and the location of these stands across the landscape would result in a decreased potential for crown fires and help to reduce the extent of wildfires in the area. These reductions in intensity and extent of wildfires would also result in a reduction in the amount of PM-10 released if a wildfire developed.

CUMULATIVE EFFECTS

The cumulative area that may be burned in the analysis over the next 15 years under this alternative would be 32,400 acres. This is the same area as under alternative B. However, the cumulative effects on the scheduling of burns and the possibility for delays would be greater under alternative C. Since more fuels would be burned under this alternative and the emissions released greater, a greater number of days would be needed to conduct the burning so as not to exceed air quality standards. This could result in creating more burning delays as a result of the demand for burning within the area. This would most likely happen in about 5 or 6 six years when there would still be some of the DFTM areas left to burn, possibly some burning scheduled on Denver Water lands and the initial proposed thinning areas under alternative C would be ready for prescribed burning. This increased chance of delay in burning would also increase in the chance of natural ignition of the fuels prior to prescribed burning.

SUMMARY OF EFFECTS

DIRECT AND INDIRECT EFFECTS

Alternative A would have no direct adverse effect on air quality. Without the silvicultural treatments and associated prescribed burning, no new emissions would be created in the short-term under this alternative. In the long-term, large quantities of emissions could be released if a large wildfire developed due to an abundance of fuels in the area. A large wildfire has the potential to emit large amounts of smoke that could remain in the local airsheds for a few days to several weeks depending on the size and intensity of the fire.

Alternatives B and C would both have a direct, short-term effect on air quality in the analysis area. Under these alternatives PM-10 would be released as a result of prescribed burning operations. Under these two alternatives 17,400 acres would be burned. However, alternative C would result in a greater short-term effect on air quality because a greater amount of fuel would be burned under this alternative and a greater amount of pollutants would be released.

The amount of burning conducted in any one airshed is monitored and controlled by the Colorado Air Pollution Control Commission. Therefore, none of the alternatives would be expected to result in a violation of air quality standards. Based on the SASEM computer model outputs for the alternatives, the amount of total suspended particulate (TSP) and PM-10 emitted yearly would be below de minimis levels. By burning outside the high pollution period (November 1st to the end of February) and with emission rates below de minimis all of the alternatives would be within conformity guidelines and standards for PM-10 non-attainment areas in Colorado.

Indirect effects of alternatives B and C include a potential reduction in the amount of PM-10 released from wildfires in the area. These two alternatives would reduce the amount of standing live fuels as well as ground fuels in the area. In addition, the arrangement of thinned stands across the landscape following treatment would create natural fuels breaks. This would reduce the amount of fuel that could be burned during a wildfire and limit the extent of wildfires in the area. These effects would result in reducing the amount of emissions from wildfires in the area.

CUMULATIVE EFFECTS

Since no prescribed burning is proposed under alternative A, this alternative would not result in any delays in burning as a result of increased demand for "air space." The cumulative area that may be burned in the analysis over the next 15 years under alternatives B and C would be 32,400 acres. Both of these alternatives would result in an increase in demand for "air space" in 5 or 6 years. This demand for burning could result in delays in burning and an increased amount of time during which natural and activities fuels would remain on the ground prior to being burned. This delay would increase the chance for natural ignition of these fuels. These effects would be greatest under alternative C because a greater amount of fuel would be burned under this alternative. The increased emissions released under alternative C would increase the demand for "air space" under this alternative.

VISUAL QUALITY

INTRODUCTION

Visual effects are caused by physical alterations that show up visually as contrasts between the natural forest landscape and modifications to the land by harvest related activities. The types of activities that cause visual effects include road building and removal of mature trees. "Contrast," in visual terms, means changes in the major visual elements; form, line, color, and texture. Visual contrast may be seen in modification of landforms, vegetative patterns and structures.

The visual resource is addressed in this document in terms of how the project alternatives would affect the scenic quality of the area.

MANAGEMENT DIRECTION

The Forest Plan provides guidance for the management of forested area on the Pike and San Isabel National Forests through its stated goals and objectives and through the objectives for each Management Area (MA). The Forest Plan also sets standards and guidelines that apply to the entire Forest. A detailed list of these can be found in the Forest Plan. The standards and guidelines for recreation that apply to the proposed actions are given below.

Forest-Wide Direction

FOREST-WIDE GOALS

- **Manage the visual resource to a desired condition that allows for acceptable alteration of the landscape.**
- **Enhance or preserve scenic values along heavily traveled roads, use areas, and trails through management activities.**

FOREST-WIDE STANDARDS AND GUIDELINES

- **Apply the Visual Management System to all National Forest System lands.**
- **Achieve enhancement of landscapes through addition, subtraction or alteration of elements of the landscape such as vegetation, rockform, water features or structures.**

- **Plan, design, and locate vegetation manipulation in a scale that retains the color and texture of the characteristic landscape, borrowing directional emphasis of form and line from natural elements.**
- **Blend soil disturbance into natural topography to achieve a natural appearance, reduce erosion and rehabilitate ground cover.**
- **Revegetate disturbed soils.**

Management Area Direction

MANAGEMENT AREA 2A DIRECTION (2 PERCENT OF VEGETATION TREATMENT AREA)

The management emphasis for this MA is for semiprimitive motorized recreation opportunities. Visual resources are managed so that management activities are not evident or remain visually subordinate. Landscape rehabilitation is used to restore landscapes to a desirable visual quality. Enhancement aimed at increasing positive elements in the landscape to improve visual variety is also used.

- **Design and implement management activities to provide a visually appealing landscape. Enhance or provide more viewing opportunities and increase vegetation diversity in selected areas.**

MANAGEMENT AREA 2B DIRECTION (66 PERCENT OF VEGETATION TREATMENT AREA)

The management emphasis for this MA is for rural and roaded-natural recreation opportunities. Visual resources are managed so that management activities maintain or improve the quality of recreation opportunities. Management activities are not evident, remain visually subordinate, or may dominate, but harmonize and blend with the natural setting.. Landscape rehabilitation is used to restore landscapes to a desirable visual quality. Enhancement aimed at increasing positive elements in the landscape to improve visual variety is also used.

- **Design and implement management activities to provide a visually appealing landscape. Enhance or provide more viewing opportunities and increase vegetation diversity in selected areas.**

MANAGEMENT AREA 4B DIRECTION (4 PERCENT OF VEGETATION TREATMENT AREA)

Management emphasis is on habitat for management indicator species. Management activities may dominate in foreground and middleground but harmonize and blend with the natural setting.

- **Design and implement management activities to blend with the natural setting.**

MANAGEMENT AREA 5B DIRECTION (1 PERCENT OF VEGETATION TREATMENT AREA)

Management emphasis is on forage and cover on winter range. Management activities are not evident, remain visually subordinate, or dominate in the foreground and middleground but harmonize and blend with the natural setting.

❖ Design and implement management activities to blend with the natural setting.

MANAGEMENT AREAS 7A DIRECTIONS (24 PERCENT OF VEGETATION TREATMENT AREA)

Management emphasis is on wood-fiber production and utilization. Management activities are not evident or remain visually subordinate along Forest arterial and collector roads and primary trails. In other portions of the area, management activities may dominate in foreground and middleground, but harmonize and blend with the natural setting.

❖ **Meet stated visual quality objectives.**

MANAGEMENT AREAS 7D DIRECTIONS (4 PERCENT OF VEGETATION TREATMENT AREA)

Management emphasis is on wood-fiber production and utilization for products other than sawtimber. Management activities, although they may be visually dominant harmonize and blend with the natural setting.

❖ **Meet stated visual quality objectives**

EVALUATION CRITERIA

Discussion of Visual Quality and Harvest Activities

The effects of timber harvest or vegetation treatment on visual quality are seen primarily in vegetation and, to a lesser extent, in landform or topographic changes. Form contrast is commonly seen as modifications to the natural vegetative patterns caused by removal of trees in geometric units. Line contrast may smoothly curvilinear, or sharp, straight edges of harvest units, introduced in contrast to the more irregular natural linear features such as ridge lines, streams and meadow edges. Color contrast often accentuates form and line contrasts. For example, a geometrically shaped harvest unit may demonstrate moderate to strong visual contrast when ground cover is medium green grass in contrast to deep bluegreen forest surrounding the unit. The contrast becomes much stronger in the winter when white snowcover contrasts with the dark forest color. These visual elements, form, line, and color contrasts, are important considerations for the visual effects of created openings in visually sensitive areas.

The element of landscape texture can be affected by intermediate harvest prescriptions that remove a percentage of trees. These harvests show up visually as a pattern of individual trees or tree clusters rather than as a uniform “carpet” of forest. Texture is commonly, although not always, a lesser concern in timber harvest visual effects than the other elements. Texture will, however, be one of the major changes to the existing visual environment because of the homogeneous nature of the existing forest and the proposal to thin, or reduce canopy cover to 25 percent, over large areas.

Evaluation Criteria

Chapter 3 – Visual Quality presents photos of the historical condition of the forest and the current condition. These photos provide an illustration of the types of conditions that the proposed actions are striving to create and the difference from the existing homogeneous nature of much of the forest. Most analysis tools for visual effects rely on the Visual Quality Objectives for an area. These objectives assume that the desired condition is the existing characteristic landscape. The degree of allowable alterations to the landscape depends on the type of VQO as described below.

Table 4-9. Descriptions of the Visual Quality Objective Classifications

Classification	Description
Preservation	Only ecological change is allowed
Retention	Management activities that are not visually evident to the casual forest visitor are allowed.
Partial Retention	Management activities may be evident but must remain subordinate to the characteristic landscape and appear as a natural occurrence.
Modification	Management activities may dominate the characteristic landscape but must utilize naturally established form, line, color and texture. The modification should appear as a natural occurrence when viewed in foreground or middleground distances.
Maximum Modification	Management activities may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

The desired future condition for the appearance of the forest is not the characteristic landscape that currently exists. Therefore, it is part of the project's objectives to change the characteristic landscape, which is somewhat contrary to the tools traditionally used for analysis. However, it is an objective of the project for the changes to appear natural and blend into the existing landscape character. Management activities and changes to the character of the forest may be evident to a visitor who has come to the area frequently and is familiar with its current appearance. However, the landscape changes and management activities may not be evident to a visitor who is new to the area. Therefore, the evaluation criteria for this EA will examine how those two types of visitors would perceive the changes.

In all areas of vegetative treatment, the characteristic landscape would be changed. It is not likely, nor necessarily desired, that these changes be subordinate to the characteristic landscape. However, it is desirable that the landscape alterations meet the VQOs in terms of a natural appearance. Other management activities such as the appearance of the units prior to prescribed burning are also a concern. The discussion will use VQOs as a measure of the project's effect on the natural appearance of the area and the importance of that effect.

The U.S. Forest Service's database does not provide VQO mapping of the Project Area. However, a combination of the Management Area direction and the assumed sensitivity of specific areas can be used to assume VQOs for sensitive viewing locations and routes. Table 4-10 provides the general guidelines for the VQOs for the Management Areas where vegetation treatments are proposed.

Table 4-10. Management Area Visual Quality Objective Guidelines

Management Area	Management Emphasis	VQO Guidelines
2A	Semiprimitive motorized recreation	Partial retention
2B	Rural and roaded-natural recreation	Partial retention and modification
4B	Management Indicator Species	Modification
5B	Big game winter range	Partial retention and modification
7A & 7D	Wood fiber production and utilization	Retention and partial retention along Forest arterial and collector roads and primary trails. In other areas, modification

The Partial Retention VQO applies to most of the sensitive viewing areas used for this analysis and will be the primary focus for evaluation of alternative effects.

The management area direction provides only general guidelines within the MA for VQOs. To provide greater specificity for analysis, some assumptions were made. The North Fork of the South Platte and South Platte Rivers Environmental Impact Statement (SPSPR EIS) was consulted as an example of the kinds of assumptions that can be made to assign VQOs when that information is not available. That EIS identified the South Platte River corridor as visually sensitive and requiring VQOs of retention and partial retention. These VQOs are adopted for this project as well, and extended to the entire river corridor. These VQOs are also assumed to be valid for other visually sensitive areas such as the State Highway 126 Corridor and the Colorado Trail. The retention VQO is assumed for the foreground distance (up to 0.25 miles away from viewers). Partial retention would apply for the middleground distance, from 0.25 miles away from the viewer to the nearest ridgetop that encloses the view, or a distance of approximately 5 miles.

ALTERNATIVE COMPARISON

Alternative A

Alternative A would continue current forest management with no actions taken to reduce fire risks, improve South Platte River access, reclaim roads, or revegetate parts of the Buffalo Creek burn area.

DIRECT AND INDIRECT EFFECTS

For this alternative, the existing vegetation patterns found across the Analysis Area would be maintained in the short term. The appearance of the forest landscape would remain the same until events such as a fire, insects or disease would occur, changing the existing vegetative patterns. The scale of the change would depend on the extent of the disturbance. This alternative has the highest likelihood of a catastrophic fire, and therefore, the highest likelihood of a dramatic change of vegetation patterns. The Buffalo Creek and recent Hi Meadows fires serve as models for the effect on visual quality of a large, hot fire.

Changes caused by insect and disease would be more gradual and less noticeable. Only if a severe epidemic were to occur would there likely be large-scale changes to the visual environment. An epidemic could cause hillslopes with standing dead trees, which often appear reddish brown. Endemic insect population may cause pockets of standing dead trees. Endemic populations could even add visual variety to the landscape as the pockets of dead trees revegetate.

Should a catastrophic fire occur, public and private recreational facilities that offer views of the Analysis Area could be destroyed or damaged by fire. This could displace recreationists to other areas both within and outside of the Analysis Area to enjoy the landscape. The additional people could increase feelings of crowding in these areas.

Alternative A does not propose improvements to recreational access along the South Platte River. Therefore, there would be no change to existing visual conditions along the river. Riparian areas, which are currently disturbed as a result of uncontrolled use, would continue to degrade. These conditions would increasingly negatively affect the visual experience of recreationists using the river and adjacent areas.

Over the long-term, the Project Area would likely be subject to fires such as the Buffalo Creek and Hi Meadows fires. If large fires were to occur, the resulting changes in the appearance of the Project Area would likely be similar to that of the other areas where fires occurred. It can be assumed that these areas are not considered to be aesthetically pleasing by most viewers, so, should such fires occur, there would be a cumulative decrease in the visual quality of the affected areas.

If over the long term, wildfires are suppressed or do not occur in the Project Area, and if insects or disease do not rise to epidemic levels, the tree canopy and underbrush of the forest would continue to increase in density. The resulting forest in the Project Area would continue to have much different visual characteristics than the historic, pre-fire suppression forests.

CUMULATIVE EFFECTS

Activities planned on the Denver Water lands in the Project Area could include 2,000 acres of thinning followed by prescribed burns. These activities would be completed over the next 5 to 10 years. The objective of these treatments would be to create stand conditions that resemble historic conditions and to reduce wildfire hazard. There would also be thinning and created openings in the Lower Elk Creek Management Unit, which is outside of but adjacent to the Project Area. These activities would alter the visual environment in the treated areas, moving the combined treatment areas toward the historical landscape visual conditions. Only a small portion of the Project Area would be visually affected and the cumulative visual effects would be minor.

Prescribed burning in stands affected by the Douglas-fir tussock moth would only result in minor visual changes. While some understory seedlings and saplings will be killed during the burning, many of the stands will retain a well-developed understory. The burns will not create new openings and most of the larger trees would remain.

Alternative B

DIRECT AND INDIRECT EFFECTS

Vegetation Treatments

General Effects

The actions proposed by Alternative B would have relatively minor effects on visual resources given the site specific planning for treatment areas that would be visible from primary viewing locations and routes. The use of forwarders to access timber in roadless areas could have minor short-term effects on visual quality in a few locations.

Some people may find the more open and less dense forest in the Analysis Area that would result from the implementation of Alternative B less aesthetically appealing than the current condition. These people may choose to stay away from the area and go to other areas. Other people may find the more open forest attractive and may visit the area more frequently. Others may be attracted to the Analysis Area to observe treatment operations and to see how the area changes over the years.

Short-term visual effects would include slash remaining from harvest and smoke from prescribed burns. The visual effect of the slash would last from 1 to 2 years, until the area would be burned. The burned area may be visually unappealing for a short time until the underbrush is reestablished. Smoke from the prescribed burns would be a short-term effect lasting for only a couple of days. Other short-term visual effects would be apparent harvest equipment in the treatment units and paths created by forwarders, which would dissipate over time. These effects are unavoidable but short-term.

Alternative A discusses the visual effects of a large wildfire or epidemic insect populations. This alternative decreases the risk of adverse visual effects due to these types of events. However, fires and insect and disease epidemics could still occur and alter the visual quality of the area.

Visual Quality Objectives

Alternative B proposes thinning to reduce the canopy cover from approximately 50 percent to approximately 25 percent. As discussed in *Evaluation Criteria*, this treatment would change the characteristic landscape from a dense forest to a more open condition. However, based on observations of another similar harvest treatment near the Project Area, the changes can appear natural and blend with the landscape so that a visitor new to the area may not notice the change once harvest has been completed. It is part of the restoration project to change the appearance of the forest, therefore, as long as the change appears natural and blends with the denser adjacent forest, the thinning itself would not create VQO violations. The thinned areas would be blended with the adjacent forest by using different intensities of thinning, particularly along the edge of the treatment area. This would prevent an abrupt change in texture of the forest and would avoid creating artificial looking lines.

In visually sensitive areas, particularly those defined as retention, possible visual problems could be created by the slash that is left on the ground and remaining tree stumps. In retention areas, all trees within the first 300 feet of the road, trail, river or facility, would be removed using a feller, which cuts the trees at the ground level. The slash would be a short-term effect, lasting from 1 to 2 years, until the area could be prescribed burned.

Alternative B also would create openings within the thinned areas that would range in size from 1 to 40 acres. In retention areas, these openings would generally be prohibited unless creating the opening could enhance a view by opening up a scenic vista. In partial retention areas, specific design criteria (discussed

below) would be employed to make the openings appear natural. As in areas that are thinned, visitors who frequent the area may notice the changes in the landscape, but a new visitor would find a natural appearing forest. In some areas, openings along with thinning could be used to improve the visual interest of the forest by adding variability to the texture and form. When selecting areas for openings, natural features such as rock outcroppings that are hidden by dense canopy cover may be found. Creating an opening around such a feature could add interest and color to the existing homogenous landscape.

Throughout the treated areas, the created openings should be designed to mimic natural openings and blend with the environment. Special attention would be given to those areas identified as retention or partial retention. Openings created in partial retention would be designed to have a clearcut like opening at the center, except for replacement trees for wildlife, transitioning to full forest or to the thinned areas along jagged and irregular edges. Replacement trees should be left in clusters rather than scattered uniformly (and artificially looking) throughout the stand. The irregular edges should be shaped so that in places the more open areas intrude deeper, like fingers, into the forest canopy. The boundaries of the openings should not be geometric or linear in appearance. The objective is to avoid any sharp contrasts of form, line or texture. Color contrasts should vary and appear like a natural meadow.

Viewing Locations and Routes

Chapter 3 – Visual Quality describes the primary locations and routes from which treatment areas could be viewed. The following analysis qualitatively describes how implementation of Alternative B would change the landscape near the locations and routes. It also discusses the likelihood of Alternative B meeting VQOs.

State Highway 126 Corridor

Several treatment areas would be located along the State Highway 126 Corridor. The MA for the corridor is 2B, which emphasizes rural and roaded-natural recreation. The VQO guideline for this MA is primarily Partial Retention (see Table 4-2). As discussed in *Evaluation Criteria*, the foreground areas along this corridor (0.25 miles from the highway) are assumed to have a Retention VQO, unless they have already by physically disturbed by human activity. Viewers driving along the corridor would pass through and adjacent to several treated areas. They would notice a much more open forest than exists today due to the thinning operations. They may also notice visual changes from the untreated to the treated areas. This may actually provide visual interest. The strip of retention along the highway would only be thinned and no openings would be created, unless a created opening could improve a view by opening a scenic vista. These measures would limit the visual changes that would be readily apparent to the casual forest visitor. A visitor new to the area would notice that the forest in the treatment area has a different character than other areas that had been seen. This may actually add interest to the drive and to the views. Opening the forest may also provide better viewing opportunities.

Viewers would also notice slash and other debris from treatment. This would be a short-term effect (see Visual Quality Objective discussion, above)

Several of the developed facilities along the corridor would be in or near the treatment areas including the trailhead for the Colorado Trail (and part of the trail), the Little Scraggy Scenic Overlook, the Kelsey Creek Campground, and the Wigwam Campground and Picnic Area. People visiting the trail, campgrounds, and picnic areas would have close views of the treatment areas and careful planning would be required to meet the VQO of Retention that is assumed for the immediate vicinity around these areas. Viewers would notice a difference from the existing conditions because the forest would be more open and less brushy. However, these changes would not be detrimental to the visual quality. Openings would be avoided in these retention areas, unless an opening would provide an enhanced view of a vista. In

these areas, the first 300 feet from the trail, overlook, campground or picnic areas would be harvested using a leveler to avoid the obvious appearance of remaining tree stumps.

Viewers from the Little Scraggy Scenic Overlook would have distant views of treatment areas located across the South Platte River valley to the Rampart Range. These distant treatment areas would not be particularly noticeable to most viewers because of the many rock outcroppings and other natural openings in the forest visible from the viewpoint. In these areas, it would be easier to create larger openings that blend with the existing environment and meet the partial retention VQO. The overlook would also provide a close-up view of an adjacent treatment area. In this area, openings would be carefully designed to blend with the thinned area and be natural in appearance (see design criteria in Visual Quality Objective discussion).

South Platte River Corridor

The South Platte Corridor would pass through a number of vegetation treatment areas. Residences and facilities such as the Lone Rock Campground, the Platte River Campground, the Scraggy View Picnic Area, the Ouzel Campground, and the Osprey Campground are located very close to proposed vegetation treatment areas. Treatment areas within 0.25 miles of these facilities would be considered to be located in a retention VQO. As in the preceding State Highway 126 corridor, openings would not be created in this VQO unless the opening would provide an enhanced viewing opportunity. Other effects would be the same as discussed for the facilities located along Highway 126.

Some treatment areas on the hillsides above the river corridor would be visible. Depending upon their distance from the river or road, the treatment areas would be required to meet VQOs of Retention (within 0.25 miles of the river or road) or Partial Retention (beyond 0.25 miles, extending to the nearest ridgetop or five miles). As long as the design criteria provisions for openings in retention and partial retention are met, there would not be any long-term visual effects. As previously discussed, whether or not the changes are evident would depend on the sensitivity of the forest visitor. Slash and stumps would not be as visible in these units.

The Colorado Trail

The Colorado Trail does not pass through any of the proposed treatment areas. At the State Highway 126 trailhead, it would be possible to observe some of the treatment areas. The effects are as discussed above in the State Highway Corridor discussion

Other Visual Resources

If the owners of The Flying G Ranch choose to participate in vegetative treatments of areas around their property, the fire break could be visible from the Wigwam Trail.

There would be no treatment areas near the Lost Creek Wilderness. As a result, the wilderness would not by directly affected by Alternative B. However, it may be possible to observe the firebreaks that could surround two private parcels (one of which is the Flying G Ranch) located near the wilderness.

Trail Improvements

The proposed trail improvements would enhance the visual environment by reducing the evidence of resource damage from numerous social trails and by reducing the existing and potential future erosion from hillslopes to the river.

Road Reclamation

The road reclamation would provide visual improvements by restoring the reclaimed roads to a more natural appearing environment.

Buffalo Creek Revegetation

The proposed actions in the Buffalo Creek area are limited to riparian and upland revegetation. These actions would improve the visual quality of the portion of the Buffalo Creek area that was damaged by fire. The revegetation would accelerate visual recovery of the area.

CUMULATIVE EFFECTS

The combination of this alternative with activities being completed on Denver Water lands would further move the Project Area towards a more open, historical forest condition. It is expected that in the larger area of the Landscape Assessment, several more projects similar to this one will be completed. These projects along with the activities in the Lower Elk Creek Management Unit will result in a forest that is gradually being modified from a closed, homogenous condition, to a more open canopy interspersed with numerous openings. The photos in *Chapter 3 – Visual Quality* provide an example of the changes that would be expected in much of this area.

COMPLIANCE WITH THE FOREST PLAN

Although this alternative would change the character of the existing landscape, the changes would not be considered violations of the Forest Plan because the changes would not be visually detrimental. The proposed treatments would alter the forest from one type of natural appearing environment to a different and possibly more visually interesting, natural environment.

Alternative C

DIRECT AND INDIRECT EFFECTS

Alternative C would essentially have the same direct effects on visual resources as Alternative B. With Alternative C, logs would not be removed in 5,414 acres of roadless areas. There may be an increase in the amount of smoke produced due to burning larger trees in these areas. Forwarders would not be used as extensively in this alternative. Therefore, the potential effect of recreationists observing the forwarders or "paths" made by the forwarders or hearing the forwarders, would be less with Alternative C.

CUMULATIVE EFFECTS

The cumulative effects would be the same as discussed for Alternative B.

COMPLIANCE WITH THE FOREST PLAN

Compliance with the Forest Plan would be the same as discussed for Alternative B.

HERITAGE RESOURCES

INTRODUCTION

This section describes the effects of the proposed actions and alternatives on historic properties that have already been identified on the forest floor, as well as properties that remain undiscovered. The Forest Service proposes to implement mitigation measures to eliminate adverse effects to potentially significant resources.

MANAGEMENT DIRECTION

National Historic Preservation Act

The National Historic Preservation Act (NHPA) requires Federal agencies, prior to taking action to implement an undertaking, to take into account the effects of their undertaking on historic properties and to afford the ACHP a reasonable opportunity to comment regarding the undertaking.

The first step in the process is to inventory all heritage resources within the Project Area. This is followed by an evaluation of the potential for the project to affect historic and a resolution of these effects. The 1992 NHPA amendments specify that properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian may meet the criteria for listing on the National Register. A Federal agency is required to consult with any Indian tribe that attaches religious and cultural significance to these properties. Regulations also establishes special measures for consultation with Indian tribes and other interested parties regarding potential impacts to historic properties.

The Forest Service is fulfilling its NHPA responsibilities concurrently with its NEPA responsibilities. Project review under NHPA is likely to continue beyond the NEPA process. Inventories of the proposed actions (vegetation treatment, trail improvement, road reclamation) are currently underway. The surveys would be completed, recorded sites evaluated, and any necessary avoidance or mitigation measures developed before the projects are implemented.

Other Regulations

Besides the NHPA, a number of additional legislative and executive orders direct consideration of the cultural environment on National Forest System lands and are relevant to the present project. These are discussed in the Specialist report for this project and would be followed as required.

USFS Forest-Wide Direction

The Forest Plan provides guidance for the management of forested areas on the Pike and San Isabel National Forests through its stated goals and objectives and through the objectives for each Management Area (MA). The Forest Plan also sets standards and guidelines that apply to the entire Forest. The standards and guidelines that apply to the proposed actions for cultural or heritage resources are given below.

FOREST-WIDE GOALS

- **Evaluate, protect and enhance cultural resources on the National Forests for future education and enjoyment.**

FOREST-WIDE STANDARDS AND GUIDELINES

- **Protect, find an adaptive use for, or interpret all cultural resources on National Forest System lands which are listed on the National Register of Historic Places, the National Register of Historic Landmarks, or have been determined to be eligible for the National Registers.**
- **Protect and foster public use and enjoyment of cultural resources**
- **Complete cultural resource surveys prior to any ground-disturbing project;**
  - **Avoid disturbance of known cultural resources until evaluated and determined not significant;**
  - **Collect and record information from sites where there is no other way to protect the properties;**
  - **Issue antiquities permits to qualifying academic institutions or other organizations for the study and research of sites.**

USFS Management Area Directions

There are no specific management area directions that apply to this resource.

EVALUATION CRITERIA

Future or on-going Actions for Cumulative Effects Analysis

For the cumulative effects analysis it is assumed that for all projects on Federal lands that the surveys have been or will be completed and appropriate mitigation applied to cultural resources that would result in no effect. There are no requirements for cultural surveys or mitigation on private land.

Direct, Indirect and Cumulative Effects

The potential for direct and indirect effects are primarily evaluated by examining the potential for physical damage due to activity in the area, the amount of ground disturbing activities and the risk of damage from fire.

ALTERNATIVE COMPARISON

Alternative A

DIRECT AND INDIRECT EFFECTS

Vegetation Treatment

Direct effects to historic properties are not anticipated. However, this alternative has the greatest risk of a large, hot, destructive fire (see *Chapter 4 – Forest Vegetation*). Therefore, indirect effects would include potential destruction or damage of archaeological sites and historically significant buildings and structures within the Project Area and surrounding areas. Such a fire could damage or destroy combustible materials found in historic-era archaeological sites and historic buildings in the Wigwam, Deckers, Trumbull, Nighthawk and South Platte settlement areas. Other effects of such a fire could include erosion of archaeological deposits on slopes destabilized by the loss of vegetation.

Buffalo Creek Revegetation

In this alternative, natural revegetation processes would take longer to occur than the other alternatives. Upland slopes and streambanks that were denuded and destabilized by the Buffalo Creek burn would erode at a higher rate than vegetated areas, potentially disturbing prehistoric and historic archaeological sites and exposing such sites to natural weathering processes and to human vandalism and inadvertent disturbance.

South Platte River Access Trail Improvements

Informal social trails that access the South Platte River have created a situation where recreational users are weaving throughout the forest and in the process, possibly unknowingly trampling archaeological sites and promoting erosion in areas where archaeological may exist. This situation would continue and is likely to worsen under this alternative.

Road Reclamation

Runoff and erosion from existing roads has the potential to impact archaeological sites by exposing or displacing these sites. However, it is not known whether roads that would be reclaimed are having such an effect.

Alternative B

DIRECT AND INDIRECT EFFECTS

To meet its responsibilities under Section 106 of the NHPA, the Forest Service would complete archaeological surveys within the Project Area and would complete formal National Register eligibility evaluations for all previously recorded and newly recorded archaeological sites that could potentially be adversely affected by the proposed actions. . These sites would be flagged and and fenced to protect them from direct impacts. Mechanical equipment and workers would be kept out of the protected areas. Alternatively, the Forest Service may chose to avoid the need for formal eligibility evaluations of all recorded sites by avoiding adverse effects to these sites. Under this option, the Forest Service would

delineate the horizontal boundaries of these sites and would establish a fenced protective 100-foot buffer around the sites. These actions would prevent direct effects.

The project could also be staffed with a qualified archaeological monitor during ground disturbing activities. Additional protection could be achieved by training all construction workers in archaeological site indicators, in the importance of and laws protecting heritage resources on National Forest lands, and in procedures to follow in the event that archaeological resources are encountered during project work.

Some direct impacts to heritage resources that do not meet the National Register criteria could result from the proposed activities; however, because these sites are not significant, the impacts would be considered less than significant.

Vegetation Treatment

The proposed actions for vegetation treatments require that trees be felled and then removed, which have potential to cause direct effects to cultural resources. Felling of trees would have a minimal effect on historic properties. Known historic properties can be flagged and/or fenced and trees can be felled in a direction away from any known resources. Additional archaeological reconnaissance in areas slated for tree felling and removal could insure that unrecorded surface resources will not be impacted. With minimal ground disturbance, felling is not likely to impact unknown subsurface archaeological deposits, which may be additionally protected from the falling trees by some forest undergrowth and duff accumulation.

The removal of downed trees using conventional logging systems has the greatest potential for ground disturbance and therefore the greatest potential to impact unknown, buried archaeological deposits. Known sites would be protected as discussed above.

As discussed in *Chapter 4 – Forest Vegetation*, the proposed activities would affect the short-term and long-term risk of fire in the Project Area. The risk of fire represents potential indirect effects to cultural resources. Short-term risks are due to accumulations of harvest slash and downed logs, which would increase the ground fuels until they are prescribe burned or removed. The prescribed burning of these fuels carries with it a small risk of escape. This risk would be minimized by strict adherence to all precautions and policies for prescribed burns, however, the risk cannot be eliminated. It is unlikely that prescribed burning would have any impact on prehistoric archaeological sites. Prehistoric sites within the Project Area have already been subjected to a cycle of numerous natural fires over the thousands of years represented by these sites.

Prescribed burning has the potential to affect historic archaeological sites, which may contain intact combustible materials. To date, the only historic archaeological site in the Project Area that meets the criteria for listing on the National Register is the Corbin Cabin/Ranch House, which includes standing structures.

The long-term risk of wildfire, especially a large, intense crown fire, would be reduced by the proposed actions. Although the risk of such a fire is not eliminated, it would be lessened by the vegetation treatments and firebreaks created by openings. It would be more likely that fires started in the Project Area would burn less intensely and be more limited in extent. There would be less likelihood that historic sites would be burned or could not be protected by fire fighting efforts. Fires that burn at a lower intensity are also less likely to create the types of erosion that could damage archaeological deposits on destabilized slopes.

Buffalo Creek Revegetation

The proposed revegetation would accelerate the stabilization of slopes and streambanks, providing greater protection for surface and subsurface archaeological sites than No Action. The planting and use of biosolids would involve minimal ground disturbance and would not adversely affect historic properties. Reshaping of sediment deposits using conventional equipment would involve a greater degree of ground disturbance and has the potential to disturb recorded historic properties and potentially significant subsurface archaeological deposits that have not been recorded. Impacts to recorded historic properties can be easily protected as discussed above (*Direct and Indirect Effects*). Impacts to potentially significant unrecorded archaeological deposits could be avoided by additional archaeological surveys and shovel probing, as needed, in areas where sediment reshaping would occur, as well as taking measures discussed above.

South Platte River Access Trail Improvements

Trail construction and improvements would involve little ground disturbance and are unlikely to impact archaeological sites. The work would occur in areas that have already been substantially disturbed by recreational users. Construction of stairs would involve the greatest levels of ground disturbance and this would take place on the steepest trail sections where archaeological sites are least likely to exist. To date, no historic properties have been identified along the proposed trail improvement corridors. The Forest Service will complete archaeological surveys and any necessary evaluations of sites for National Register eligibility before trail work begins.

Although no historic properties have been identified in the Project Area, the Proposed Action may be beneficial to archaeological sites. Trail improvements and reclamation of informal trails should reduce the use of random travel routes through the forest, reducing the likelihood of inadvertently damaging or destroying archaeological sites. Known sites along formal trails can be studied and interpretive information could possibly be placed along the trail to educate the public on sites in the area and on the role of the Forest Service and general public in protecting cultural heritage sites.

Road Reclamation

In general, road reclamation projects would occur in areas that have already been disturbed by road construction, use, and maintenance. Additional impacts to historic properties are not likely. Once specific locations are identified, the Forest Service would inventory these areas for archaeological resources, including conducting additional ground surveys, as needed. Further measures would be taken as discussed above (*Direct and Indirect Effects*). If erosion from existing roads are impacting archaeological sites, reclamation of these roads would have a beneficial effect.

Alternative C

DIRECT AND INDIRECT EFFECTS

The effects of this alternative would be the same as discussed for Alternative B, except as discussed below.

Vegetation Treatment

As discussed for Alternative B, the removal of felled trees has the greatest potential for ground disturbance and therefore the greatest potential to impact buried archaeological deposits. The exclusion of the roadless area from tree removal activities would reduce the total area potentially impacted by ground disturbance by approximately 2,600 acres. At this time, specific areas in which trees would be left

in place have not been identified. Impacts to archaeological sites are site-specific, and since archaeological site inventories and evaluations within the Project Area are not complete, quantitative comparisons between impacts under Alternatives B and C are not possible at this time. However, the roadless areas are some of the least probable areas for archaeological sites (i.e., areas furthest from transportation corridors and areas with slopes greater than 30 percent). Therefore, effects of tree removal under this alternative are likely to be very similar to effects under Alternative B.

The difference in tree removal also affects the risk of wildfire. This alternative would have a higher short-term risk because larger ground fuels would be increased over a greater area where trees are left on site until they are prescribe burned. The risk of escape would also be higher as opposed to Alternative B (see *Chapter 4 – Forest Vegetation*). Therefore, in the short-term, this alternative would have a greater risk of damage to historic resources due to fire than Alternative B. The effects of the reduction in the long-term risk of wildfire would be the same as discussed for Alternative B.

Buffalo Creek Revegetation

In this alternative, sediments would be reshaped with hand tools only. This would reduce potential for accidental mechanical disturbance of archaeological deposits. Monitoring may not be necessary, as long as workers are provided with cultural resource sensitivity and response training and a qualified archaeologist is kept on call in the event that archaeological resources are encountered during project work.

South Platte River Access Trail Improvements

Effects for this alternative would be the same as Alternative B.

Road Reclamation

Effects for this alternative would be the same as Alternative B.

Forest Plan Compliance

All alternatives would meet the Forest Plan Goals, Standards and Guidelines, as stated above.

SOCIOECONOMICS

METHODOLOGY

The following analysis addresses direct, indirect, and cumulative effects on the social and economic environment. Projected effects are compared with the baseline conditions established in the affected environment section. The methods and assumptions employed to assess project effects are discussed by impact area in the following sections.

REGULATIONS AND POLICIES

The environmental justice effects of the proposed alternatives are assessed in accordance with Executive Order 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.

ALTERNATIVE A

Alternative A is the baseline for this analysis. Current forest management practices would continue under this alternative with no different actions taken to reduce fire risks or stream sedimentation. Vegetation treatments would be deferred except for ongoing actions such as Christmas tree cutting and prescribed fire in Tussock moth mortality areas. Current forest conditions combined with greater human encroachment into the forest have dramatically increased the potential risk of loss of life and property from wildfires. The 1996 Buffalo Creek and June 2000 Hi Meadow fires clearly demonstrated the potential devastation that another large-scale fire could cause. Another fire of this magnitude is more likely to occur under this alternative than under Alternatives B or C. Social and economic effects associated with this type of fire would likely be similar to those experienced during and following the Buffalo Creek and Hi Meadow fires. These fires had significant effects on surrounding communities including property damage and, in the case of the Buffalo Creek Fire, human fatalities.

The Buffalo Creek Fire burned approximately 12,000 acres in 1996, resulting in the loss of several homes and essential forest cover on highly erodible soils. Heavy rainfall and floods following the fire resulted in two fatalities and caused substantial erosion and sedimentation. These events also had severe effects on downstream reservoirs that supply water to the Denver metropolitan area. Denver Water has, as a result, spent nearly $1 million on water quality cleanup and dredging operations and anticipates spending an additional $8 million on Buffalo Creek Fire-related activities.

The June 2000 Hi Meadow Fire burned nearly 11,000 acres and destroyed 58 structures, including 51 homes. Approximately 750 Forest Service fire fighters were called in from across the country to help suppress the Hi Meadow Fire, which lasted about six days. Local emergency services were also involved. All 26 volunteer personnel in the North Fork Fire District, as well as all of the District's equipment, were, for example, involved at one time. Twenty personnel were involved full-time for the duration of the fire. This type of extended response effort strains local resources and affects their ability to respond to other emergencies.

The South Platte River access trail improvements proposed under Alternatives B and C would also not take place under Alternative A. Some sections of the Gill Trail are currently unsafe to the point of being considered dangerous. Local emergency services typically rescue several injured people from the Gill Trail each year. Last year three people also had to be rescued from Cheesman Canyon via the Gill Trail. These risks to human health and the associated rescue costs would continue under this alternative.

ALTERNATIVE B

Direct and Indirect Effects

TRANSPORTATION

Truck Traffic

The project life under this alternative is expected to be four to five years. The Forest Service anticipates that approximately 2,000 acres of vegetation would be treated in the first year, with 5,000 to 6,000 acres treated in the following two years. The remaining acres would be treated in year 4 and/or year 5. The Forest Service would require the material to be felled under contract.

Assuming that the average volume of material treated and removed is 2,500 board feet/acre (2.5 mbf/acre), a total of 29,000 mbf would be removed over the life of the project under this alternative. Approximately half of this material would likely consist of non-saw logs, the majority of which would be used for wood chips. If treatment was undertaken by three, three-person crews at a rate of one acre per person-day, treating 2,000 acres in project year one would take 222 days or about 45 work weeks. Assuming an average truck capacity of 5 mbf per truck, this work would generate an average of approximately 4 to 5 truck trips per day. Using these same basic assumptions, eight, three-person crews treating up to 6,000 acres in years 2 or 3 would take 250 days or 50 work weeks and generate an average of 12 roundtrip truck trips per day. These estimates assume that material would be removed from all of the acres treated in the first three project years, with no material removed from the areas treated in project years 4 and 5. If material were removed at a constant rate throughout the life of the project, treatment activities in the first year would generate an average of 2 to 3 truck trips a day. Material would be removed at an average rate of 45 mbf per day in project years 2 or 3, generating an average of 9 truck trips a day.

Alternative B, then, could generate an average of 2 to 5 round trips a day, 5 days a week, for most of the first year of the project. This number could increase to an average ranging from 9 to 12 round trips a day in project years 2 or 3. Unloaded return trips would be significantly lighter than loaded trips. The rear axles of the trucks would likely be hoisted, reducing the overall length of the vehicle, as well as increasing the truck's mobility and safe operating speed.

Assuming that most of the removed material would be transported to western Colorado, the majority of the truck trips would likely take Jefferson County Road 126 (CR 126) north through the towns of Buffalo Creek, Pine, and Pine Junction to US 285. Truck traffic would also be generated on Douglas County Roads 67 and 97 (CRs 67 and 97). Trucks may also head north and then east from the Project Area along SH 67 to Sedalia. If a new facility were established near Woodland Park, truck traffic would be generated on State Highway 67 south from Deckers to Woodland Park. Available traffic count data for these roads are summarized in Table 3-13.

Although trucks regularly travel along Project Area roads, the introduction of project-related logging truck traffic would be noticeable to local residents, as well as people traveling through the Project Area. There has been very little logging activity and associated truck traffic in the Pike National Forest in recent years. The addition of a maximum of 12 round truck trips a day would represent a relatively large addition to traffic volumes on some of the less-traveled Project Area roads. Potential impacts would be greater for the loaded trips.

Logging truck traffic would likely slow some traffic on steep slopes. Average uphill speed for a loaded truck is typically in the range of 30 to 35 miles per hour (mph). The speed limit on many of the Project Area roads is 50 mph. In most cases, these are two lane roads with no passing lanes. Faster moving traffic traveling behind a loaded logging truck would be forced to reduce speed in these areas. One exception to this would be the three-lane stretch of CR 126 that extends north from Wigwam to Kelsey Campground. Truck trips would likely be spread throughout the day and limited to weekdays and business hours when resident and visitor traffic is less.

Increased truck traffic would also contribute to wear on local roads, particularly those designed to handle relatively low volumes of traffic. Truck traffic on CR 97 and Sugar Creek Road, both of which have unpaved, gravel surfaces, would generate dust. There would, however, be a minimal amount of truck traffic on gravel and dirt roads near occupied residences. Efforts would be made to reduce the local transportation effects of logging and other site activities through use of appropriate signals and/or warnings to alert oncoming vehicles to the presence of a work site with trucks entering and leaving. Efficient operation procedures would be employed by contractors to prevent vehicles from blocking access points to the extent possible.

The two main bridges on CR 126, which span Buffalo Creek and the North Fork of the South Platte River, would not be affected by the projected truck traffic. Increased truck traffic may, however, cause new fill material placed on the approaches to the Buffalo Creek Bridge to settle. Information is not available for nine smaller structures along this road. Three steel bridges along the stretch of CR 67 that extends north from Deckers to Sugar Creek do not meet full legal loading capacity. The addition of logging truck traffic would likely cause premature wear on the bridge decks and asphalt surfaces and result in additional maintenance expenses. Information is not available for four crossings on the stretch of CR 67 between Sugar Creek and Sprucewood. There are also 10 crossings between the town of South Platte and Highway 285 that no information is available for. The bridge at the town of South Platte would also not be affected by increased truck traffic.

Passenger Vehicles

Passenger vehicle traffic would be generated by work crews traveling to and from the work sites proposed under Alternative B. Assuming that these workers would all reside outside the Project Area and travel to work alone in personal vehicles, the proposed actions would on average generate a maximum of 15 round trips a day in project year 1 and a maximum of up to 24 round trips a day in project years 2 and 3. These trips would be concentrated at the beginning and end of the workday. It is not known exactly

where this labor force would reside or the routes they would take into the proposed Project Area. The addition of up to 34 passenger vehicles is unlikely to affect existing local traffic flows.

NOISE

Project-related activities would generate noise. Sound is typically described using the decibel (dB) scale, a logarithmic rating system that accounts for large differences in audible sound intensities. Studies addressing the effects of noise on people need to consider the frequency response of the human ear. Sound measuring instruments are, therefore, often designed to respond to or ignore certain frequencies. The frequency-weighting most often used to evaluate environmental noise is A-weighting. Measurements from instruments using this system are reported in "A-weighted decibels" or dBA. This scale accounts for the human perception of a doubling of loudness as an increase of 10-dBA. A 70-dBA sound level, for example, sounds twice as loud as a 60-dBA sound level. Factors affecting potential noise impacts include distance from the source, frequency of the sound, absorbency of the ground, the presence of obstructions, and the duration of the sound.

Traffic is the primary source of human noise presently generated in the Project Area. Light automobile traffic at 100 feet has a typical sound level of 50 dBA. A heavy truck at 50 feet has a typical sound level of 90 dBA. Because the dB scale used to describe noise is logarithmic, a doubling of a traffic noise source (i.e., twice as much traffic on a road) produces a 3-dBA-increase average roadway noise. Average sound levels due to line sources such as traffic decrease with distance from the road at a rate of 3 to 4.5 dBA per doubling of distance from the road. Vegetation attenuates noise if it is dense and deep enough. Intervening vegetation may also create a soft surface over which the noise would travel and would be expected to absorb sound energy.

Project-related logging truck trips would likely be spread throughout the day and limited to weekdays and business hours when resident and visitor populations are less. Each truck would likely represent a discrete rather than a cumulative addition from a noise perspective and would be comparable to the sound level presently generated by other trucks using Project Area roads.

Vegetation treatment and revegetation activities would also generate noise. Possible vegetation treatment noise sources include chain saws and loaders. A chain saw has a specific event sound level of 110 dBA and the Forest Service requires that chain saw operators wear earplugs. A front-end loader going through various cycles has a typical hourly average sound of 75 dBA at 100 feet. Average sound levels due to discrete point sources, such as chainsaws, decrease at a rate of 6 dB per doubling of distance from the source. Intervening vegetation would be expected to absorb some sound energy.

The majority of the proposed treatment acres are located away from occupied residences. Treatment in these areas would be noticeable to visitors recreating in close proximity. Some visitors would likely avoid work areas in the short-term but there would be no long-term effects. Vegetation treatment activities in the buffer areas surrounding private inholdings would be noticeable to some local residents. Noise effects would, however, be limited because treatment activities would only occur with cooperation from affected property owners and would be of limited duration as the buffer areas are typically 500 feet in width. All vegetation treatment activities would take place during the day.

POPULATION, EMPLOYMENT, AND INCOME

The actions proposed under Alternative B would likely generate approximately 15 jobs during project year one. Six of these anticipated jobs would be associated with the proposed road and trail improvements, last from one to four months, and most likely be contracted locally. The other nine anticipated jobs would be associated with the vegetation treatment action. The limited logging capacity

along the Front Range suggests that these workers would need to relocate to the area from elsewhere, most likely western Colorado. This portion of the project labor force would increase in project years 2 and 3, with a maximum of up to 24 workers relocating to the area. This number may, however, be less if the selected logging contractor decided to hire and train local employees.

Assuming an average family size of 3.18, which was the average U.S. family size in 1998, population in and around the Project Area would increase by about 76 people if all 24 workers and their families relocated to the general area (U.S. Census Bureau, 1998). This possible increase in population would represent a small proportion of the population growth already projected for the area and would be unlikely to have any noticeable effect on local services or housing availability.

Average annual wages in the lumber and wood products sector were $28,090 in the Denver metropolitan area in 1998. Twenty-four full-time jobs would generate about $674,160 in total annual income in project years two and three. Total personal income in Jefferson and Douglas counties in 1994 was about $11.6 billion and $2.5 billion, respectively (U.S. Census Bureau, 2000). Local spending associated with the projected project-related income would, as a result, be unlikely to have any noticeable effect on the local or regional economy.

The proposed action consists of four sub-projects. The cost of carrying out these four sub-projects is estimated to be approximately $5.3 million over the five-year life of the project. The majority of project expenditures would be on labor, rather than goods and supplies and is not expected to have any noticeable effect on local business sales.

The mechanical vegetation treatment sub-project is estimated to cost approximately $250 per acre with a total cost of about $4.35 million. This sub-project is designed to reduce the risk of wildfire. Previous wildfires in the Project Area have resulted in significant human and economic costs. The cost of suppressing the June 2000 Hi Meadow Fire, for example, was nearly $5 million. Future seeding and erosion control work on the fire damaged lands is estimated to cost an additional $2.5 million. This works out at about $700 per acre burned and does not include the costs associated with the 58 structures that were destroyed, the evacuation of local residents, the strain on local emergency services, and the social cost to those directly affected.

This sub-project would reduce the risk of future wildfires. This could result in significant cost savings for the Federal government, reduce the strain placed on local emergency services, and benefit local homeowners and residents. Nearly 200 structures are located in the small communities located in the vicinity of the proposed treatment areas.

The trail improvement sub-project would also benefit recreationists and local emergency services by reducing the risk of injury on the Gill Trail, as well as improving access to Cheesman Canyon for recreationists and rescue crews.

ENVIRONMENTAL JUSTICE

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires each federal agency to make the achievement of environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low income populations. The Order further stipulates that the agencies conduct their programs and activities in a manner that does not have the effect of excluding persons from participation in, denying persons the benefits of, or subjecting persons to discrimination because of their race, color, or national origin.

Vegetation treatment and other measures designed to improve water quality by stabilizing stream channels and reducing road- and trail-related sediment would not disproportionately affect minority or low income communities. While local communities would be affected by the proposed actions in the short-run, these actions are intended to reduce the risk of large scale fires and potential damage to property and human health of the type experienced during and following the 1996 Buffalo Creek and June 2000 Hi Meadow fires. Proposed vegetation treatment areas adjacent to private property would only be treated in cooperation with affected property owners. The Forest Service is holding a series of public meetings in the local area to get input from the public and identify local concerns with the proposed actions and alternatives.

Cumulative Effects

Ongoing or foreseeable future actions within or near the Project Area that could add to the effects of the proposed actions include ongoing and proposed Colorado State Forest Service projects, as well as ongoing and proposed U.S. Forest Service projects.

The Colorado State Forest Service is presently working on a number of demonstration projects on Denver Water lands within and near the Project Area. These projects, which include a 90-acre fuel break restoration thinning project along the entrance road to Cheesman Reservoir, as well as an additional 60-acre restoration thinning project located near Trumbull, have the potential to generate additional logging truck traffic. To date, these programs have generated at most one of two logging truck trips a day.

Continuation of the South Platte Ranger District's efforts to limit sediment entering Sugar Creek from CR 67 could temporarily affect traffic flow along this road. Although potential effects might be increased with the addition of logging truck traffic, possible disruptions would be temporary and short-term.

Other ongoing and proposed projects, such as Christmas tree cutting and prescribed fire in Tussock moth mortality areas, also have the potential to affect local population, employment, and income. Potential associated cumulative effects are, however, unlikely to have any noticeable effect on local services, the availability of housing, or the local or regional economy.

ALTERNATIVE C

Direct and Indirect Effects

TRANSPORTATION

Truck Traffic

The maximum truck traffic effects under Alternative C would be the same as those identified for Alternative B. Average daily truck traffic generated under Alternative C would, however, likely be less because logs are being removed from fewer acres. The introduction of project-related logging truck traffic would still be noticeable to local residents, as well as people traveling through the Project Area. Logging truck traffic would likely slow some traffic on steep slopes. Truck trips would likely be spread throughout the day and limited to weekdays and business hours when resident and visitor traffic is less.

Increased truck traffic under Alternative C would also contribute to wear on local roads, particularly those designed to handle relatively low volumes of traffic. There would, however, be a minimal amount of truck traffic on gravel and dirt roads near occupied residences. Efforts would be made to reduce the local transportation effects of logging activities through use of appropriate signals and/or warnings to alert oncoming vehicles to the presence of a work site with trucks entering and leaving. Efficient operation procedures would be employed by contractors to prevent vehicles from blocking access points to the extent possible.

Potential impacts to local road surfaces and bridges would be similar to those identified for Alternative B.

Passenger Vehicles

Project-related passenger vehicle traffic would generally be the same under alternatives B and C. As discussed for Alternative B, the addition of up to 24 passenger vehicles is unlikely to affect existing local traffic flows.

NOISE

Noise effects would be similar to those discussed for Alternative B. There would, however, be fewer truck trips associated with Alternative C because logs would not be removed from roadless areas.

POPULATION, EMPLOYMENT, AND INCOME

Potential direct and indirect effects on population, employment, and income would be generally the same as those discussed for Alternative B.

ENVIRONMENTAL JUSTICE

Vegetation treatment and other measures designed to improve water quality by stabilizing stream channels and reducing road- and trail-related sediment would not disproportionately affect minority or low income communities. While local communities would be affected by the proposed actions in the short-run, these actions are intended to reduce the risk of large scale fires and potential damage to property and human health of the type experienced during and following the 1996 Buffalo Creek and June 2000 Hi Meadow fires. Proposed vegetation treatment areas adjacent to private property would only be treated in cooperation with affected property owners. The Forest Service is holding a series of public meetings in the local area to get input from the public and identify local concerns with the proposed actions and alternatives.

Cumulative Effects

Potential cumulative effects under this alternative would be the same as those identified for Alternative B.

CONSISTENCY WITH THE FOREST PLAN

The proposed actions are consistent with the Forest Plan goals that relate to social and economic issues. These goals include the following:

- **Provide for increased production and productive use of wood fiber while maintaining or improving other resource values.**
- **Provide for local community stability when allocating resource uses.**
- **Provide the opportunity for economic growth of industries and communities dependent upon Forest outputs.**
- **Provide the opportunity for community stability and cohesion within the Human Resource Units to remain in productive harmony with National Forest activities.**
- **Provide a cost-effective level of fire protection to minimize the combined costs of protection and damages, and prevent loss of human life.**

SHORT-TERM USE & LONG-TERM PRODUCTIVITY

Vegetation

The short-term use would be for some timber production from the Project Area. The long-term productivity of the forest would be enhanced because the proposed action would reduce the risk of catastrophic fire.

Soil Productivity

The soil resource is a key ingredient for maintaining the long-term productive potential for an area. Accelerated erosion and effects detrimental to the soil resource will be minimized through use of careful design and BMPs. Soil protection measures in the Forest Standards and Guidelines will maintain critical soil parameters and nutrients, ensuring long-term productivity.

Hydrology

Short-term effects of the activity proposed on National Forest land could include a minor increase in peak flows and total sediment yields. These effects are negligible and would not affect long-term productivity. None of the activities proposed on National Forest land would adversely affect channel stability. Beneficial uses would not be adversely affected.

Fisheries

The activities proposed on National Forest land would not adversely affect fish habitat. The proposed action would reduce the risk of a catastrophic fire thereby enhancing the long-term productivity for fish bearing streams.

Wildlife

Implementation of Alternatives B and C would increase openings and reduce forest density. This change in forested habitats would favor wildlife species preferring more open habitats or a mosaic of open and forested habitats. Populations of these species would be expected to increase with increased availability of preferred habitats. A concurrent reduction in species associated with more closed forested habitats would also occur.

Over the long-term, vegetation treatment in these areas would create a greater mixture of multi-aged timber stands that would result in increased habitat diversity. The forest would have a lower risk of catastrophic fire and subsequent loss of forested habitats.

Fire and Fuels

Fire exclusion has created unnatural closed canopy conditions, increasing the risk of crown fires. Prescribed fire could reduce fuel loadings due to slash and ladder fuels, reducing the consequences of a wildfire. This would enhance the long-term productivity of timber by reducing the potential for severely burned soil and loss of forested habitats.

Air Quality

The temporary impacts of smoke from prescribed burning would have minor effects on the short-term use of forest resources including recreation sites, visual resources, and roadless areas. The long-term benefits of fire would more than outweigh the short-term impact to air quality.

Recreation / Visual Quality

The long-term recreational use of the area would be only slightly affected by the action alternatives. Noise and the feeling of increased human presence would be a short-term effect of the vegetation treatment activities.

The visual effects vary in duration and intensity depending on the location. Initially, the appearance of harvested areas would interrupt the natural appearance of the landscape. Following implementation of all of the vegetation treatments and the foreseeable activities the more open forest would appear more natural. Long-term reduction of wildfire risk would be a benefit to visual quality in the area.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irreversible commitment of resources results from a decision to use or modify resources that are not renewable, or are renewable only over a long period of time. The commitment is irretrievable if the use of a renewable resource is lost due to land allocation decisions or conflicts in scheduling activities. In this case, the opportunities are foregone for a given time period.

Vegetation

Timber production would be lost from land converted to openings. These areas would no longer be capable of producing timber volume due to the commitment of these lands to other uses.

Soils

Any soil lost to erosion would be considered an irreversible and irretrievable commitment of the soil resource. Best Management Practices would be used to minimize soil productivity losses from vegetation treatment. There would be a short-term irretrievable loss of productivity in landings, skid trails, and slash piles.

Hydrology

None of the activities proposed on National Forest land, by themselves, would result in irretrievable effects.

Fisheries

There would be no irretrievable impacts due to proposed activities on National Forest land.

Wildlife

Loss or conversion of forest habitat would not be irretrievable or irreversible, but would be long-term due to management direction.

Recreation / Visual Quality

Effects to recreation and visual quality would not result in irreversible modification of the environment.

Cultural Resources

Any activity that would disturb a cultural resource is an irreversible commitment. No disturbance of cultural resources is predicted in any alternative.

UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

The effects of the alternatives would be minimized by adhering to all the mitigation measures and alternative design features. Some impacts, however, still cannot be avoided.

Soils

There may be some decrease in long-term soil productivity due to topsoil disturbance during logging operations. There would also be a slight decrease in soil quality due to erosion.

Hydrology

None of the activities proposed on National Forest land would result in an adverse impact on water quality.

Wildlife

The proposed action would change some forested habitat into openings and some closed stands into a more open structure. This would be an adverse impact to those wildlife species that depend on the more closed structure habitats.

Fire and Fuels

Some adverse impacts would be caused by the use of prescribed fire. Some large woody debris and soil organic matter would be consumed. The severity of these impacts would depend on the intensity and duration of the prescribed fire.

Air Quality

Temporary, seasonal impacts to air quality would be unavoidable in the implementation of the activity proposed on National Forest land. Prescribed fire is an integral part of the vegetation treatments.

Recreation / Visual Quality

Recreationists and forest visitors would notice some disturbance to the landscape. This is an unavoidable effect of vegetation treatment activities. The degree of disturbance would vary by alternative.

Timber harvesting and road building activities may temporarily disrupt the normal recreational uses of the area. Impacts would include noise, dust, wood debris, smoke and disturbance of understory vegetation.

Cultural Resources

There is no assurance that every cultural resource site would be located in advance of all planned management activities. Some ground-disturbing activity could unavoidably affect an undiscovered historic or prehistoric site. Sites discovered in this manner would be immediately protected from further disturbance with a site specific management plan. Some sites could be inadvertently destroyed or damaged.

POTENTIAL CONFLICTS WITH PLANS, POLICIES, AND OBJECTIVES OF OTHER JURISDICTIONS

This section describes the potential conflicts between the activities proposed by the U.S. Forest Service and the plans, policies and objectives of other federal, state, regional, and local agencies.

Wildlife

The U.S. Forest Service and the U. S. Fish and Wildlife Service (USFWS) share responsibility for the recovery of threatened and endangered species on National Forest lands. The vegetation treatment would occur in occupied Pawnee montane skipper habitat, along with other listed species. These are addressed in the Biological Assessment (Appendix C). The Colorado Division of Wildlife (CDOW) manages populations of elk and mule deer. The proposed action reduces elk winter range which may present a conflict with CDOW management objectives.

Hydrology

The Federal Clean Water Act requires federal agencies to comply with all federal, state and interstate and local authorities in the control and abatement of water pollution. All activity proposed on National Forest land would comply with these authorities.

Fisheries

The U.S. Forest Service manages the habitats within the National Forests while the CDOW manages the fish and wildlife resources of the State. Therefore, there is substantial potential for overlapping polices and programs for both agencies that impact the fisheries resources. Generally, there is a strong mutual support for programs that benefit fish and wildlife resources.

Air Quality

All prescribed burning operations would be conducted according to Colorado air quality laws and guidelines. Potential conflicts could exist if other agencies were also to schedule open burning for the same period. This could result in the rescheduling of burning operations and a delay of site preparation and reforestation efforts to keep smoke emissions within the limits set by State Standards.

Cultural Resources

The laws and policies that govern cultural resource work on federal lands are coordinated and consistent with those of the State of Colorado and State Historic Preservation Office. Cultural resources have been inventoried in the Project Area and are known to exist. They would be avoided, protected or mitigated according to the National Historic Preservation Act.

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GLOSSARY

A

Affected Environment - The physical, and human-related environment that is sensitive to changes resulting from the proposed actions.

Aggraded - A condition where sediment has accumulated in the stream channel.

Air Quality - Refers to standards for various classes of land as designated by the Clean Air Act, P.L. 88-206:Jan., 1988.

Airshed - A geographic area that, due to topography, meteorology, and climate, shares the same air.

Allowable Cut - Amount of timber which can be harvested in any given year.

Allowable Sale Quantity (ASQ) - The quantity of timber that may be sold, from the area of suitable land covered by the Forest Plan, for a time period specified by the Plan. This quantity is usually expressed on an annual basis as the "average annual allowable sale quantity."

Allochthonous - Organic matter in the stream that is produced outside of the stream, usually by riparian plants and trees. Autothonous organic matter is produced in the stream, by algae and aquatic plants.

Alluvial - Materials transported and deposited by water.

Alternative - A mix of management prescriptions applied to specific land areas to achieve a set of goals and objectives. The alternative provides management direction for the proposed project which reflects identified public and management concerns for the Decision Area.

Analysis Area - The Analysis Area is the area that bounds the analysis for a particular resource and/or issue. It may be confused with the Project Area which is the area within which the proposed activities are limited to.

B

Background - That part of a scene, landscape, etc., which is furthest from the viewer, usually from three miles to infinity from the observer.

Basal Area - The area of the cross section of a tree stem near the base, generally at breast height and inclusive of bark.

Best Management Practices (BMPs) - Practices determined by the State to be the most effective and practical means of preventing or reducing the amount of water pollution generated by non-point sources, to meet water quality goals.

Big Game - Those species of large mammals normally managed as a sport hunting resource.

Big Game Summer Range - A range, usually at higher elevation, used by deer and elk during the summer. Summer ranges are usually much more extensive than winter ranges.

Big Game Winter Range - A range, usually at lower elevation, used by migratory deer and elk during the winter months; more clearly defined and smaller than summer ranges.

Biological Diversity (Biodiversity) - The relative distribution and abundance of different plant and animal communities and species within an area.

Biological Evaluation - A documented Forest Service review of activities in sufficient detail to determine how an action or proposed action may affect any threatened, endangered, proposed or sensitive species.

Board Foot (bf) - The amount of wood equivalent to one foot by one inch thick.

Broadcast Burn - Allowing a prescribed fire to burn over a designated area within well-defined boundaries for reduction of a fuel hazard or as a silvicultural treatment , or both.

Browse - Twigs, leaves, and young shoots of trees and shrubs on which animals feed.

C

Canopy - The more-or-less continuous cover of branches and foliage formed collectively by the crown of adjacent trees.

Cavity - The excavated hollow in trees by birds or other natural phenomena; used for roosting and reproduction by many birds and mammals.

Cavity Excavator - An animal that constructs cavities in trees for nesting or roosting.

Channel Types - The following are the channel types, as defined by Rosgen, 1985.

A Type - is well confined and low sinuosity

B Type - is moderately confined and moderate sinuosity

C Type - is unconfined and moderate to high sinuosity

D Type - is multiple channels and very high sinuosity

Chipping - The reduction of woody residue by a portable chipper to chips that are left to decay on the forest floor.

Classified Road – A road that is constructed or maintained for long-term highway vehicle use. Classified roads may be public, private, or forest development.

Clearcut Harvest - A harvest regeneration method under an even-aged silvicultural system in which the existing stand of trees is removed.

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

Climax Species - Those species that dominate a climax stand.

Code of Federal Regulations (CFR) - The listing of various regulations pertaining to management and administration of the National Forests.

Commercial Thinning - Tree thinning that produces merchantable material at least equal in value to the direct costs of harvesting.

Compaction - The packing together of soil particles by forces exerted at the soil surface, resulting in increased soil density.

Compartments - A geographic area delineated by a sub-watershed drainage for management planning purposes.

Condition Class - A grouping of timber stands into size-age-stocking classes for Forest planning.

Conifer - Any of a group of needle and cone-bearing evergreen trees.

Council on Environmental Quality (CEQ) - An advisory council to the President, established by NEPA. It reviews federal programs for their effect on the environment, conducts environmental studies and advises the President on environmental matters.

Cover - Vegetation used by wildlife for protection from predators or to escape the adverse effects of weather.

Cover complexity - Cover complexity is a qualitative rating of the combinations of different types of cover in one habitat unit. Greater cover complexity would be expected to yield greater fish abundance.

Cover/opening Ratio - The mixture of cover and forage areas on a unit of land, expressed as a ratio.

Cultural Resources - The remains of sites, structures, or objects used by humans in the past-historic or prehistoric.

Cumulative Effect - The impact on the environment which results from the incremental impact of the action when added to other actions. Cumulative impacts can also result from individually minor, but collectively significant, actions taking place over a period of time.

Cumulative Effects Area (CEA) - The area that is used for assessing cumulative impacts (see above).

D

Decision Area - The geographic area defining the scope of this document and the alternatives proposed by it.

Decommissioning - Some of the roads are discussed in terms of "decommissioning". This term is used to refer to a specific type of road closure. On a decommissioned road, access would be controlled by means of a moderately sized berm or "tank trap" impassable to vehicles but capable of being easily bulldozed to permit vehicle passage if the road is recommissioned in the future. For all decommissioned roads, water bars are installed, the road bed is seeded, all culverts are removed and self maintaining cross road drainage is provided.

Developed Recreation - Recreation dependent on facilities provided to enhance recreation opportunities in concentrated use areas. Examples are ski areas, resorts and campgrounds.

Diameter at Breast Height (dbh) - The diameter of a tree measured four feet, six inches above the ground.

Dispersed Recreation - Recreation that occurs outside of developed recreation sites requiring few, if any, facilities or other improvements and includes such activities as hunting, hiking, viewing scenery and cross-country skiing.

Displacement of Soil - The movement of the forest floor (litter, duff, and humus layers) and surface soils from one place to another by mechanical forces such as a blade used in piling and windrowing. Mixing of surface soil layers by disking, chopping, or bedding operation, is not considered displacement.

Duff - An organic surface soil layer below the litter layer in which the original form of plant and animal matter cannot be identified with the unaided eye.

E

Ecosystem - Any community of organisms along with its environment, forming an interacting system.

Ecotone - The boundary or transition zone between adjacent plant communities.

Edge - Where plant communities meet or where successional stage or vegetation conditions within the plant community come together.

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

Endangered Species - Any plant or animal species which is in danger of extinction throughout all, or a significant portion of its range (Endangered Species Act of 1973).

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

Environment - The aggregate of physical, biological, economic, and social factors affecting organisms in an area.

Environmental Assessment (EA) - A concise public document which serves to: a. briefly provide sufficient evidence and analysis for determining whether to prepare an EIS, or a finding of No Significant Impact; b. Aid an agency's compliance with NEPA when no EIS is necessary; c. facilitate preparation of an EIS when necessary.

Environmental Impact Statement - A detailed summary prepared by the responsible official in which a major Federal action which significantly affects the quality of the human environment is described, alternatives to the proposed action provided, and the effects analyzed.

Ephemeral Streams - Streams that flow only as a direct response to rainfall or snowmelt events. They have no baseflow.

Epidemic - The populations of plants, animals and diseases that build-up, often rapidly, to highly abnormal and generally injurious levels.

Erosion - The detachment and transport of individual soil particles by wind, water, or gravity.

Eutrophication - The process of excessive addition of inorganic nutrients, organic matter and/or silt to lakes and reservoirs, leading to increased biological production and a decrease in volume.

Evenaged Management - The application of a combination of actions that result in the creation of stands in which trees of essentially the same age grow together. Clearcut, shelterwood or seedtree harvest methods produce even-aged stands.

Evenaged Stands - Stands in which all trees are of about the same age (a spread of 10 to 20 years is generally considered one age class).

F

Fauna - Animals, including lesser form such as insects, mites, etc.

Federal Candidate Taxa - A classification category for those threatened, endangered and sensitive plants or animals listed in the Federal Register (Sept. 27, 1985), and other plants recommended for addition to the Federal Candidate list.

Flatwater - Flatwater is slower flowing water that does not have the turbulence associated with a riffle due to lower gradient or more depth. For the fisheries survey, flatwater was classified as run, glide or pocketwater.

Floodplain - The lowland and relatively flat areas adjoining inland and coastal waters, including, at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

Flora - Plants

Forage - All browse and non-woody plants that are available to livestock or game animals and used for grazing or harvested for feeding.

Forage Areas - Vegetated areas with less than 60 percent combined canopy closure of tree and tall shrub (greater than seven feet in height).

Forb - An herbaceous plant that is not a graminod.

Foreground - That part of a scene, landscape, etc., which is nearest to the viewer, and in which detail is evident, usually one quarter to one-half mile from the observer.

Forest Development Road – A road wholly or partially within or adjacent to a National Forest System boundary that is necessary for the protection, administration, and use of National Forest System lands, which the Forest Service has authorized and over which the agency maintains jurisdiction.

Fry - Recently hatched fish.

Fuel Treatment - Manipulation or reduction of natural or activity fuels (generated by a management activity such as slash left from logging) to reduce fire hazard.

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

G

Genetic Seedlings - Tree seedlings from a genetically superior seed source. The seeds are collected from trees displaying exceptional form and raised in nurseries during outplanting. The seedlings usually have faster growth rates than naturally regenerated seedlings.

Graminoid - All grasses and grasslike plants, including sedges and rushes.

Group Selection - An uneven-aged silvicultural harvest system in which all trees in a small group are removed for regeneration purposes. The size of the group is small enough in area that all subsequent regeneration will be influenced by the surrounding uncut stand. Cuts are generally 0.25 - 2.0 acres in size.

Growing Season - That part of the year when temperatures and moisture are favorable for vegetation growth.

H

Habitat - The sum total of environmental conditions of a specific place occupied by a wildlife species or a population of such species.

Habitat Type - An aggregation of all land areas potentially capable of producing similar plant communities at climax stage.

Hardwood - A broad-leaved tree.

Hiding Cover - Vegetation capable of hiding 90 percent of a standing adult deer or elk at 200 feet or less. Includes some shrub stands and all forested stand conditions with adequate tree stem density or shrub layer to hide animals. In some cases, topographic features also can provide hiding cover.

High Risk - Individual or groups of trees that are live (green) but that have the physical characteristics favorable to insect infestation or disease infections. Trees in this category are subject to mortality and loss of economic value.

I

Immature Timber - Trees that have not attained full development, especially height.

Immediate Foreground - That part of the foreground which is extremely critical for visual detail, usually within 400 feet of the observer.

Indicator Species - See Management Indicator Species.

Indirect Effects - Secondary effects which occur in locations other than the initial action or significantly later in time.

Individual Tree Selection - An unevenaged silvicultural harvest system that removes selected trees of all size classes on an individual basis.

Intensive Management - A high investment level of timber management that includes precommercial and commercial thinnings, plantings with genetically improved stock, control of competing vegetation, and other practices which increase tree growth.

Interdisciplinary (ID) Team - A group of professional specialists with expertise in different resources that collaborate to develop and evaluate management alternatives.

Interdisciplinary Approach - Utilization of one or more individuals representing areas of knowledge and skills focusing on the same task, problem, or subject. Team member interaction provides needed insight to all stages of the process.

Intermediate Harvest - Any removal of trees from a stand between the time of its formation and the regeneration cut. Most commonly applied intermediate cuttings are release, thinning, sanitation and salvage.

Intermittent Stream - A stream that runs water in most months, but does not run water during the dry season of most years.

Invertebrates - Animals having no backbone such as earthworms, insects and lesser animals.

Irretrievable - Applies to losses of production, harvest, or a commitment of renewable natural resources. For example, some or all of the timber production from an area is irretrievable lost during the time an area is used as a winter sports (recreation) site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

Irreversible - Applies primarily to the use of nonrenewable resources, such as minerals, or cultural resources, or to those factors that are renewable only over long-time spans, such as soil productivity. Irreversible also includes loss of future options.

Issue - A subject or question of public discussion or interest to be addressed or discussed in the planning process.

L

Land Allocation - The assignment of a management emphasis to particular land areas with the purpose of achieving goals and objectives. Land allocation decisions are documented in environmental analysis documents such as the Idaho Panhandle National Forests' FEIS and Forest Land and Resource Management Plans.

Landtype - A unit of land with similar designated soil, vegetation, geology, topography, climate, and drainage. The basis for mapping units in the land systems inventory.

Limiting Factor - The environmental influence that exceeds the tolerance limit of an animal to restrict it in its activities, functions, or geographic range.

Limnology - The study of bodies of inland waters, as lakes and ponds, especially with reference to their physical and biological features.

Linkage - A belt or band of cover or habitat which allows animals to move from one location to another.

Litter - An organic surface soil layer usually composed of identifiable leaves, branches or other vegetative material, and animal remains.

Lodgepole Pine - See Timber types.

Long-term Sustained Yield - The estimated timber harvest that can be maintained indefinitely over time, once all stands have been converted to a managed state under a specific management intensity consistent with multiple-use objectives.

Lop and Scatter - Fuel treatment where, following tree felling, limbs and branches are cut off and scattered in the unit.

M

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

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

Management Indicator Species - A species selected because its welfare is presumed to be an indicator of the welfare of other species sharing similar habitat requirements. A species of fish, wildlife, or plants which reflect ecological changes caused by land management activities.

Management Prescriptions - A set of land and resource management policies that, as expressed through Standards and Guidelines, creates the Desired Future Condition over time.

Mature Timber - Trees that have attained full development, particularly height.

Middleground - That part of a scene or landscape which hits between the foreground and background zones.

Minimum Management Requirement (MMR) - Minimum standards for resource protection to meet the goals and objectives of the National Forest System.

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

Mixed Conifer - See Timber Types

Model - A formalized expression of a theory to describe, analyze or understand a particular concept.

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

Mortality - In forestry, trees in a stand that die of natural causes.

Mountain Pine Beetle - The common name for the bark beetle (*Dendroctonous Ponderosae Hopkins*) which is the most destructive insect pest in the intermountain west.

Mulching - Covering the surface of the soil with natural (e.g. litter) or deliberately applied organic materials (e.g. straw, wood chips, foliage).

N

National Environmental Policy Act (NEPA) Process - An interdisciplinary process, which concentrates decisionmaking around issues, concerns, alternatives, and the effects of alternatives on the environment.

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

Natural Regeneration - Reforestation of a site by natural seeding from the surrounding trees. Natural regeneration may or may not be preceded by site preparation.

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

Noxious Weed - A plant species that is highly injurious or destructive and has a great potential for economic impact. A plant species that is listed as noxious by the State of Idaho.

O

Obliteration- Obliteration of an existing road would involve; removal of all culverts, establishing permanent drainages and recontouring of the road surface.

Old Growth Habitat - Habitat for certain wildlife that is characterized by mature coniferous forest stands with large snags and decaying logs.

Oligotrophic - An oligotrophic lake or reservoir is low in nutrients and organic productivity. Oligotrophic lakes are usually deep, with nutrient poor sediments, few macrophytes and large amounts of dissolved oxygen.

Open Road Density - A standard set in the Forest Plan that is applied to most Management Areas important to big game. This road density standard of three-quarters of a mile of open road per square mile of habitat correlates directly to the elk habitat effectiveness of the area (i.e. 68 percent).

Optimum Habitat - The amounts and arrangement of cover and forage that results in the greatest level of production that is consistent with other resource requirements.

Overstory - The portion of trees in a forest which form the uppermost layer of foliage.

Overstory Removal - A harvest method that removes the overstory of a two-story stand and leaves the smaller understory for further development.

P

Partial Cut - Term to relate harvest units where many trees are left and forested appearance is retained. Partial cutting usually provides no long-term benefits to forest health and productivity.

Particulates - Small particles suspended in the air and generally considered pollutants.

Pathogen - A specific causative agent of disease, such as a virus.

Peak Flow - The greatest flow attained during the melting of the winter snowpack.

Pelagic Zone - It is the open water zone in a lake, that is characterized by freely floating organisms (zooplankton and phytoplankton) and certain fish species.

Perennial Streams - Streams that flow continuously throughout the year.

Pioneer Species - A plant capable of invading a bare site (newly exposed soil surface) and persisting there until replaced by another species or community as succession progresses.

Plant Community - An assembly of plants living together.

Pole Timber - Trees of at least five inches in diameter at breast height (DBH), but smaller than the minimum utilization standard for sawtimber.

Pool tail embeddedness - Pool tail embeddedness is the degree to which larger particles are covered or surrounded by finer sediments in the downstream end of the pool. A qualitative rating was assigned. The pool tail is where salmonids generally create redds for spawning. Greater pool tail embeddedness would be expected to reduce biotic productivity.

Pools - Pools are very slow or stagnant water that forms were the channel bottom is substantially lower in elevation than upstream or downstream. For the fisheries survey, pools were classified by the feature that caused the pool to form. These features are undesignated, artificial, beaver, bedrock, boulder, culvert, large woody debris, meander and rootwad.

Precommercial Thinning - The practice of removing some of the trees less than marketable size from a stand so that the remaining trees will grow faster.

Preferred Alternative - The alternative recommended for implementation in the EIS (40 CFR 1502.14).

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

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

Private Road – A road under private ownership authorized by an easement to a private to a private party, or a road which provides access pursuant to a reserved or private right.

Project Area - The Project Area is the area within which the proposed activities are limited to. It may be confused with the Analysis Area which is the area that bounds the analysis for a particular resource and/or issue.

Public Road – A road open to public travel that is under the jurisdiction of and maintained by a public authority such as States, counties and local communities.

Puddling, Soil - A physical change in soil properties due to shearing forces that alters soil structure and porosity. Puddling occurs when the soil is at or near liquid limit.

R

Range of Alternatives - An alternative is one way of managing the National Forest, expressed as management emphasis leading to a unique set of goods and services being available to the public. A range of alternatives is several different ways of managing the Forest, offering many different levels of goods and services.

RARE II – The acronym for the second Roadless Area Review and Evaluation conducted by the Forest Service in 1979 that resulted in an inventory of roadless areas considered for potential wilderness designation.

Recreation Opportunity Spectrum (ROS) - A system for defining the types of outdoor recreation opportunities the public might desire and identifies that portion of the spectrum a given area might be able to provide. It is used for planning and managing the recreation resource and recognizes recreation activity, setting, and experience opportunities.

Reforestation - The natural or artificial restocking of an area with forest trees.

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

Regeneration Harvest - Used in reference to harvest methods which remove an existing stand to prepare the site for regeneration.

Rehabilitation - To return environments into good health.

Release - Freeing trees from competition for light, water and nutrients by removing or reducing the vegetation growth that is overtopping or closely surrounding them.

Research Natural Area - An area in as near a natural condition as possible, which exemplifies typical or unique vegetation and associated biotic, soil, geological, and aquatic features. The area is set aside to preserve a representative sample of an ecological community primarily for scientific and educational purposes; commercial and general public use is not allowed.

Residual Stand - The trees remaining standing after some activity, such as an individual tree selection.

Restricted Road - A National Forest road or segment which is restricted from a certain type of use or all uses during certain seasons of the year or yearlong. The use being restricted and the time period must be specified. The closure is legal when the Forest Supervisor has issued and posted an order in accordance with 36 CFR 261.

Riffles - Riffles are relatively fast flowing water that has a substantial amount of turbulence. For the fisheries survey three types of riffles were recorded including low gradient riffles, high gradient riffles and cascades.

Riparian - Pertaining to areas of land directly influence by water. Riparian areas usually have visible vegetative or physical characteristics reflecting this water influence. Stream sides, lake borders, or marshes are typical riparian areas. Vegetation bordering watercourses, lakes or swamps; it requires a high water table.

Road – A vehicle travel way of over 50 inches wide.

Road Maintenance - The upkeep of the entire Forest Development Transportation Facility including surface and shoulders, parking and side areas, structures and such traffic control devices as are necessary for its safe and efficient utilization.

Roadless Area - A National Forest-system area which is larger than 5,000 acres or, if smaller than 5,000 acres, is contiguous to a designated Wilderness or primitive area; contains no roads, and has been inventoried by the Forest Service for possible inclusion into the wilderness preservation system.

Rotation - The planned number of years required to establish (including the regeneration period) and grow timber to a specified condition or maturity for regeneration harvest. Selected management prescriptions provide the basis for the rotation age.

S

Salvage Harvest - Intermediate harvests made to remove trees that are dead or in imminent danger of being killed by injurious agents such as insects.

Sanitation Harvest - Intermediate harvests made to remove dead, damaged or susceptible trees to prevent the spread of pests or pathogens.

Sawtimber - Trees containing at least one 12 foot sawlog or two non-contiguous eight foot logs, and meeting regional specifications for freedom from defect.

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

Scree - Any slope covered with loose rock fragments.

Sediment - Any material carried in suspension by water, which will ultimately settle to the bottom. Sediment has two main sources; from the channel itself, and from upslope areas.

Seed Tree - A tree selected as a natural seed source within a shelterwood or seed tree harvest cut; sometimes also reserved for seed collection.

Seed Tree Harvest - An evenaged regeneration harvest of a portion of the mature timber from an area, except for a small number of seed bearing trees left singly or in small groups for regeneration of a stand.

Seedlings and Saplings - Non-commercial size young trees.

Selection Harvest - The periodic removal of trees, usually at 10-20 year intervals, individually or in small groups, from an unevenaged forest in order to realize yield and establish regeneration or irregular constitution.

Sensitive Species - Those species identified by the Regional Forester for which population viability is a concern as evidenced by significant current or predicted downward trends in population numbers or density, or habitat capability that would reduce a species' existing distribution.

Seral - A biotic community which is a development, transitory stage in ecological succession.

Series - A group of habitat types having the same climax tree species.

Shelterwood Harvest - An evenaged regeneration harvest of a portion of the mature stand while retaining a portion of the stand as a source for seed and protection during the regeneration period.

Silvicultural System - A management process whereby forests are tended, harvested, and replaced, resulting in a forest of distinctive form. Systems are classified according to the method of carrying out the cuttings that remove the mature crop and provide for regeneration, and according to the typed of forest thereby produced.

Silviculture - The art and science of growing and tending forest vegetation, i.e. controlling the establishment, composition, and growth of forests, for specific management goals.

Site Preparation - A general term for a variety of activities that remove or treat competing vegetation, slash and other debris that may inhibit the establishment of regeneration.

Site Productivity - Production capability of specific areas of land.

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

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

Special Use Permit - A permit issued under established laws and regulations to an individual, organization, or company for occupancy or use of National Forest land for some special purpose.

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

Stand Replacing Fire - A fire that consumes an entire stand of trees. These fires are generally quite hot and can burn hundreds of acres.

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

Stream Order - It is often convenient to classify streams within a drainage basin by systematically defining the network of branches. Each nonbranching channel segment (smallest size) is designated a *first-order stream*. A stream which receives only first-order segments is termed a *second-order stream*, and so on. The order of a particular drainage basin is determined by the order of the principle or largest segment.

Stream Segment of Concern - State of Idaho designation of streams identified for special emphasis as part of the State Antidegradation Policy. Local working committees are charged with development of site-specific Best Management Practices for the stream and associated watershed.

Streambed Particle Size Distribution - A graphical representative of the size and class composition of the streambed at a cross section of a stream reach. The composition is determined by statistically valid sampling of the particles comprising the streambed in the cross section. It is not based on the area covered by the individual particles.

Succession - The progressive changes in plant communities toward climax habitat.

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

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

Sustained Yield - See long-term sustained yield.

T

Talus - The loose accumulation of fragmented rock material on slopes, such as at the base of a cliff.

Thermal Cover - Vegetative cover used by animals to modify the adverse affects of weather.

Thinning - Cutting in evenaged stands to redistribute growth potential or benefit the quality of the residual stand.

Threatened Species - Any species of plant or animal which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Tiering - Refers to the coverage of general matters in broader Environmental Impact Statements or Environmental Assessments with subsequent other related statements in Environmental Assessments incorporated, by reference, the discussions contained in the previous document, solely on the issues specific to the statement subsequently prepared.

Timber Types - A descriptive classification of forest land based on present occupancy of an area by tree species (i.e. lodgepole, mixed conifer). More appropriately called cover types, this category is further defined by the composition of its vegetation and/or environmental factors that influence its locality.

Trophic State - The state of nutrient enrichment of a lake or reservoir.

U

Unclassified Road – A road that is not constructed, maintained, or intended for long-term highway use, such as, roads constructed for temporary access and other remnants of short-term use roads associated with fire suppression, timber harvest, and oil, gas, or mineral activities, as well as travel ways resulting from off-road vehicle use.

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

Unevenaged Management - The application of a combination of actions needed to simultaneously maintain continuous high-forest cover. Harvest systems that develop or maintain unevenaged stands are individual tree and group selection.

Ungulate - A mammal having hoofs, i.e. deer, elk, and moose.

Unroaded Area – An area that does not contain classified roads.

V

Vertebrates - Animals having a backbone, or a spinal column, including mammals, fishes, birds, reptiles, and amphibians.

Viable Population - A population which has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population on the planning area.

Viewshed - Subunits of the landscape where the scene is contained by topography similar to a watershed.

Visual Condition Class (VCC) - A measure of the level of disturbance to the visual resource, expressed in acres. The visual condition classes are used as indicators to measure the existing conditions and effects of alternatives.

Visual Quality Objective (VQO) - A system of indicating the potential expectations of the visual resource by considering the frequency an area is viewed and the type of landscape. Specific VQOs are in *Chapter 3 - Visual Quality.*

Visual Resource - The composite of landforms, water features, vegetative patterns, and cultural features which create the visual environment.

W

Water Yield - The measured output of the Forest's streams.

Watershed - Entire area that contributes water to a drainage system or stream.

Wetlands - Areas that are inundated by surface or ground water with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, wet meadows, river overflows, mud flats, and natural ponds.

Wilderness - All lands included in the National Wilderness Preservation System by public law; generally defined as undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation.

Wildfire - Any wildfire not designated and managed as a prescribed fire with an approved prescription.

Wildlife Diversity - The relative degree of abundance of wildlife species, plant species, communities, habitats, or habitat features.

Windrowing - Slash or debris piled in a row along the contour of the slope.

Y

Yarding - A method of bringing logs into a roadside area or landing, for truck transport. Methods may include forms of skyline cable logging systems, ground-based skidding, balloon, helicopter, etc.

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APPENDIX A

WATERSHED CONSERVATION PRACTICE STANDARDS

Best Management Practices (BMP's) or "Watershed Conservation Practices" (WCP's) are intended to control non-point source pollutants. Region 2 of the Forest Service established the "Watershed Conservation Practices Handbook" (Forest Service Handbook 2509.25-99-1) to provide direction for the protection of soil, aquatic, and riparian systems on National Forest System lands.

"The watershed conservation practices translate legal provisions and scientific principles onto solid, common-sense stewardship actions. Use of the practices support continued wise resource use. The practices cover five areas: hydrologic function, riparian areas, sediment control, soil productivity, and water purity. Each area has a set of standards. Each standard contains design criteria, as well as monitoring guides and restoration guides.

- The standards are statements of outcome to ensure that management actions comply with applicable laws and regulations. They are incorporated into each Forest Plan as standards and cannot be deviated from without an amendment to the Forest Plan.
- The design criteria are specific ways to meet the standard using current knowledge and technology. They may be revised as knowledge and technology improve. They carry the same weight and must be followed to the same degree as Forest Plan guidelines. Other methods may be used if they result in the same outcome directed by the standard, but the NEPA document must tell why these other methods will be as effective.

"Project Specific Required Mitigation" have been developed or compiled on the Forest and are similar to design criteria, but tailored to a specific project or type of project. Project Specific Required Mitigation is intended to provide a stronger link between the Forest Plan Standards/Design Criteria and how the actual project is implemented "on-the-ground". This list is intended to serve as a library of "Project Specific Required Mitigation" or examples which can be selected when appropriate for use on any given project.

Watershed Conservation Practices and BMPs (FSH 2509.25 R2 Amendment 2509.25.96-1).

Applicable Standards	Design Criteria	Project-Specific Required Mitigation
FP Standard: In watersheds containing aquatic TES species, allow activities and uses within 300 feet or the top of the inner gorge (whichever is greatest), of the perennial and intermittent streams, wetlands, lakes (over 1 acre) only if onsite analysis shows that long-term hydrologic function, channel stability, and stream health will be maintained or improved.		Apply Watershed Conservation Practices and limit activities within Critical Upslope distances of streams and wetlands.
11.1 Standard (1) - Manage land treatments to conserve site moisture and to protect long-term stream health from damage by increased runoff.	**a.** In each 3rd order and larger watershed, limit connected disturbed areas so the total stream network is not expanded by more than 10%. Progress toward zero connected disturbed area as much as feasible. Do not add connected disturbed area to Class III watersheds (FSM 2521).	
	b. Design the size, orientation, and surface roughness of forest openings to prevent snow scour and site desiccation.	
11.2 Standard (2) - Manage land treatments to maintain enough organic ground cover in each land unit to prevent harmful increased runoff.	**a.** Maintain the organic ground cover of each land unit so that pedestals, rills, and surface runoff from the land unit are not increased.	
	b. Restore the organic ground cover of degraded land units within the next plan period, using certified local native plants as feasible; avoid persistent or invasive exotic plants.	

Applicable Standards	Design Criteria	Project-Specific Required Mitigation
12.1 Standard (3) - In the water influence zone next to perennial and intermittent streams, lakes and wetlands, allow only those land treatments that maintain or improve long-term stream health and riparian ecosystem condition.	**a.** Allow no action that will cause long-term change to a lower stream health class in any stream reach. In degraded systems, progress toward robust stream health within the next plan period.	Recommendations for application of critical upslope vegetation buffers for riparian area protection are summarized for suitable ground as follows: Slope Critical Upslope Distance 0-20 % 100 feet 20-30% 180 " 30-40 % 280 "
	b. Allow no action that will cause long-term change away from desired condition in any riparian or wetland vegetation community. In degraded systems, progress toward desired condition within the next plan period.	
	c. Keep heavy equipment out of streams, swales, and lakes, except to cross at designated points, build crossings, or do restoration work, or if protected by at least 1 foot of packed snow or 2 inches of frozen soil. Keep heavy equipment out of streams during fish spawning, incubation and emergence periods.	
	d. Ensure at least one-end log suspension in the WIZ. Fell trees in a way that protects vegetation in the WIZ from damage. Keep log landings and skid trails out of the WIZ, including swales.	
	e. Locate new concentrated-use sites outside of the WIZ if feasible and outside riparian areas and wetlands always. Harden or reclaim existing sites in the WIZ to prevent detrimental soil and bank erosion.	

Applicable Standards	Design Criteria	Project-Specific Required Mitigation
	f. Exclude livestock from riparian areas and wetlands that are rated as Not Functioning by the PFC protocol, and where livestock grazing would impede improvement.	
	g. Keep stock tanks, salt supplements, and similar features out of the WIZ if feasible and out of riarian areas and wetlands always. Keep stock driveways out of the WIZ except to cross at designated points. Harden water gaps and designated stock crossings where needed and feasible.	
	h. Remove livestock from riparian areas and wetlands when the average stubble height of Carex species reaches 3-4 inches in spring-use pastures and 4-6 inches in summer/autumn use pastures.	
	i. Avoid season-long grazing in riparian areas and wetlands. Apply short-duration grazing as feasible (generaly less than 20 days) to provide greater opportunity for regrowth and to avoid utilization of woody species. Avoid livestock grazing, as feasible, during the hot season (mid-to-late summer) when livestock are more likely to concentrate in riparian areas and wetlands and to utilize woody species.	
	j. Do not excavate earth material from, or store excavated earth material in, any stream, swale, lake, wetland, or WIZ.	
	k. Maintain the extent of stable banks in each stream reach at 80% or more of reference conditions. Consider degree of livestock trampling on stream banks, by stream	

Applicable Standards	Design Criteria	Project-Specific Required Mitigation
	type, when timing livestock moves between units. As a general rule, stream banks can receive a maximum of 20-25% alteration and still maintain their integrity.	
	l. Adjust management in riparian areas and wetlands to remedy detrimental soil compaction whenever it occurs.	
	m. Do not excavate earth material from, or store excavated earth material in, any stream, swale, lake, wetland, or WIZ.	
12.2 Standard (4) - Design and construct all stream crossings and other instream structures to provide for passage of flow and sediment, withstand expected flood flows, and allow free movement of resident aquatic life.	**a.** Install stream crossings to meet Corps of Engineers and State permits, pass normal flows, and be hardened to withstand flood flows as follows: Design Life (years) 1 2 5 10 20 50 Design Flood (years) 10 10 25 50 100 225	
	b. Size culverts and bridges to pass debris. Engineers work with hydrologists on site design.	
	c. Install stream crossings on straight and resilient stream reaches, as perpendicular to flow as feasible, and to provide passage of fish and other aquatic life.	
	d. Install stream crossings to sustain bankfull dimensions of width, depth, and slope and keep stream beds and banks resilient. Favor hardened fords and bridges on streams with flood plains, and bottomless arches instead of pipe culverts.	

Applicable Standards	Design Criteria	Project-Specific Required Mitigation
12.3 Standard (5) - Conduct actions so that stream pattern, geometry, and habitats are maintained or improved toward robust stream health.	**a.** Add or remove rocks, wood, or other material in streams or lakes only if such action maintains or improves stream and lake health. Leave rocks and portions of wood that are embedded in beds or banks to prevent channel scour.	
	b. Install fish migration barriers only if needed to protect endangered, threatened, sensitive or unique native aquatic populations, and only where natural barriers do not exist.	
	c. Do not relocate natural stream channels if avoidable. Return flow to natural channels where feasible. Construct channels and floodways with natural stream pattern and geometry and stable beds and banks.	
12.4 Standard (6) - Maintain long-term ground cover, soil structure, water budgets, and flow patterns of wetlands to sustain their ecological function, per 404 regulation..	**a.** Keep ground vehicles out of wetlands unless protected by at least 1 foot of packed snow or 2 inches of frozen soil. Do not disrupt water supply or drainage patterns into wetlands.	
	b. When feasible, keep roads and trails out of wetlands. If roads or trails must enter wetlands, use bridges or raised prisms with diffuse drainage to sustain flow patterns. Set crossing bottoms at natural levels of channel beds and wet meadow surfaces. Avoid actions that may dewater or reduce water budgets in wetlands.	
	c. Avoid long-term reduction in organic ground cover and organic soil layers in any wetland (including peat in fens).	

Applicable Standards	Design Criteria	Project-Specific Required Mitigation
	d. When feasible, keep buried utility and pipe lines out of wetlands. If such a line must enter a wetland, use measures that sustain long-term wetland function.	
	e. Avoid any loss of rare wetlands such as fens and springs.	
	f. Do not build firelines in or around wetlands unless needed to protect life, property, or wetlands. Use hand lines with minimum feasible soil disturbance. Use wetland features as firelines if feasible.	
12.5 Standard (7) - Maintain enough water in perennial streams to sustain existing stream health. Return some water to dewatered perennial streams when needed and feasible.	**a.** For existing dams and diversion on naturally perennial streams, obtain bypass flows at the point of diversion or storage that support a healthy, self-sustaining community of aquatic life having all regionally-expected species and population dynamics at permit reissuance. Bypass flows must exceed the native median flow of the lowest winter month for the fall-winter seasons, and the native median flow of the lowest summer month for the spring-summer seasons.	
	b. For NEW dams and diversions, obtain bypass flows at the point of diversion or storage that protect stream processes, aquatic and riparian habitats and communities, and recreation and aesthetic values. Include base flows and a range of high flows that bracket bankfull discharge, as needed to support these uses.	
	c. Obtain instream flow water rights under federal and state law to protect stream processes, aquatic and riparian habitats and communities, and recreation and	

Applicable Standards	Design Criteria	Project-Specific Required Mitigation
	aesthetic values. Top priority is to protect imperiled native species.	
12.6 Standard (8) - Manage water-use facilities to prevent gully erosion of slopes and to prevent sediment and bank damage to streams.	**a.** Design all ditches, canals, and pipes with at least an 80% chance of passing high flows and remaining stable during their life.	
	b. Do not flush or deposit sediment from behind diversion structures into the stream below. Deposit sediment in a designated upland site.	
	c. Mitigate water imports so that the extent of stable banks in each receiving stream reach is at least 80% of reference conditions.	
13.1 Standard (9) - Limit roads and other disturbed sites to the minimum feasible number, width, and total length consistent with the purpose of specific operations, local topography, and climate.	**a.** Construct roads on ridge tops, stable upper slopes, or wide valley terraces if feasible. Stabilize soils onsite. End-haul soil if full-bench construction is used. Avoid slopes steeper than 70%.	
	b. Avoid soil-disturbing actions during periods of heavy rain or wet soils. Apply travel restrictions to protect soil and water.	
	c. Install cross drains to disperse runoff into filter strips and minimize connected disturbed areas. Make cuts, fills, and road surfaces strongly resistant to erosion between each stream crossing and at least the nearest cross drain. Revegetate using certified local native plants as feasible; avoid persistent or invasive exotic plants.	

Applicable Standards	Design Criteria	Project-Specific Required Mitigation
	d. Where feasible, construct roads with rolling grades instead of ditches and culverts.	
	e. Retain stabilizing vegetation on unstable soils. Avoid new roads or heavy equipment use on unstable or highly-erodible soils.	
	f. Use existing roads unless other options will produce less long-term sediment. Reconstruct for long-term soil and drainage stability.	
	g. Avoid ground skidding with blades lowered or on highly erodible slopes steeper than 40%. Conduct logging to disperse runoff as feasible.	
	h. Designate, construct, and maintain recreational travelways for proper drainage and harden their stream crossings as needed to control sediment.	
13.2 Standard (10) – Construct roads and other disturbed sites to minimize sediment discharge into streams, lakes and wetlands.	**a.** Design all roads, trails, and other soil disturbances to the minimum standard for their use and to "roll" with the terrain as feasible.	
	b. Use filter strips, and sediment traps if needed, to keep all sand sized sediment on the land and disconnect disturbed soil from streams, lakes and wetlands. Disperse runoff into filter strips.	
	c. Key sediment traps into the ground. Clean them out when 80% full. Remove sediment to a stable gentle upland site and revegetate.	

Applicable Standards	Design Criteria	Project-Specific Required Mitigation
	d. Keep heavy equipment out of filter strips except to do restoration work or build hardened stream or lake approaches. Yard logs up out of each filter strip with minimum disturbance of ground cover.	
	e. Build firelines outside filter strips unless tied into a stream, lake, or wetland as a firebreak with minimal disturbed soil. Retain organic ground cover in filter strips during prescribed fires.	
	f. Design road ditches and cross drains to limit flow to ditch capacity and prevent ditch erosion and failure.	
13.3 Standard (11) – Stabilize and maintain roads and other disturbed sites during and after construction to control erosion.	**a.** Do not encroach fills or introduce soil into streams, swales, lakes, or wetlands.	
	b. Properly compact fills and keep woody debris out of them. Revegetate cuts and fills upon final shaping to restore ground cover, using certified local native plants as feasible; avoid perisitent or invasive exotic plants. Provide sediment control until erosion control is permanent.	
	c. Do not disturb ditches during maintenance unless needed to restore drainage capacity or repair damage. Do not undercut the cut slope.	
	d. Space cross drains, from no more than 120 feet in highly erodible soils on steep grades, to no more than 1,000 feet in resistant soils on flat grades. Do not divert water from one stream to another.	

Applicable Standards	Design Criteria	Project-Specific Required Mitigation
	e. Empty cross drains onto stable slopes that disperse runoff into filter strips. On soils that may gully, armor outlets to disperse runoff. Tighten cross-drain spacing so gullies are not created.	
	f. Harden rolling dips as needed to prevent rutting damage. Ensure that road maintenance provides stable surfaces and drainage.	
	g. Where berms must be used, construct and maintain them to protect the road surface, drainage features, and slope integrity while alos providing user safety.	
	h. Build firelines with rolling grades and minimum downfill convergence. Outslope or backblade, permanently drain, and revegetate firelines imediately after the burn. Use certified local native plants as feasible; avoid persistent or invasive exotic plants.	
13.4 Standard (12) – Reclaim roads and other disturbed sites when use ends, as needed to prevent resource damage.	**a.** Site-prepare, drain, revegetate, and close temporary and intermittent use roads and other disturbed sites within one year after use ends. Provide natural drainage that disperses runoff into filter strips and maintains stable fills. Do this work concurrently. Use native vegetation as feasible.	Ways would be obliterated within sight distance of main roadways, remainder would be ripped and seeded. All existing "ways" used for timber sale access will be fully recontoured to approximate natural topography; natural stream courses will be reestablished; sites will be returned to productivity. Drainage structures would be removed on all ways, including from portions of ways beyond the timber sale access, which would no longer be accessible due to closures/obliteration activities through this sale.

Applicable Standards	Design Criteria	Project-Specific Required Mitigation
	b. Remove all temporary stream crossings (including all fill material in the active channel), restore the channel geometry, and revegetate the channel banks using native revegetation as feasible.	
14.1 Standard (13) - Manage land treatments to limit the sum of severely burned and detrimentally compacted, eroded, and displaced land to no more than 15% of any land unit (FSH 2509.18)	**a.** Restrict roads, landings, skid trails, concentrated-use sites, and similar soil disturbances to designated sites.	
	b. Operate heavy equipment for land treatments only when soil moisture is below the plastic limit, or protected by at least one foot of packed snow or 2 inches of frozen soil.	
	c. Conduct prescribed fires when soil, humus, and large fuels are moist.	
14.2 Standard (14) - Maintain or improve long-term levels of organic matter and nutrients on all lands.	**a.** On soils with topsoil thinner than 1 inch, topsoil organic matter less than 2%, or effective rooting depth less than 15 inches, retain 90% or more of the fine (less than 3 inches in diameter) logging slash in the stand after each clearcut and seed-tree harvest, and retain 50% or more of such slash in the stand after each shelterwood and group-selection harvest, considering existing and projected levels of fine slash.	
	b. If machine piling of slash is done, conduct piling to leave topsoil in place and to avoid displacing soil into piles or windrows.	

Applicable Standards	Design Criteria	Project-Specific Required Mitigation
15.1 Standard (15) - Place new sources of chemical and pathogenic pollutants where such pollutants will not reach surface or ground water.	**a.** Put pack and riding stock sites, sanitary sites, and well drill-pads outside the water influence zone (WIZ).	
	b. Put vehicle service and fuel areas, chemical storage and use areas, and waste dumps and areas on gentle upland sites. Do mixing, loading, and cleaning on gentle upland sites. Dispose of chemicals and containers in State-certified disposal areas.	
15.2 Standard (16) - Apply runoff controls to disconnect new pollutant sources from surface and ground water.	**a.** Install contour berms and trenches around vehicle service and refueling areas, chemical storage and use areas, and waste dumps to fully contain spills. Use liners as needed to prevent seepage into ground water.	
	b. Reclaim each mine waste dump when its use ends, using certified local native plants as feasible; avoid persistent or invasive exotic plants. Stabilize waste dumps and tailings in non-use periods to prevent wind and water erosion. If non-use will exceed one year, perform concurrent reclamation.	
	c. Use lined ponds below waste dumps and tailings to contain all inflow. Build tailings dams with a 95% chance of containing floods over their design life. Permanently stabilize dams at final shaping.	
	d. Clean waste water from concrete batching and aggregate operations before returning the water to streams, lakes, or wetlands.	

Applicable Standards	Design Criteria	Project-Specific Required Mitigation
	e. Inspect chemical equipment daily for leaks. If leaks or spills occur, report them and install emergency traps to contain them and clean them up.	
15.3 Standard (17) - Apply chemicals using methods which minimize risk of entry to surface and ground water.	**a.** Favor pesticides with half-lives fo 3 months or less. Apply at lowest effective rates as large droplets or pellets. Follow the label. Favor selective treatment. Use only aquatic-labeled chemicals in the WIZ.	
	b. Use nontoxic, nonhazardous drilling fluids when feasible.	

APPENDIX B
BIOLOGICAL EVALUATION

INTRODUCTION

The Forest Service is analyzing proposed forest restoration actions in the Upper South Platte watershed on the Pike National Forest. These actions would include timber harvesting, prescribed burning, revegetation in the Buffalo Creek burn area, obliteration and reclamation of unnecessary roads, and trail improvements.

This document contains an evaluation of potential effects of the Forest Service alternatives on sensitive species identified in the Upper South Platte Watershed Landscape Assessment (Foster Wheeler ,1999). The list includes 22 plants, 8 mammals, 3 amphibians, and 12 birds which are known from, or which could occur within the Upper South Platte Project Area. The principal objective of this Biological Evaluation (BE) is to ensure that a proposed action does not contribute to loss of viability of any native or desired non-native plant or animal species. Forest Sensitive Species have no protection under the Endangered Species Act, but are evaluated for impacts from projects occurring with National Forests in the spirit of the Act. Consideration of these sensitive plants and wildlife helps to protect from future listing.

PROJECT AREA

For the purposes of the BA, the project area was defined as the Project Area defined in the Environmental Assessment (EA). The Upper South Platte Project Area is located within the foothills of the Colorado Front Range of the Rocky Mountains. It is a large, important watershed that is a critical water supply for the city of Denver, providing 70 percent of the city's water. Due to its proximity to the city, it contains a large urban–wildlands interface and provides easy access to fishing, hiking, and other outdoor pursuits. A portion of the South Platte River is a gold medal trout fishery.

The Project Area is approximately 140,000 acres in total extent (public and private lands) and encompasses three sub-watersheds of the Upper South Platte River watershed including Horse Creek, Waterton/Deckers, and Buffalo Creek sub-watersheds. These watersheds are located in Jefferson and Douglas Counties, west of Denver. This area was selected based on recommendations from the Landscape Assessment of the Upper South Platte Watershed (Foster Wheeler, 1999).

Approximately 120,000 acres of the Project Area is on National Forest land. The remaining areas within these sub-watersheds are predominately privately owned lands. However, there are also state and county lands within the assessment area.

Elevations within the Assessment Area range from approximately 6,000 feet along the South Platte River to almost 9,000 feet at some of the higher peaks. The terrain is extremely varied and includes deep, narrow canyons; flat river-valley bottoms; broad meadows; rugged mountain foothills; steep slopes;

rounded granite peaks; and scattered, rugged granite outcroppings. Portions of the Waterton/Deckers and Buffalo Creek watersheds are within the Lost Creek Wilderness Area.

A portion of the Project Area was burned in the 1996 Buffalo Creek fire. This large, hot fire resulted in loss of forest cover on 12,000 acres and burned several homes. Summer storms in the area of the burn caused catastrophic erosion and sediment deposition into the watershed's streams. Flooding events following the fire destroyed much of the stream channels and riparian zones along Buffalo and Spring Creeks. Even after four years, much of the burn area remains unvegetated (see Proposed Actions and Purpose and Need in the Environmental Assessment for further discussion of this fire).

METHODS

This BE was conducted in accordance with procedures described in Forest Service Manual 2672.4 and Region 2 Supplement Number 2600-94-2. Federal, state, and Colorado Natural Heritage Program Database listings of special-status species and their habitats were reviewed to identify those species potentially occurring within the Project Area. Based on these lists, plants and wildlife species were carefully identified to eliminate or confirm the occurrence of special-status species within the Project Area.

The Environmental Assessment discusses activities that includes creating a more heterogeneous forest landscape, planting 1,000 acres of trees in the Buffalo Creek Burn area, revegetating 25 miles of roads, improving river trail systems to reduce soil erosion in and around riparian areas, and creating 60 acres of riparian areas in the upland areas of the Buffalo Creek Burn area. In general, the effects of these actions will improve habitat and diversity of wildlife in the project area. The planting of 1,000 acres of trees and rehabilitating 60 acres of riparian areas in the Buffalo Creek Burn area are beneficial in the long-term because additional habitat is being created. The reclamation of 25 miles of roads will offer a more continuous, less disjointed habitat. The improvement of the river trail systems to reduce soil erosion in and around riparian areas offers the similar benefits. Another beneficial effect would be that the project would yield a greater surface water flow and might increase the upwards extension of the riparian zones, which would increase the size of riparian habitat.

The impacts associated with the thinning and logging of the vegetation treatment areas is the focal point of the discussion below because some temporary adverse effect might take place. Although the creation of a heterogeneous forest will positively affect the majority of wildlife species in the project area, some temporary adverse effects may occur. These include: disturbance of foraging habitat during logging and burning, disruption of nesting habits, etc. These are only temporary adverse effects, but the long-term effects are anticipated to be beneficial. In addition, the treatment areas only encompass a small portion of habitat available to the wildlife. This means that suitable habitat is available for the wildlife outside of the treatment areas.

FOREST SERVICE SENSITIVE ANIMAL SPECIES

Information on species occurrence was gathered from the statewide database through contact with the CNHP and Forest Service personnel. Contacts were made with species experts and resource specialists

from the USGS Biological Service, Forest Service personnel, and USFWS personnel to gather file information on wildlife resources in the project study area, including mapped and database information.

FOREST SERVICE SENSITIVE PLANT SPECIES

Information on occurrences of known sensitive and rare plants in the project study area was obtained initially from the CNHP and through consultation with Forest Service personnel. Additional information on species' habitat requirements, blooming periods, and field identifying characteristics was obtained from state flora guides (Weber 1990; Spackman et al. 1997). Federal and state resource specialists, including the Forest Service and USFWS were also contacted to obtain information on sensitive plants.

SENSITIVE SPECIES KNOWN FROM OR POTENTIALLY OCCURRING WITHIN THE PROJECT AREA

This section describes the presence or absence and any potential impacts to Forest Service Sensitive plants and animals of priority for the Forest.

MAMMALS

North American Wolverine (Gulo gulo luscus)

Status: Colorado endangered species and Region 2 Forest Sensitive Species

The population status and distribution of the North American wolverine in Colorado is uncertain at this time. In 1978, the Colorado Division of Wildlife conducted surveys for the wolverine without finding any definitive population in the state (Fitzgerald et al., 1994). The wolverine may occur in the following Colorado counties: Chaffee, Clear Creek, Custer, Huerfano, Jefferson, Lake, and Park. The wolverine is a scavenging predator and depends on a diverse ungulate population with a high turnover rate. They can be found in mature and intermediate timbered areas around natural openings, including cliffs, slides, basins, and meadows. Their habitat use varies seasonally; in summer, they favor cooler subalpine and alpine areas (Forest Service, 1994). CNHP information on actual occurrences indicates that the wolverine has not been documented in the Project Area. Potential habitat for the wolverine does occur in pockets throughout the Project Area, but it is unlikely that wolverines occur within the project area because no positive records have been recorded in the state since during the early 1900s (Cary 1911).

No populations of this mammal are known to occur in the project area. Therefore, no adverse effects to the North American wolverine would result from the proposed action or the alternatives.

Ringtail (Bassariscus astutus)

Status: Region 2 Forest Sensitive Species

The ringtail inhabits arid and semiarid habitats throughout the southwest, including most of southern and western Colorado. In Colorado its preferred habitat includes areas in rimrock canyons with cliffs that have perennial streams and abundant trees and shrubs and foothills areas of pinyon-pine-juniper woodlands, montane shrublands, or mixed conifer oakbrush (Fitzgerald et al., 1994). The ringtail dens in rock crevices and tree cavities (Forest Service, 1994). Based on these habitat requirements, the ringtail is not expected to occur in any of the Treatment Areas. Therefore, no adverse effects to the ringtail would result from the proposed action or the alternatives.

Wet Mountains Yellow-bellied Marmot (Marmota flaviventris notioros)

Status: Region 2 Forest Sensitive Species

The Wet Mountains yellow-bellied marmot is found in rocky areas with boulders and talus slopes where it feeds primarily on grasses and forbs (Forest Service, 1994). This marmot is endemic to an area in Huerfano County and is not anticipated to occur in the Project Area and will not be evaluated further.

American Marten (Martes americanus)

Status: Region 2 Forest Sensitive Species and Forest Management Indicator species for Pike and San Isabel National Forests

The American marten is mostly a boreal mammal, ranging across Alaska and Canada to Newfoundland and southward at increasingly high elevation along mountain ranges to California and New Mexico. Their range of habitats in Colorado is fairly broad, including tundra rockpiles and talus slopes as well as montane woodland (Armstrong, 1987). In Colorado, American martens occur at elevations of 8,000 to 13,000 ft. They are associated with spruce-fir and lodgepole vegetation types with mature to old growth structural stages. They prefer moderate to high canopy cover (Forest Service, 1994).

No populations of this mammal are known to occur within the project area. However, suitable habitat for the animal does occur within the project area and if American marten were to eventually occupy the project area, the action alternatives may effect their habitat by reducing canopy cover. Based upon the magnitude of this short-term disturbance and the availability of similar potential habitat in adjacent subalpine and alpine areas, the action alternatives may effect individuals but are not likely to cause a trend toward federal listing or loss of viability of the marten within the project watersheds.

Dwarf Shrew (Sorex nanus)

Status: Region 2 Forest Sensitive Species

The dwarf shrew occurs in most of the mountains in Colorado. It is associated with alpine and subalpine rockslides to spruce fir bogs; coniferous forests; sedge marshes; dry brushy hillsides; and open woodland (Fitzgerald et al., 1994). The elevation range is from 5,500 to 10,000 ft (Armstrong, 1987). In Colorado, this species generally occurs at higher elevations near timberline. Based on these habitat requirements, the dwarf shrew is not expected to occur in any of the Treatment Areas and will not be evaluated further.

Fringed-tailed Myotis (Myotis thysanodes pahasapensis)

Status: Region 2 Forest Sensitive Species

The fringed-tailed myotis may occur in Baca, El Paso, Huerfano, Las Animas, Otero, and Pueblo Counties. It inhabits mid-elevation grasslands, deserts, and oak and pinyon woodlands. In Colorado, this bat reportedly winters in pinyon juniper and ponderosa pine habitats. It typically forages over watercourses (Forest Service, 1994).

Although potential habitat for the fringe-tailed myotis occurs in Waterton/Deckers and Buffalo Creek watersheds, CNHP information on actual occurrence has documented that this bat does not occur in any of the watersheds included in the Project Area. Therefore, this species will not be further evaluated.

Spotted Bat (Euderma maculatum)

Status: Region 2 Forest Sensitive Species

The spotted bat is known to occur on the western slope in Moffat and Montezuma Counties near Mesa Verde. Although no known records exist, there is some potential for the spotted bat to occur in the Pike and San Isabel National Forests. The nearest record is in northern New Mexico in Rio Arriba County (Forest Service, 1994). It has been found in ponderosa pine of montane forests, pinyon-juniper woodlands, and open semi-desert shrublands. Rockcliffs are necessary to provide suitable cracks and crevices for roosting, as is access to water. The animals show apparent seasonal changes in habitat, occupying ponderosa pine woodlands in the reproductive season and lower elevations at other times of the year (Fitzgerald et al., 1994).

Potential habitat for the spotted bat does occur in pockets throughout the Project Area. Potential temporary effects of the action alternatives include disturbance of foraging habitat during logging and burning. Although, these activities may temporarily effect individuals but are not likely to cause a trend toward federal listing or loss of viability of this species of bat in the project area.

Townsend's Big-eared Bat (Plecotus townsendii)

Status: Region 2 Forest Sensitive Species

Townsend's big-eared bat is a western species occupying semidesert shrublands, pinyon-juniper woodlands, and open montane forests. It is frequently associated with caves and abandoned mines for day roosts and hibernacula, or where the bat hibernates, but will also use abandoned buildings and crevices on rock cliffs for refuges. The bats are relatively sedentary. They do not move long distances from hibernacula to summer roosts nor do they move or forage far from their day roosts (Fitzgerald et al., 1994).

One subspecies, *Plecotus townsendii pallescens* occurs over most of the western two-thirds of Colorado and extreme southeastern Colorado to elevations of about 9,500 feet (Fitzgerald et al., 1994). Potential habitat for this bat occurs throughout the Project Area, including all of the Treatment Areas. Potential impacts of the action alternatives include disturbance of foraging habitat during logging and burning. These activities may temporarily effect individuals but are not likely to cause a trend toward federal listing or loss of viability of this species of bat in the project area.

BIRDS

Osprey (Pandion haliaetus)

Status: Region 2 Forest Service Sensitive Species

Ospreys are a rare to uncommon spring and fall migrant in western valleys, mountains, and mountain parks, and on the eastern plains. It is also a rare to uncommon summer resident in the mountains and in mountain parks. The osprey is generally associated with lakes, rivers, and reservoirs (Andrews et al., 1992). They occur along river corridors during migration. Ospreys nest in a wide variety of places, requiring both a large body of water with fish large enough to catch, and suitable nest sites. They may nest in tall dead trees and dead broken-off treetops and on power poles and goose nest platforms (CBBA, 1998).

There are now records of confirmed breeding or probable breeding from at least 15 sites in the mountains nearly statewide, but concentrated in the northern half of the state. The largest concentration is at the reservoirs of eastern Grand County. The increase in breeding in Colorado may be due to the proliferation of mountain reservoirs in conjunction with this species' continuing population recovery (Andrews et al., 1992).

Based on potential habitat maps, the osprey may forage within the Project Area. Potential impacts of the action alternatives include temporary disturbance of foraging habitat during logging and burning, but riparian corridors, where the osprey would concentrate its activities, would be protected with a buffer zone, ranging from 100 feet to 280 feet, based on the slope of the bank. The treatment activities may temporarily effect individuals but are not likely to cause a trend toward federal listing or loss of viability of the osprey in the project area.

Northern Goshawk (Accipiter gentilis)

Status: Region 2 Forest Service Sensitive Species

The northern goshawk is a rare to uncommon resident in foothills and mountains. Some individuals wander to above timberline, especially in the fall. It is a rare spring and fall migrant and winter resident in western valleys, mountain parks, and on eastern plains. It occurs in forest, primarily in mature stands of aspen, ponderosa pine, and lodgepole pine. Migrants and winter residents are seen in all types of coniferous forests and in riparian forests and are occasionally seen in shrublands (Andrews et al., 1992).

Potential habitat for the northern goshawk occurs in the western and southeastern portion of the Project Area. Under the action alternatives, treatment activities in the project area could result in goshawk avoidance of foraging areas and decreased nesting success due to stress from short-term habitat loss and noise and activity of human activities. Mitigation measures for raptors, as discussed in the Environmental Consequences section of the Environmental Assessment are to be applied before treatment activities are to take place. With this mitigation, the action alternatives would have no impact on goshawks in the project area. The goshawk will show the beneficial effect of an increase in large diameter trees due to the treatment actions.

Black Tern (Chlidonias niger)

Status: Region 2 Forest Service Sensitive Species

The black tern is a common to abundant spring migrant and uncommon to fairly common fall migrant on the eastern plains. It is a rare to uncommon summer resident in mountain parks and on the eastern plains. It is associated with aquatic habitats that have emergent vegetation, such as cattail marshes, with adjacent large open water (Andrews et al., 1992). It resides in Otero, Pueblo, and Park counties and the southeast portion of Fremont County in the summer where it usually nests in small colonies on floating vegetation (Forest Service, 1994). There have been widespread declines in populations of this species probably due to loss of habitat but potentially also due to pesticide use (McDonald, 1991, as cited in Andrews et al., 1992). Riparian habitat will be avoided during vegetation treatments due to a buffer for activities occurring near drainages within the Forest, ranging from 100 feet to 280 feet, based on the slope of the bank. Thus, no adverse effects to the black tern would be expected under implementation of the action alternatives.

Flammulated Owl (Otus flammeolus)

Status: Region 2 Forest Service Sensitive Species

The flammulated owl is associated with mature to old growth ponderosa pine and ponderosa-Douglas-fir forests along the Rocky Mountains, often mixed with mature aspen. In some areas, these birds are seen in pure aspen or old-growth pinyon-juniper woodlands (Andrews et al., 1992). They are secondary cavity nesters and depend on woodpeckers for their nesting holes (Forest Service, 1994).

Potential habitat for the flammulated owl occurs throughout the Project Area, including all of the Treatment Areas. Under the action alternatives, treatment activities in the project area could result in owl avoidance of foraging areas and decreased nesting success due to stress from habitat loss and noise and activity of human activities. Mitigation measures for raptors, as discussed in the Environmental Consequences section of the Environmental Assessment are to be applied before treatment activities are to take place. Beneficial effects to the flammulated owl from treatment activities are: an increase of open areas for hunting, an increase of large, exposed branches, an increase in large diameter aspen trees, and better foraging due to increase of insects from the increase of grassy areas.

Black Swift (Cypseloides niger)

Status: Region 2 Forest Service Sensitive Species

The black swift has localized distribution in the mountains in the summer with records in El Paso County. It nests on precipitous cliffs near or behind high waterfalls. Beyond that requirement, they inhabit a variety of landscapes, from seacoasts to the Rocky Mountains. Black swifts spend most of their time in the air, ranging far from nesting areas. They forage over most montane and lowland habitats (CBBA, 1998). Habitats where they may occur include aspen groves, spruce fir, spruce fir clearcuts, Douglas-fir, lodgepole pine, lodgepole pine clearcuts, ponderosa pine, open water, forest dominated by wetland and riparian areas, shrub dominated wetland and riparian areas, exposed rock, mining operations, and meadow tundra (NDIS, 1999).

Potential habitat for the black swift occurs in the northwestern and southeastern portions of the Project Area, including many of the Treatment Areas. The black swift may potentially occur in the Spring Creek area in association with the waterfalls present there. Temporary effects due to treatment activities in the project area could result in swift avoidance of foraging areas and displacement due to loss of foraging

habitat. Black swift forage over large areas (Andrews and Righter 1992); hence, removal and disturbance of potential foraging habitat is not likely to impact black swifts that nest in the area. Alternatives B and C may temporarily effect individuals but are not likely to contribute to a trend toward federal listing or loss of viability of black swifts within the project area.

Three-toed Woodpecker (Picoides tridactylus)

Status: Region 2 Forest Service Sensitive Species and a Forest Management Indicator Species

The three-toed woodpecker primarily occurs in spruce-fir forests. At all seasons and elevations, this species is most common in years and areas where trees have high insect populations due to disease or fire. Where insect populations are high it may also occur in ponderosa pine, Douglas-fir and lodgepole pine forest (Andrews et al., 1992).

Potential habitat for the three-toed woodpecker occurs in the Project Area, especially in the western portion of the Area. The action alternatives will impact suitable woodpecker habitat in the short-term but improve habitat by improving forest health in the long-term. Suitable habitat to be temporarily affected may result in avoidance of foraging areas and displacement due to loss of nesting habitat. Woodpecker habitat is widespread throughout the forest and removal and disturbance of some habitat is not likely to impact the woodpeckers that occur within the forest. The action alternatives may temporarily impact individuals but are not likely to contribute to a trend toward federal listing or loss of viability of three-toed woodpecker within the project area.

Lewis' Woodpecker (Melanerpes lewis)

Status: Region 2 Forest Service Sensitive Species

Lewis' woodpecker is a year-round resident of the foothills of southern Colorado and occurs in lowland and foothill riparian areas, agricultural areas and urban areas with tall deciduous trees. It sometimes avoids riparian forests because of competition with the red-headed woodpecker. It is known to occur in the Wet Mountains and Custer and Pueblo Counties (Forest Service, 1994). Based on these habitat requirements and its known distribution, Lewis' woodpecker is not expected to occur in any of the Treatment Areas. Therefore, the Lewis' woodpecker will not be further evaluated.

Olive-sided Flycatcher (Contopus borealis)

Status: Region 2 Forest Service Sensitive Species

The olive-sided flycatcher is primarily a mountain summer resident at elevations of 10,000 and 11,500 ft (Forest Service, 1994). It breeds primarily in mature spruce-fir and Douglas-fir forests, especially on steep slopes or near cliffs, and less often in other types of coniferous forests, mountain and foothill riparian communities, and aspen forests. During migration, it occurs in all types of wooded habitats (Andrews et al., 1992). Although not expected to occur within the project area, suitable habitat for the flycatcher does occur within the proposed treatment areas.

Potential habitat for the flycatcher occurs in the project area, including many of the Treatment Areas. Under the action alternatives, treatment activities in the project area could result in flycatcher avoidance of foraging areas and displacement due to loss of foraging habitat. Based on the availability of potentially suitable habitat in the area and since the birds generally prefer higher elevations than those within the project area, Alternatives B and C may effect individuals but are not likely to contribute to a trend toward federal listing or loss of viability of olive-sided flycatchers within the project area. Mitigation measures

for olive-sided flycatchers, as discussed in the Environmental Consequences section of the Environmental Assessment are to be applied during treatment activities.

Purple Martin (Progne subis)

Status: Region 2 Forest Service Sensitive Species

The purple martin is a summer resident of the mountains of western Colorado, but is occasionally found on the east slope and plains. It breeds in loose colonies of old growth aspen forests near parks and generally near water. It may also occur in mixed aspen/ponderosa pine or aspen/Douglas-fir forest. In some areas it nests in dead trees near or standing in reservoirs. During migration, it occurs over riparian areas, open agricultural areas, and reservoirs (Andrews et al., 1992).

Potential habitat for the purple martin exists throughout the Project Area, especially along riparian corridors. The purple martin may nest and forage within the Project Area and implementation of the action alternatives would impact them by disturbance of foraging habitat during logging and burning. Since the birds prefer to nest and forage near water, impacts to this species would be limited because riparian corridors, where the martins would concentrate their activities, would be protected with a buffer zones. The treatment activities may effect individuals but are not likely to cause a trend toward federal listing or loss of viability of the purple martin in the project area.

Pygmy Nuthatch (Sitta pygmaea)

Status: Region 2 Forest Service Sensitive Species

The pygmy nuthatch is a fairly common to common resident in the foothills and lower mountains from Mesa, Grand, and Larimer counties southward. It is rare to uncommon in the periphery of the San Luis Valley and is apparently absent from northwestern Colorado. It is primarily found in ponderosa pine and aspen forest. In Grand and Summit Counties, it is commonly found in lodgepole pine forests, but seems to be rare in that habitat elsewhere. It is found rarely in Douglas-fir and pinyon-juniper woodlands, and even more rarely in spruce-fir forests and lowland riparian forests (Andrews et al., 1992). Human population expansion and cutting of firewood in ponderosa pine forests have caused a loss of trees with suitable nest sites, resulting in population declines. For this reason, this species is an excellent indicator species for the ponderosa pine forest (Webb, 1985 as cited in Andrews et al., 1992).

Potential habitat for the pygmy nuthatch occurs throughout the Project Area. Direct loss of habitat in the short-term due to logging would occur under the proposed action alternatives. However, the treatments will improve forest health in the long-term and benefit the nuthatch. Based on this and the availability of potentially suitable habitat in the surrounding area, Alternatives B and C may effect individuals but are not likely to cause a trend toward federal listing or loss of viability of the pygmy nuthatch in the project area.

Golden-crowned Kinglet (Regulus satrapa)

Status: Region 2 Forest Service Sensitive Species

The golden-crowned kinglet is a summer resident of high mountains but moves to lower elevations in the winter. It breeds primarily in mature, dense spruce-fir forests, and occasionally in limber pine and Douglas-fir forests. In winter, it occurs in coniferous forests, especially Douglas-fir or ponderosa pine, but also in other types such as pinyon pine-juniper woodlands, foothill and lowland riparian forests, and in planted conifers in parks, cemeteries, and residential areas in the lowlands. During migration, it mostly

occurs in wooded habitats. The golden-crowned kinglet appears to be more common west of the Continental Divide than the east (Andrews et al., 1992).

Potential habitat for the golden-crowned kinglet occurs in the majority of the Treatment Areas. Direct loss of habitat in the short-term due to logging would occur under the proposed action alternatives. However, the habitat treatments will improve forest health in the long-term and benefit the kinglet. Based on this and the availability of potentially suitable habitat in the surrounding area, Alternatives B and C may effect individuals but are not likely to cause a trend toward federal listing or loss of viability of the golden-crowned kinglet in the project area.

Fox Sparrow (Passerella iliaca)

Status: Region 2 Forest Sensitive Species

The fox sparrow is a summer resident in the Colorado mountains where it uses riparian willow shrublands and wet willow green meadows. The fox sparrow also uses forest undergrowth, woodland thickets, and montane brushland. It is less common east, rather than west, of the Continental Divide (Forest Service, 1994).

Based on habitat requirements, suitable habitat for the fox sparrow potentially occurs within the Project Area., especially along riparian corridors. The sparrow may nest and forage within the Project Area and implementation of the action alternatives would temporarily effect them by disturbance of foraging habitat during logging and burning. Since the birds prefer to nest and forage near water, impacts to this species would be limited because riparian corridors, where the fox sparrow would concentrate its activities, would be protected with a buffer zone, ranging from 100 feet to 280 feet, based on the slope of the bank. The treatment activities may impact individuals but are not likely to cause a trend toward federal listing or loss of viability of the purple martin in the project area.

AMPHIBIANS

Northern Leopard Frog (*Rana pipiens*)

Status: Region 2 Forest Service Sensitive Species

The northern leopard frog occurs throughout Colorado except in the Republican River drainage and southeastern Colorado, south of the Arkansas River. It can range up to 11,000 ft in elevation, and inhabits the banks and shallow portions of marshes, ponds, lakes, reservoirs, beaver ponds, streams, and other bodies of permanent water. The frog appears to be especially associated with rooted aquatic vegetation (Forest Service, 1994).

Based on habitat requirements, the northern leopard frog can potentially occur within the Project Area. However, no direct impacts to its habitat would be expected under the action alternatives since riparian areas will be protected with a buffer. Indirect impacts to the species may occur with an increase in erosion and increased sediment load to drainages. Mitigation to address impacts due to erosion may compensate for indirect impacts to potential breeding habitat. Reseeding after treatment and use of silt fencing when treating near drainages would eliminate indirect impacts to the frog.

Tiger Salamander (Ambystoma tigrinum)

Status: Region 2 Forest Service Sensitive Species

The tiger salamander occurs throughout Colorado at elevations up to 12,000 ft. It occurs in virtually any habitat where there is a body of non-flowing water nearby for breeding. Tiger salamanders inhabit ponds, lakes and reservoirs, glacial kettle ponds, and beaver ponds. It is usually absent from water inhabited by predatory fishes, bullfrogs, turtles, and crayfish (Forest Service, 1994).

Based on habitat requirements, the tiger salamander can potentially occur within the Project Area. However, no direct impacts to its habitat would be expected under the action alternatives since riparian areas will be protected with a buffer. After a wet, breeding season, this salamander will sometimes move upland a long distance from the water. This could result in direct effect to adults from equipment and falling trees. Mitigation to address impacts due to erosion may compensate for indirect impacts to potential breeding habitat. Reseeding after treatment and use of silt fencing when treating near drainages would eliminate indirect impacts to the salamander.

PLANTS

Addersmouth (Malaxis brachyopoda)

Status: Region 2 Forest Sensitive Species

Addersmouth is found along streams in mosses where it is kept wet by spray from streams. Occurrences are given as Boulder, Jefferson, and El Paso counties. It can occur from 7,200 to 8,000 ft in elevation (Spackman et al., 1997). The El Paso County site may have been destroyed by development. One site is near Bailey in Pike National Forest (Forest Service, 1994).

Based on habitat requirements, the addersmouth may potentially occur within the Project Area. However, no impacts to this species or its habitat would be expected under the action alternatives since riparian areas will be protected with a buffer. Riparian areas that will be restored upland in the Buffalo Creek burn area will stabilize river banks, which will increase opportunities for establishment of the plant.

Altai Cottongrass (Eriophorum altaicum)

Status: Region 2 Forest Sensitive Species

Altai cottongrass, also known as white cottongrass, may be found growing in fens at altitudes of 9,500 to 14,000 ft in elevation. Its distribution in Colorado includes Eagle, Gunnison, Hinsdale, La Plata, Park, and San Juan Counties (Spackman et al., 1997). Based on its habitat requirements, altai cottongrass is not expected to occur in any of the Treatment Areas. Therefore, altai cottongrass will not be further evaluated.

Colorado False Needle Grass (Ptilagrostis mongholica *ssp.* porteri*)*

Status: Region 2 Forest Service Sensitive Species

Colorado false needle grass is endemic to central Colorado (El Paso, Lake, Park, and Summit Counties). It can be found in hummocks in fens and willow carrs at elevations from 9,200 to 12,000 ft (Spackman et al., 1997). Based on these habitat requirements, the Colorado false needle grass is not expected to occur in any of the Treatment Areas. Therefore, Colorado false needle grass will not be further evaluated.

Colorado Tansy-aster (Machaeranthera coloradoensis*)*

Status: Region 2 Forest Sensitive Species

The Colorado tansy-aster is endemic to south-central Wyoming and to Colorado (Gunnison, Hinsdale, La Plata, Lake, Mineral, Park, Pitkin, Saguache, and San Juan Counties). It is found in gravelly places in high mountain parks, slopes, and rock outcrops up to dry tundra from an elevation of 8,500 to 12,500 ft (Spackman et al., 1997). Known locations are in Horseshoe Cirque and the floor of South Park in Park County (Forest Service, 1994). Based on these habitat requirements, the Colorado tansy aster is not expected to occur in any of the Treatment Areas. Therefore, the Colorado tansy-aster will not be further evaluated.

Degener's Penstemon (Penstemon degeneri)

Status: Region 2 Forest Service Sensitive Species

Degener's penstemon is endemic to woodlands and mountain meadows of Custer and Fremont Counties. It is typically found in pinyon/juniper woodlands and montane grasslands on rocky soils with igneous bedrock. It typically occurs from 6,000 to 9,500 ft in elevation (Forest Service, 1994). Known occurrences of this species include the pinyon-juniper woodlands of the Arkansas River Canyon and a few other areas near Canon City. These sites are well outside of the Project Area and the plant's range does not enter the project area. The plant would not be expected to occur within the project area. Thus, Degener's penstemon will not be further evaluated.

Globe Gilia (Ipomopsis globularis)

Status: Region 2 Forest Sensitive Species

Globe gilia is endemic to central Colorado. Its known distribution is limited to the Mosquito Range and the Hoosier Range area that includes Lake, Park, and Summit Counties. It grows in gravelly, exposed calcareous, alpine ridges on Leadville limestone or Manitou dolomite at elevations from 12,000 to 14,000 ft (Spackman et al., 1997). Based on these habitat requirements the globe gilia is not expected to occur in any of the Treatment Areas. Therefore, the globe gilia will not be further evaluated.

Great-spurred Violet (Viola selkirkii)

Status: Region 2 Forest Service Sensitive Species

The great-spurred violet is known from two areas: Rocky Mountain National Park, where it was last seen in 1965, and at the east base of Devil's Head in Douglas County, where it was last seen in 1923 (Colorado Native Plant Society [CNPS], 1997). Potential habitat for this species includes cold mountain forests, moist woods, and thickets at elevations from 8,500 to 9,100 ft (Spackman et al., 1997). No suitable habitat for this species exists in the project area. The plant requires moist to wet conditions within alder stands. Some marginal habitat may occur for the species within the project area, but based on its very

strict habitat requirements, it would not be expected to occur within the project area. Thus, the great-spurred violet will not be further discussed.

Greenland Primrose (Primula egaliksensis)

Status: Region 2 Forest Service Sensitive Species

The Greenland primrose occurs in Colorado in Park County. This species occurs in wet meadows, streambanks, willow carrs, and rich fens in high mountain valleys from 9,000 to 9,800 ft in elevation (Spackman et al., 1997). Based on these habitat requirements the Greenland primrose is not expected to occur in any of the Treatment Areas. Therefore, the Greenland primrose will not be further evaluated.

Hall Fescue (Festuca hallii)

Status: Region 2 Forest Sensitive Species

Hall fescue is an alpine grass that may occur on the Pike National Forest in Kobresia stands. One historic record from the 1890s is from somewhere in or around the north end of the South Park (Forest Service, 1994). Based on these habitat requirements, Hall fescue is not expected to occur in any of the Treatment Areas. Therefore, hall fescue will not be further evaluated.

Livid Sedge (Carex livida *(Wahlenb.) Willd.)*

Status: Region 2 Forest Service Sensitive Species

Livid sedge is a wetland species occurring in rich fens from 9,000 to 10,000 ft in elevation. Its distribution includes High Creek Fen and East Lost Park, both located in Park County (CNPS, 1997). Based on these habitat requirements, the livid sedge is not expected to occur in any of the Treatment Areas. Therefore, livid sedge will not be further evaluated.

Molybdenum Milk-vetch (Astragalus molybdenus)

Status: Region 2 Forest Sensitive Species

Molybdenum milk vetch is endemic to Gunnison, Lake, Park, Pitkin, and Summit Counties. It is found on rocky slopes and turf hillsides above timberline at elevations between 11,400 to 13,200 ft (Spackman et al., 1997). Based on these habitat requirements, the molybdenum milk-vetch is not expected to occur in any of the Treatment Areas. Therefore, molybdenum milk-vetch will not be further evaluated.

Myrtle-leaf Willow (Salix myrtillifolia)

Status: Region 2 Forest Service Sensitive Species

Myrtle-leaf willow is a wetlands plant that has a disjunct distribution in Colorado (Park County). It can be found in calcareous fens at approximately 9,300 ft elevation (Forest Service, 1994). Based on these habitat requirements, the myrtle-leaf willow is not expected to occur in any of the Treatment Areas. Therefore, myrtle-leaf willow will not be further evaluated.

Narrow-leaved Moonwort (Botrychium lineare)

Status: Region 2 Forest Sensitive Species

The narrow-leaved moonwort is sparsely distributed throughout the mountainous portions of Colorado. Locally this species appears to occur only on Pikes Peak (Forest Service, 1994). Other locations have been recorded in New Brunswick, Quebec, Idaho, Montana, Oregon, and California. This species occurs on grassy slopes, among medium-height grasses, and along edges of streamside forests at elevations from 7,900 to 9,500 ft (Spackman et al., 1997). All known occurrences of this species and its historic range are well outside of the treatment areas, therefore narrow-leaved moonwort will not be further evaluated.

Northern Blackberry *(*Cylactis arcticus *ssp.* acaulis*)*

Status: Region 2 Forest Service Sensitive Species

The northern blackberry's distribution includes Clear Creek and Park Counties. It is found in willow bogs and mossy streamsides at elevations from 8,600 to 9,700 ft (Forest Service, 1994). Based on these habitat requirements and the use of buffers, the northern blackberry is not expected to occur in any of the Treatment Areas. Therefore, northern blackberry will not be further evaluated.

Pale Moonwort (Botrychium pallidum)

Status: Region 2 Forest Sensitive Species

Pale moonwort is found in mountain meadows of Teller County. It has also been reported in Boulder, Conejos, Gunnison, Larimer, Park, San Juan and Teller Counties. Its habitat consists of open exposed hillsides, burned or cleared areas and old mining sites from an elevation of 9,800 to 10,600 ft (Spackman et al., 1997). All reported sightings of the species are outside of the treatment areas and the project area elevational range. Therefore, the pale moonwort would not be expected to occur within the project area and will not be further evaluated.

Reflected Moonwort (Botrychium echo*)*

Status: Region 2 Forest Service Sensitive Species

The reflected moonwort is found in mountain meadows in central Colorado, including El Paso and Clear Creek Counties (just northwest of the Project Area). It grows in gravely soils near roads and trails, rocky hillsides, grassy slopes, and meadows at elevations between 9,500 and 11,000 ft (Forest Service, 1994). Based on these habitat requirements and the location of known occurrences, the reflected moonwort is not expected to occur in any of the Treatment Areas. Therefore, the reflected moonwort will not be further evaluated.

Rolland's Bulrush *(*Scirpus rollandii*)*

Status: Region 2 Forest Service Sensitive Species

Rolland's bulrush is a wetland/alpine species that has a disjunct distribution in Colorado. It is known to occur in Horseshoe Cirque on South Park Ranger District in wet moss willow carrs. This rush grows in calcareous soils (Forest Service, 1994). Based on these habitat requirements and the use of buffers,

Rolland's bulrush is not expected to occur in any of the Treatment Areas. Therefore, Rolland's bullrush will not be further evaluated.

Sea Pink (Armeria maritima *ssp.* siberica)

Status: Region 2 Forest Sensitive Species

Sea pink is an alpine species with a widely disjunct distribution in Colorado. It is found in Summit and Park Counties and occurs on the South Park and South Platte Ranger Districts (Forest Service, 1994). Its habitat consists of grassy tundra slopes, wet, sandy, or spongy organic soils at 11,900 to 13,000 ft in elevation (Spackman et al., 1997). Based on these habitat requirements, sea pink is not expected to occur in any of the Treatment Areas. Therefore, sea pink will not be further evaluated.

Smith's Whitlow-grass (Draba smithii*)*

Status: Region 2 Forest Service Sensitive Species

Smith's Whitlow-grass is endemic to south-central Colorado (Custer, Las Animas, Mineral, and Saguache Counties). It is found between 8,000 and 11,000 ft in talus slopes and crevices and between rocks in shaded protected sites (Spackman et al., 1997). Known occurrences of this species include Wagon Wheel Gap, the high country of the Sangre de Cristo Range, and the Raton Mesa-Fishers Peak area above Trinidad. Based on these habitat requirements, Smith's whitlow-grass is not expected to occur in any of the Treatment Areas. Therefore, Smith's whitlow-grass will not be further evaluated.

Smooth Rockcress (Braya glabella)

Status: Region 2 Forest Sensitive Species

Smooth rockcress is an alpine species with a disjunct distribution in central Colorado, including Chaffee, Gunnison, Park, and Pitkin Counties. It can be found on calcareous substrates (Leadville limestone and Manitou dolomite), sparsely vegetated slopes above timberline with fine gravels or on disturbed sites associated with inactive mines between 12,000 and 12,300 ft (Spackman et al., 1997). Based on these habitat requirements, smooth rockcress is not expected to occur in any of the Treatment Areas. Therefore, smooth rockcress will not be further evaluated.

Weber's Monkey-flower (Mimulus gemmiparus)

Status: Region 2 Forest Sensitive Species

Weber's monkey-flower is endemic to Colorado (Grand, Jefferson, Larimer, and Park Counties). It occurs on granitic seeps, slopes and alluvium in open sites within spruce-fir and aspen forests 8,500 to 10,500 ft in elevation (Spackman et al., 1997). Based on these habitat requirements, Weber's monkey-flower is not expected to occur in any of the Treatment Areas. The action alternatives will create more suitable habitat for the species in the long-term. Therefore, the Weber's monkey-flower will not be further evaluated.

Wooly Willow (Salix lanata *L. ssp.* calcicola)

Status: Region 2 Forest Service Sensitive Species

The wooly willow is a wetland species with a disjunct distribution in Colorado (including Gunnison and Park Counties). It is known to occur in Horseshoe Cirque on South Park Ranger District, on calcareous lakeshores or edges of tarns at approximately 12,000 ft elevation (Forest Service, 1994). Based on these habitat requirements, wooly willow is not expected to occur in any of the Treatment Areas. Therefore, the wooly willow will not be further evaluated.

STATE PROTECTED SPECIES

Boreal Toad (Bufo boreas boreas)

Status: Federal candidate, state endangered and Region 2 Forest Service Sensitive Species

The boreal toad occurs throughout most of the mountainous portion of Colorado, but appears to be absent from the Wet Mountains and Pikes Peak region. They are most common between 8,500 and 11,000 ft in elevation. This toad inhabits marshes, wet meadows, and the margins of streams, beaver ponds, lakes, and glacial kettle ponds in subalpine areas of Colorado. It is found in shallow water or among sedges and shrubby willows where soil is damp or wet (Forest Service, 1994). Based on habitat descriptions, the boreal toad may potentially occur within the Project Area but not within any treatment areas. Riparian buffers will be employed and suitable habitat for this species is not expected to be impacted. Therefore, no impacts are expected to the boreal toad under implementation of the action alternatives.

Peregrine Falcon (Falco peregrinus)

Status: Region 2 Forest Service Sensitive Species and Colorado threatened species

The peregrine falcon is a rare spring and fall migrant in western valleys, foothills, lower mountains, mountain parks, and on the eastern plains. It is a rare summer resident in foothills and lower mountains. Breeding pairs nest on cliffs and forage over adjacent coniferous and riparian forests, and at times other habitats. Migrants and winter residents occur mostly around reservoirs, rivers, and marshes, but may also be seen in grasslands, and agricultural areas (Andrew et al., 1992). Active aeries are known on the San Isabel and the Pike National Forests (USFS, 1994).

CNHP information (from NDIS 1999) indicates that there are no conservation sites in the Project Area, and that the falcon may occur in the northeastern portion of the Project Area including the Buffalo Creek and Waterton/Deckers Composite watersheds, specifically near Foxton and Eagle Rock. Forage areas, along river corridors, may be affected by the vegetation treatment activity in the action alternatives, however the long-term trend would be an increase in forage. Therefore, no impacts are expected to the peregrine falcon under implementation of the action alternatives.

CUMULATIVE EFFECTS

Alternative A would result in no direct or indirect effects to species or their habitats. A potential long-term impact would be a continuing increase in fire risk, compared to the action alternatives. The

cumulative effect of this alternative would be basically the same effect as the current and future actions. There would be no additional cumulative effect from this alternative.

Alternative B and C (action alternatives) would cause direct loss of vegetation due to the treatments, particularly logging, within or adjacent to sensitive species habitat in Pike National Forest. These impacts include the short-term loss of habitat through thinning and the creation of openings within the forest itself, the displacement of foraging animals, the loss of nesting trees and other habitats, and crushing and mortality of sensitive plants that may occur within the treatment areas by use of harvesting equipment during logging. However, these negative short-term impacts are outweighed by positive long-term effects, including the creation, improvement, and enhancement of habitat within the Pike National Forest and the decreased risk of catastrophic fires, like the Hi-meadows Fire in June 2000.

Virtually all species discussed in this Biological Evaluation will benefit from a more heterogeneous forest structure. This will allow for increased diversity of habitat and populations. The planting of 1,000 acres of trees in the Buffalo Creek Burn area will benefit all species in that area by creating habitat that was lost in the fire. For those species in this Biological Evaluation that require riparian habitat, the creation of 60 acres of riparian habitat in the Buffalo Creek Burn area will benefit from this new habitat. These same species will benefit from the improvement of the river trail systems by minimizing impacts on riparian areas by reducing potential human interference. For the species discussed in this Biological Evaluation whose movement might be restricted by roads, the reclamation and revegetation of 25 miles of roads will increase the ability of movement for these species. This action will also provide grassland habitat for those species dependant on grasslands. The current and future restoration actions would also contribute to enhancement of habitat and associated improved population viability. Therefore, the action alternatives would have a positive cumulative effect on forested habitats and sensitive species on the Pike National Forest.

REFERENCES

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Cary, M. 1911. A Biological Survey of Colorado. N. Ameri. Fauna. 33:1-256.

APPENDIX C
BIOLOGICAL ASSESSMENT

INTRODUCTION

The U.S. Forest Service has proposed a series of actions with the goal of forest restoration in the Upper South Platte Watershed on the Pike National Forest. These actions would include timber harvesting, prescribed burning, revegetation in the Buffalo Creek burn area, obliteration and reclamation of unnecessary roads, and trail improvements. This Environmental Assessment (EA) discloses the environmental consequences of implementing the proposed actions.

In conjunction with the National Environmental Policy Act (NEPA) process, the Forest Service is required to comply with Section 7 on the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.) by consulting with the U.S. Fish and Wildlife Service (USFWS) prior to release of the Environmental Assessment (EA). The purpose of this consultation is to ensure that the proposed action does not preclude or threaten the continued existence of any federally listed threatened or endangered species or adversely affect designated critical areas (50 CFR 17). In accordance with regulations at 50 CFR 402, the U.S. Forest Service initiated informal consultation with the USFWS on June 1, 2000.

Data was obtained from existing and available information, including resource management plans and other environmental documents prepared for similar proposed actions in the project study area. These documents were reviewed to determine the locations and types of biological resources that could exist in the project study area. Information on species occurrence was also gathered from the statewide database through contact with the CNHP. Contacts were made with species experts and resource specialists from the Forest Service, CDOW, and USFWS to gather file information on biological resources in the project study area, including maps and database information. This document provides an analysis of the potential effects of the project on these species and, with the concurrence of the USFWS, satisfies the ESA requirement for preparation of a Biological Assessment (BA) (50 CFR 402.112).

The BA presents an analysis of the potential effects of the project alternatives on Threatened and Endangered species identified by the above mentioned means. The list of species considered for this document include two birds and one invertebrate which are known from, or which could occur within the project area.

PROJECT AREA

For the purposes of the BA, the project area was defined as the Upper South Platte watershed. The Upper South Platte watershed is located within the foothills of the Colorado Front Range of the Rocky Mountains. It is a large, important watershed that is a critical water supply for the city of Denver,

providing 70 percent of the city's water. Due to its proximity to the city, it contains a large urban–wildlands interface and provides easy access to fishing, hiking, and other outdoor pursuits. A portion of the South Platte River is a gold medal trout fishery.

The Project Area is approximately 140,000 acres in total extent (public and private lands) and encompasses three sub-watersheds of the Upper South Platte River watershed including Horse Creek, Waterton/Deckers, and Buffalo Creek sub-watersheds. These watersheds are located in Jefferson and Douglas Counties, west of Denver. This area was selected based on recommendations from the Landscape Assessment of the Upper South Platte Watershed (Foster Wheeler, 1999).

Approximately 120,000 acres of the Project Area is on National Forest land. The remaining areas within these sub-watersheds are predominately privately owned lands. However, there are also state and county lands within the assessment area.

Elevations within the Assessment Area range from approximately 6,000 feet along the South Platte River to almost 9,000 feet at some of the higher peaks. The terrain is extremely varied and includes deep, narrow canyons; flat river-valley bottoms; broad meadows; rugged mountain foothills; steep slopes; rounded granite peaks; and scattered, rugged granite outcroppings. Portions of the Waterton/Deckers and Buffalo Creek watersheds are within the Lost Creek Wilderness Area.

A portion of the Project Area was burned in the 1996 Buffalo Creek fire. This large, hot fire resulted in loss of forest cover on 12,000 acres and burned several homes. Summer storms in the area of the burn caused catastrophic erosion and sediment deposition into the watershed's streams. Flooding events following the fire destroyed much of the stream channels and riparian zones along Buffalo and Spring Creeks. Even after four years, much of the burn area remains unvegetated (see Proposed Actions and Purpose and Need for further discussion of this fire).

METHODS

Review of literature and databases was conducted to assess the status of species identified by the Forest Service, USFWS, CNHP, and CDOW as potentially occupying the project area. Contacts with species experts were made to augment published information and database records of species occurrence. Federal, state, and Colorado Natural Heritage Program Database listings of special-status species and their habitats were reviewed to identify those species potentially occurring within the project area. Based on these lists, plants and wildlife species were carefully identified to eliminate or confirm the occurrence of special-status species within the project area.

THREATENED AND ENDANGERED ANIMAL SPECIES

Information on species occurrence was gathered from the statewide database through contact with the CNHP and Forest Service personnel. Contacts were made with species experts and resource specialists from the USGS Biological Service, Forest Service personnel, and USFWS personnel to gather file information on wildlife resources in the project study area, including mapped and database information. One invertebrate, two birds and one mammal were identified for analysis for this BA.

THREATENED, ENDANGERED, AND CANDIDATE PLANT SPECIES

Information on occurrences of federally protected plants in the project study area was obtained initially from the CNHP and through consultation with Forest Service personnel. Additional information on species' habitat requirements, blooming periods, and field identifying characteristics was obtained from state flora guides (Weber 1990; Spackman et al. 1997). Federal and state resource specialists, including the Forest Service and USFWS were also contacted to obtain information on threatened and endangered plants. No threatened, endangered, or candidate plant species occur within the project area. Therefore, plants are not carried forward in this document.

THREATENED AND ENDANGERED SPECIES KNOWN FROM OR POTENTIALLY OCCURRING WITHIN THE PROJECT AREA

FEDERALLY LISTED THREATENED SPECIES

Pawnee Montane Skipper (Hesperia leonardus montana)

The Pawnee montane skipper is found in sparsely wooded grasslands and open pine forests at elevations from 6,000 to 7,500 ft. They are dependent on two plant species, the prairie gayfeather (Liatris punctata), which flowers late summer through early fall and blue grama (Bouteloua gracilis). The butterfly uses liatris for its nectar and the blue grama as larval plant food (U.S. Fish and Wildlife Service 1998). The butterfly has a very limited distribution occurring along a 12-mile stretch of the South Platte River. The Pawnee montane skipper is known to occur in Douglas, Jefferson, Park and Teller Counties in Colorado (Forest Service, 1994). Distribution information from CNHP indicates that the Pawnee montane skipper has been identified at two locations in the Waterton/Deckers Composite watershed and one location near the southeastern corner of the Horse Creek watershed.

An extensive study of skipper presence and habitat was conducted in 1986 for the proposed Two Forks reservoir (ERT Company 1986). The Two Forks study area was stratified into 160-acre sampling blocks for distribution sampling. There were 310, 160-acre blocks that were available for sampling. Skipper presence was confirmed in 161 sampling blocks. The occupied skipper habitat identified from the 1986 study is shown with the vegetation treatment areas on Map 1. The total occupied skipper habitat identified in the 1986 study is 24,831 acres. The occupied habitat in the EA Project Area is 14,010 acres. Habitat for the skipper occurs in the Vegetation Treatment Areas.

ALTERNATIVE A

Alternative A (No Action) would have no direct impacts on the skipper or its habitat. No trees would be cut down and no tree removal or prescribed burning would occur. However, marginal skipper habitat would continue to be degraded through increasing density of the forest. The higher quality skipper habitat would likely remain in good condition because those sites are quite dry. The loss of marginal habitat would increase habitat fragmentation, and reduce dispersal avenues among islands of highly suitable habitat. Catastrophic forest fires would likely be beneficial to skipper movements in the long-term.

This alternative would have a higher long-term risk of catastrophic fire than the other alternatives. Should a wildfire occur it could eliminate marginal skipper habitat and could kill individuals. The timing of recovery of the habitat and recolonization by the skipper is unknown but the post-fire condition would be more open and therefore would support more blue grama and liatris than the current condition.

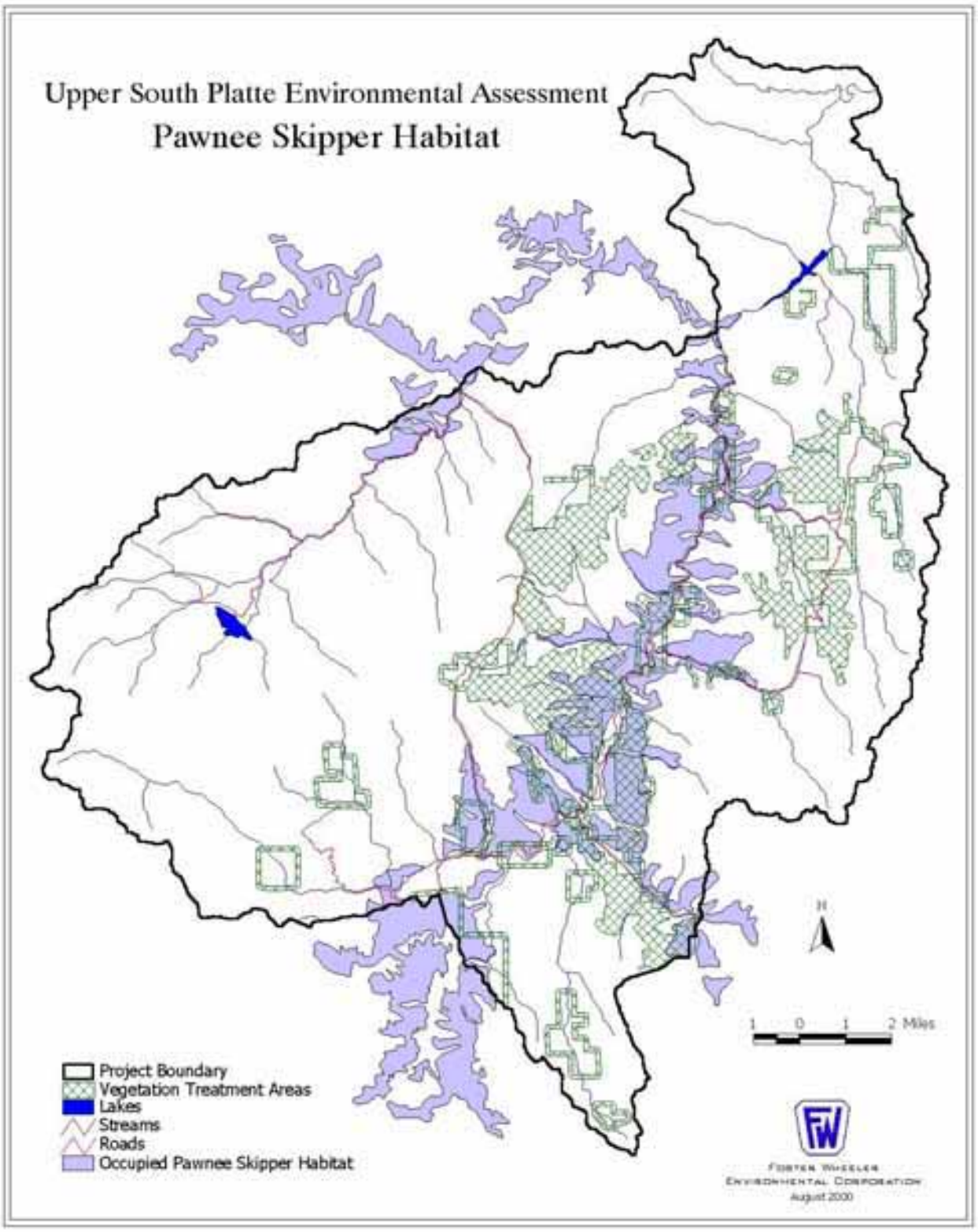
ALTERNATIVE B

Alternative B (Proposed Action) would create open ponderosa pine stands on 17,500 acres of which 3,846 acres would be occupied skipper habitat. The vegetation treatments and prescribed burning would also reduce the wildfire risk and the resulting open ponderosa pine stands would be more favorable habitat conditions for the skipper.

In 1998, The USFWS developed a recovery plan for the skipper (U.S. Fish and Wildlife Service 1998). The recovery plan lists general characteristics of skipper habitat as:

- **Tree canopy cover of 30 percent**
- **Ponderosa pine crown cover of 25 percent, Douglas fir crown cover of 5 percent**
- **Tree density of less than 120 trees/acre in the smallest size class (0 to 5 feet diameter breast high); overall tree density of less than 200 per acre.**
- **Shrub and grass cover generally less than 10 percent**
- **Prairie gayfeather flower stem density ranging from 50 to 500/acre**
- **Blue grama cover 5 percent or less , present nearly everywhere**

The vegetation treatments would move forest conditions to more favorable habitat based upon the general habitat characteristics listed above. The vegetation treatments would convert areas of more closed (40-70 percent closure) tree canopy to 30 percent or less. The general habitat characteristics indicate that Douglas fir would be a minor component. The vegetation treatments would create mostly pure ponderosa pine stands and would target Douglas fir for removal. Tree density would be less than 100 trees per acre and only 25 small trees per acre. The shrub, grass cover and flower densities would vary depending upon the site conditions following the vegetation treatments. However, the site conditions would be more favorable for establishment of good skipper habitat than the current condition. The vegetation treatments would have a risk of introduction or expansion of noxious and invasive weeds that would exclude liatris and blue grama.



Map 1. Occupied Pawnee montane skipper habitat.

An examination of current skipper habitat conditions, the vegetation treatment areas and the completed vegetation treatment area at Trumbell was conducted on July 19, 2000 to formulate mitigation measures. The following mitigation measures would minimize potential impacts to skippers and their habitat.

- **Restrict openings in skipper habitat to 5 acres or less in size**
- **Fell trees off of blue grama/liatris areas where possible**
- **Minimize the disturbance area with a pre-logging survey to determine the best skid trails and forwarder routes. Routes would be designated to avoid blue grama/liatris areas.**
- **Minimize slash on blue grama/liatris areas**
- **Minimize machine operations on blue grama/liatris areas**
- **Limit prescribed burning to 500 acres per year in skipper habitat and stagger timing so that adjacent areas are burned with a minimum 2 year window for recovery time.**
- **Noxious weed treatments should include**
  - **Identify weed concentration areas in and near harvest units**
  - **Pretreat weed concentrations with herbicide during the optimum life stage for treatment, typically spring or fall**
  - **Wash equipment before it is brought into the harvest area**
  - **Avoid machine operations through weed areas**
- **Use blue grama seed in the seed mixture used for road reclamation.**

Direct and indirect effects of the vegetation treatment on the skipper would be minimal if the above mitigation is followed. Females typically deposit their eggs in open areas with existing low tree cover and larger patches of blue grama. If harvesting equipment is keep off of these areas then there would be minimal impacts. Prescribed burning would have the highest potential for effects.

The egg stage occurs in the summer when no prescribed burning would occur. Early Spring would be best for prescribed burning because larval stage is down in the soil or in the basal clump of blue grama and therefore would have some thermal protection, and soil temperatures are low. Fall prescribed burning would also allow similar protection of the larval stage. The blue grama/liatris areas have few trees. Therefore, if slash is kept off of blue grama/liatris areas the prescribed fire would not burn hot, or at all, because of lack of fuel.

Road reclamation activities present an opportunity to improve skipper habitat and populations. These roads likely do not currently function as skipper habitat. The use of blue grama seed in the revegetation effort would increase skipper habitat. Another potential benefit would be that if blue grama were established on these reclaimed roads they could serve as possible habitat connections between better habitat islands. The use of biosolids would help promote the establishment of blue grama (which is difficult to establish).

The Gill Trail project would have both positive and negative effects on skipper habitat. The expansion of the parking lot at the trailhead would permanently remove about 1 acre of skipper habitat. This habitat is disturbed and is not high quality. A portion of the social trails that would be rerouted are in skipper habitat. The trail rerouting would minimize current human impacts to that habitat.

The Buffalo Creek burn area revegetation and riparian rehabilitation efforts proposed would have minimal but positive effects on skipper habitat. Areas that are proposed for ponderosa pine planting may become skipper habitat in the future. The use of biosolids would help promote revegetation efforts.

This alternative would be consistent with the skipper recovery plan because skipper habitat would be created or marginal habitat improved. The long-term habitat trend would be positive, however there may be some short-term impacts. During implementation of the vegetation treatments, falling trees and vehicle tires may crush larvae or adult butterflies and skidding may pull up or crush blue grama and gayfeather plants. The burning of slash, may kill individual adult butterflies and larvae (particularly if the fire is a hot ground fire).

Monitoring

Monitoring the effects of burns on known skipper areas would provide the feedback needed for adaptive management. The Buffalo Creek burn and the Trumbull site should be reviewed during the summer of 2000 flight season and in subsequent years. There is a monitoring opportunity because one of the 1986 transects appears to be partially in the Trumbull area where Denver Water completed vegetation treatments during the fall of 1999. This area should be re-surveyed to compare the conditions before and following treatment. Additional 1986 transects exist in proposed vegetation treatment areas on National Forest land.

A monitoring study has been designed for the summer of 2000. The details of the plan are presented here but subsequent monitoring may be modified to better meet the objectives.

Objectives, Study Area and Study Design

The objective of this study is to compare skipper butterfly use (measured by the number of adult butterflies seen within a known area) of untreated ponderosa pine woodland with butterfly use in thinned ponderosa pine woodland. Other habitat measurements (e.g., tree density, blue grama grass ground cover, prairie gayfeather Liatris punctata density) will be conducted by the Forest Service to provide other indicators of habitat quality for this species.

The study area is defined as suitable skipper habitat within two square miles J9S, R70W, Sections 10 and 13) east of the South Platte River near the community of Trumbull. Portions of this study area were thinned during 2000, and these two square miles include more than 600 acres of suitable skipper habitat, based on the skipper habitat map included in the ERT 1986 skipper survey report.

The study design consists of sampling skipper in treated and untreated habitat for statistical analysis purposes. Within each treatment type, three permanent 400 meter transects will be established. Each transect will be sampled once each day on three consecutive days. The total year 2000 sampling program consists of 18 sampling points (2 treatments X 3 transects per treatment x 3 sampling days per transect).

To minimize potential habitat interactions on skipper behavior, the entire length of untreated transects will be located 400 to 500 feet away from treated (thinned) area boundaries.

Sampling Methods

Skipper counts will follow the same sampling protocol used for the *1986* skipper census surveys. All skippers in the genus *Hesperia* (Pawnee montane skipper, comma skipper) will be counted within a belt transect 400 meters long by 10 meters wide (5 meters each side of the centerline). The centerline will be flagged frequently so that the observer can stay on the centerline. The belt will be subdivided into eight *50* meter subplots (staked or flagged at each 50 meter interval) so that skipper dispersion in the habitat can be examined. The number of individual skippers observed in each subplot within the overall transect will be

counted, and entered onto a data sheet. The sex of each skipper individual, skipper behavior, and the microhabitat where the individual was observed will also be recorded. Skippers observed outside the belt plot will also be recorded.

Two observers will count skippers on three transects each per day between the hours of 0900 and 1300 under good weather conditions (sunny to light overcast, temperature between 70 and *85* degrees F). Each observer will conduct trial transect walks to calibrate the distance between the centerline and the outer plot boundary so that a consistent sampling area can be maintained, and to reliably identify skippers seen within the plot. Each observer will sample all six of the transects at least once, and three transects twice. Documentary color photographs will be taken of each 400 meter plot at the beginning and mid point.

Data Analysis

The primary statistical analysis will be to determine whether there are statistically significant differences ($p = .05, .10$) in skipper numbers between treated and untreated plots. Depending on the outcome of the primary comparison, an analysis of the sources of variation in the data may be conducted to account for anomalies, or make recommendations for future changes in the program. The vegetation data collected by the USFS from each transect will be examined to identify factors that may have influenced the presence or absence skippers (e.g. tree canopy cover, *Liatris* or other nectar plant occurrence).

CUMULATIVE IMPACTS

The cumulative effects of the proposed vegetation treatments include activity in skipper habitat by Denver Water, CSFS and other private landowners. The distribution of ownership and activity proposed in skipper habitat is displayed on Table 1. The majority of activity in skipper habitat in the EA Project Area would be US Forest Service vegetation treatments proposed in the EA. However, there is a total of 7,186 acres of activity possible in skipper habitat in the cumulative effects area, which includes all of occupied skipper habitat. This activity would amount to approximately one-third of the total skipper habitat.

Table 1. Land Ownership and Skipper Habitat.

	Area in EA Project Area (acres)	Area in Cumulative Effects Area (acres)
Total Skipper Habitat	14,010	24,831
USFS Vegetation Treatment Area in Skipper Habitat	3,846	3,846
Private Treatment Areas in Skipper Habitat	527	3,340
Denver Water Department Land	1,070	6,455
Elk Creek Management Unit	NA	842
State Lands	0	268

Colorado State Forest Service Vegetation Treatments

Colorado State Forest Service (CSFS) proposes treatment activities similar to the U.S. Forest Service proposal with the following differences:

- **Vegetation treatments would occur only on state or private land**
- **New temporary roads may be built to access unroaded private or state treatment areas. No new roads would be built across USFS land.**
- **The CSFS project area would include all private and state lands within the Waterton/Deckers/Horse Creek Watershed (USFS Project Area) and the Lower Elk Creek Management Unit, Denver Water land surrounding Cheesman Reservoir, and Denver Water and state lands along the North Fork of the South Platte between Pine, Colorado and Strontia Springs Reservoir.**

The CSFS would focus treatment activities on Denver Water and state property. New roads would only be built if there were no existing roads to treatment areas and be reclaimed immediately after work was completed. These new roads would typically be short spurs less than 500 feet long. However, some areas on Denver Water property surrounding Cheesman Reservoir may require longer roads.

Additional Skipper Mitigation for Colorado State Forest Service Vegetation Treatment Areas

In addition to other mitigation measures and design criteria that apply to all treatment areas, the following would apply to state and private treatment areas:

- **New road construction to treatment areas within habitat occupied by pawnee montane skipper would be limited to less than four miles of road that averages 12-feet wide (6 acres maximum disturbance). New roads would be aligned to avoid high quality skipper habitat wherever possible.**
- **To ensure that new roads disturb less than 6 acres of skipper habitat at any one time, treatment area roads would be reclaimed immediately after treatments are completed. Reclamation would include grading to natural contours and seeding. Seed mix will be certified weed-free and include Blue Grama. Roads would be considered reclaimed after 50% of potential ground cover is achieved.**

The potential impacts to skippers and their habitat would be minimal in the short-term and would be very positive in the long-term. If the listed mitigation measures are followed this alternative would not be likely to adversely affect the skipper. This alternative could lead to habitat expansion and potential delisting of the skipper.

ALTERNATIVE C

Alternative C (Roadless Alternative), would be similar to Alternative B. The main difference would be that trees on 5,400 acres would not be removed as they would in Alternative B. The logs left on the site would increase the short-term (1-2 years) fire risk compared to Alternative B. There would also be more fuel that may cause the prescribed fire to burn hotter. Some large portions of the vegetation treatment areas that are in skipper habitat are in roadless areas. As described above under Alternative B the higher risk for skippers would be the prescribed fire. Therefore, in the areas where log removal is not

accomplished there would be a higher potential impact on skipper individuals because of the higher fuel loading and consequent higher risk of a hot fire. This alternative also does not proposed the use of biosolids, as in Alternative B, which could reduce the success of blue grama establishment on reclaimed roads.

The potential impacts to skippers and their habitat would be minimal in the short-term and would be very positive in the long-term. If the listed mitigation measures are followed this alternative would not be likely to adversely affect the skipper. This alternative could lead to habitat expansion and potential delisting of the skipper. The cumulative effects would be similar to Alternative B.

Mexican Spotted Owl (Strix occidentalis lucida)

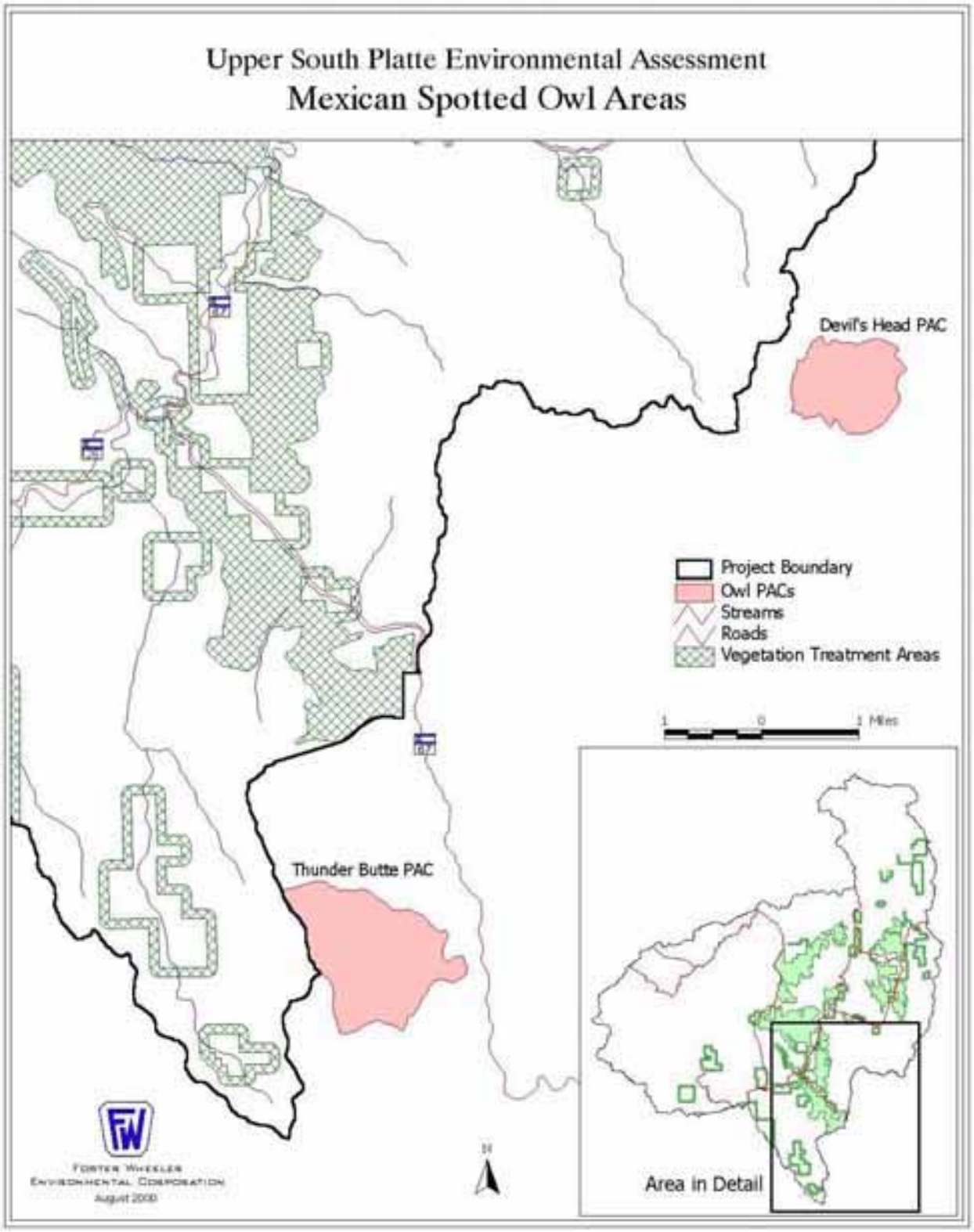
The Upper South Platte Watershed is at the northern extent of the range of the Mexican spotted owl. In this area the owl occurs primarily in steep-walled, rocky canyons (USDI Fish and Wildlife Service 1995). Further south in the owl's range it occupies more diverse habitats. Nesting habitat also changes from caves and cliff ledges in steep-walled canyons in Colorado to mostly in forested stands further south in New Mexico and Arizona (USDI Fish and Wildlife Service 1995). All nests in Colorado found to date occur on cliff ledges or caves along canyon walls (Forest Service, 1994).

There have been some reports of mortality from great horned owls and golden eagles. However, it is not currently known what effects this predation may have on Mexican spotted owl populations (USDI Fish and Wildlife Service 1995). The Mexican spotted owl has been observed on the Pikes Peak, South Platte, and San Carlos Ranger Districts. Preferred habitat includes deep rocky canyons, or between bands of cliffs, or steep slopes of mixed conifer or broad-leaf old-growth forest, also sometimes in oak or spruce-fir forests (Forest Service 1992 and CBBA 1998). This species occupies two distinct habitats in Colorado (Reynolds 1990): large, steep canyons with exposed cliffs and dense old-growth mixed forest of Douglas-fir, white fir, and ponderosa pine, and canyons in pinyon-juniper areas with small and widely scattered patches of old Douglas-firs (Barrows 1981). Summer roost sites are in a cool microclimate, generally with a closed canopy and/or a north-facing slope (Andrew et al., 1992).

Mexican spotted owls were found adjacent to the Project Area in West Creek (Thunder Butte) and on Devils Head (Map 2) adjacent to the project area. Distribution information from CNHP indicates that this owl has not been identified in any of the watersheds in the Project Area. However, suitable habitat for the species does occur within the project area. Critical habitat for the owl has been designated in the Project Area and covers the entire Project Area.

Six distinct recovery units were designated in the recovery plan (USDI Fish and Wildlife Service 1995). The Project Area for the Upper South Platte EA is in the Southern Rocky Mountains – Colorado recovery unit. Most of the Mexican spotted owl habitat in the Project Area fits into the ponderosa pine or mixed-conifer forest definitions in the recovery plan. Protected areas fall into three categories;

- **Protected Activity Centers (PACs) that protect all known sites from 1989 through the life of the plan,**
- **all areas in mixed-conifer and pine-oak types with slope >40 percent where timber harvest has not occurred in the past 20 years,**
- **And all legally and administratively reserved lands.**



Map 2. Mexican Spotted Owl Protected Area Centers (PACs)

ALTERNATIVE A

Alternative A would have no direct effects on the Mexican Spotted Owl habitat or its habitat in the Project Area. However, the long-term risk of a catastrophic fire would be the highest of all alternatives. Habitat for nesting, roosting and foraging would be reduced or eliminated in areas burned by a crown fire (USDI Fish and Wildlife Service 1995).

ALTERNATIVE B

Alternative B would reduce the distribution of Douglas-fir and create more pure ponderosa pine stands. The Devil's Head PAC would not be affected. The Thunder Butte site does not have a PAC delineated but no activity is proposed within 1 mile of the nest site. No legally or administratively reserved lands would be affected. The vegetation treatments would occur on moderate to flat slopes, and no cliffs or canyons would be impacted. There may be some areas of mixed-conifer on slopes >40 percent where timber harvest has not occurred in the past 20 years in the vegetation treatment areas. However, these areas would not be harvested because they are on too steep of slopes.

The opening of the canopy would create better habitat for preybase species, primarily small mammals such as rodents and rabbits, and would improve flight pathways and visual hunting zones for the birds. This alternative also would decrease the long-term risk of catastrophic fire.

The road reclamation, trail access and Buffalo Creek burn area rehabilitation subprojects would have no effect on Mexican spotted owls or their habitat. Due to the reasons stated above the vegetation treatments in Alternative B would have no effect on Mexican spotted owl or its habitat.

ALTERNATIVE C

Alternative C would have similar effects to the Mexican spotted owl as Alternative B. The difference between the two alternatives would be a short-term increased fire risk on more area in Alternative C than Alternative B. These differences would not change the opinion that Alternative C would have no effect on Mexican spotted owl or its habitat.

Bald Eagle (Haliaeetus leucocephalus)

Habitats where bald eagles may occur include urban or built upland, cropland, orchards, tall grass prairie, grasslands, sagebrush, shrubland, aspen groves, Douglas-fir, lodgepole pine, ponderosa pine, blue spruce, juniper woodland, open forest, wetlands, and subalpine meadows (Colorado Natural Diversity Information Service [NDIS], 1999). The bald eagle migrates in summer to northern breeding grounds but return to lower latitudes during the winter. Winter habitat consists of roost trees along rivers and other large open bodies of ice-free waters that allow access to fish (Forest Service, 1994). Typical nesting sites include trees on reservoir edges, cottonwoods along rivers, and conifers near lakes or streams (CBBA, 1998). Bald eagles overwinter at Cheesman Lake and forage along the South Platte River. Based on potential habitat maps, the bald eagle may occur within the Project Area.

No bald eagles are known to nest in the Vegetation Treatment Areas. Bald eagles undoubtedly move through the area from Cheesman Reservoir to the South Platte River, however, no seasonal concentration areas are known to exist in or directly near the project area. The action alternatives would not affect shoreline trees that may be used for roosting and foraging since riparian areas will be protected with buffers. Therefore, the project will not affect habitats that are likely to be occupied by bald eagles other than infrequently. Based on these considerations, the project will have no effect on the bald eagle.

Preble's meadow jumping mouse (Zapus hudsonius preblei)

The Preble's meadow jumping mouse *(Zapus hudsonius preblei*) is a small rodent in the family Zapodidae and is 1 of 12 recognized subspecies of the species Z. hudsonius (Federal Register 1998a). All records of Preble's meadow jumping mouse are from southeastern Wyoming and eastern Colorado. Typically, Preble's meadow jumping mouse subsists on seeds, small fruits, fungi and insects, and hibernates from October to May. This mouse is adapted for digging and creating nests of grasses, leaves, and woody material several centimeters below the ground. Preble's meadow jumping mouse is primarily nocturnal or crepuscular, but can be observed during daylight (Federal Register 1998b).

Armstrong et al (1997) described typical Preble's meadow jumping mouse habitat as "well-developed plains riparian vegetation with relatively undisturbed grassland and a water source in close proximity." This mouse also shows a preference for "dense herbaceous vegetation consisting of a variety of grasses, forbs and thick shrubs"(Federal Register 1998c).

Surveys conducted in 1999 by CNHP located the mouse at Ouzel Campground on the South Platte River and on Trout Creek, a tributary to the South Platte River (Schorr 1999). A survey conducted along Bear Creek adjacent to and downstream from the Indian Creek Campground in the Pike National Forest in July 2000 showed presence of Preble's meadow jumping mouse (Ruggles et al 2000).

The U.S. Fish and Wildlife Services proposed 4(d) regulations recommend a 300 foot buffer on each side of each stream's centerline, or 300 feet from the exterior boundary of any contiguous wetlands, whichever is further (Federal Register 1998d). It has been indicated that the 100-year floodplain may provide a more definitive boundary for protection of the Preble's meadow jumping mouse (Plage 2000). Due the potential presence of the Preble's meadow jumping mouse along the South Platte River and its main tributaries (Bear Creek), the 4(d) rule has been incorporated into mitigation for this project.

The following mitigation measures and design criteria would minimize or avoid potential impacts to Preble's meadow jumping mouse and their habitat.

- **Create a 300-foot buffer from the exterior boundary of the 100-year floodplain. Within the floodplain and the 300-foot buffer, do not allow ground disturbance from vehicles or falling trees except for access routes. This will include the South Platte River, perennial tributary streams, and intermittent streams that have well-developed riparian vegetation.**
- **Within the 100-year floodplain and 300-foot buffer, use existing roads. Where these are not available, the maximum number of crossing access routes will be limited to six access routes. Locate these routes on sites with little vegetation and prior to use, conduct surveys for the Preble's meadow jumping mouse according to U.S. Fish and Wildlife Service protocol.**
- **At the completion of the project, revegetate access routes with native seed.**
- **Within the 300-foot buffer, prescribed burns will only be conducted during the hibernation period of November 1 to April 30) (Plage 2000). Avoid damaging the shrub and tree components within this buffer at all times.**

The application of these mitigation measures would result in the proposed actions having a not likely to adversely affect the Preble's meadow jumping mouse. If, within the 300-foot buffer, the habitat is deemed unsuitable for the Preble's meadow jumping mouse, further consultation with U.S. Fish and Wildlife Service would be conducted. Unsuitable habitat would include a drastic change in elevation or entrance into dry ponderosa pine forest.

A beneficial long-term effect of the action alternatives would be a possible increase of surface water flow, which could increase the size of riparian habitat. The thinning of the ponderosa pine forest, which could

subsequently create grass and forb production. These two effects could increase the habitat for the Preble's meadow jumping mouse.

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