AFFECTED ENVIRONMENT

SOIL AND WATER

Nearly all of the burned area is comprised of shallow, weathered soils from the Pikes Peak batholith, primarily the Sphinx and Legault families. The Sphinx-Legault-Rock complex covers most of the fire area. This soil unit occurs on slopes of 15 to 80 percent and forms on mountainsides. This soil mapping unit consists of approximately 50 percent Sphinx component, 20 percent Legault, and 15 percent rock outcrop. The Sphinx soils are coarse-textured and shallow are moderately to excessively drained, and form on mountainsides. The surface layer is gravelly coarse sandy loam. Permeability is high 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 Legault soil is a dark grayish brown, very gravelly coarse sandy loam and is found on north-facing aspects and higher elevations of mountainsides. Permeability is moderate to high, and the available water capacity is very low. Runoff is rapid and erosion hazard is moderate to severe depending on slope. The dominant vegetation of these soil types is Douglas-fir and ponderosa pine.

These decomposed granite soil types, in combination with climate factors and topography, resulted in a soil surface that generally lacks vegetative cover and organic matter. Due to these factors, the area is highly susceptible to downslope movement from normal precipitation events, even in an unburned condition. The landforms are predominantly mountain slopes in steep, V-shaped valleys, and rock outcrops cover about 10% of the area. The landscape is highly dissected in the upland forested portion of the burn. Annual precipitation is comprised of snowfall during the winter and high intensity rainfall events during the summer. The majority of the precipitation comes during the summer monsoon season, and because most of this occurs in high-intensity, short–duration thunderstorms, there are high natural rates of erosion. The burned area has a high erosion rating on 70% of the landscape and 25% has a moderate hazard. These rating probably do not account for changes in erosion hazards caused by the Hayman Fire.

The severity of the fire for a large portion of the Hayman Fire was outside the range of natural behavior for this forest, which historically was a ponderosa pine/Douglas-fir mixed fire regime. After the fire, soil conditions changed. The fire totally consumed ground litter in areas mapped as high-severity burns. In some locations, the fire produced a water-repellent, hydrophobic layer that prevents water from soaking into the soil, resulting in increased runoff and erosion. The impacts of fire on soil properties may last weeks or decades, depending on the fire severity and intensity, any remedial measures, and the rate of vegetative recovery (Baker 1990). Despite the extreme nature of this fire, soil conditions have begun to improve through both natural recovery processes and active management.

Increases in sedimentation, turbidity, and mass erosion are regarded as the most serious threats to water resources following wildfire. These changes in water quality often alter stream functions so that original designated uses, including municipal water supply, wildlife habitat, and fish culture, are no longer supported. Adverse impacts to water quality after the Hayman Fire were

largely attributed to ash and sediment. Streams impacted by the Hayman Fire experienced high levels of turbidity that was caused by suspended sediment. Short-term increases of nutrients, dissolved solids, and pH may also occur while water yields remain elevated.

The project area includes eleven sixth-level watersheds that drain to the South Platte River (Table 3) Perennial tributaries include Horse Creek, Fourmile Creek, Goose Creek, Wigwam Creek, West Creek, and Turkey Creek.

TABLE 3: SIXTH LEVEL WATERSHEDS WITHIN THE BURN

6th Level Watershed	Watershed Name
101900020105	Fourmile/Deckers
101900020101	Cheesman Composite
101900020104	Goose Creek Composite
101900010403	Lower Lake George Composite
101900020106	Wigwam Creek
101900010607	Tappan Mountain Composite
101900020805	West Creek
101900020804	Lower Trout Creek
101900020107	Waterton/Deckers Composite
101900010406	Twin Creek Composite
101900010401	Elevenmile Canyon Composite

Downstream from the project area, Cheesman Reservoir and Strontia Springs Reservoir impound the South Platte River. Denver Water owns and operates these reservoirs as important water supply facilities for the Denver metro area. About 56% of the burned area drains into either Cheesman or the South Platte River. Below Cheesman, the remaining 44% drains into the South Platte River which eventually flows into Strontia Springs Reservoir.

The State of Colorado's Department of Public Health and Environment (CDPHE) has designated beneficial uses for streams in the project area as Coldwater Class 1 and Domestic Water supply. 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). Two stream reaches within the Hayman Burn area, the South Platte River above Cheeman Reservoir and Trout Creek, are on the Colorado's 303(d) list for sediment (CDPHE, 2002). In addition, several streams within the Hayman Fire perimeter are on the State's 2002 Monitoring and Evaluation List (M&E) (CDPHE, 2002), mostly for sediment and/or temperature. Streams on the M&E list are suspected of not meeting water quality standards for all beneficial uses, but more data is needed. In the project area watersheds, the following streams are on the 2002 M&E list: Horse Creek, Trail Creek, Tarryall Creek, Goose Creek, Spring Gulch, and Wren Gulch.

Hayman Fire Effects

Although much of the burn occurred in forested upland areas, the riparian areas around Horse Creek, Trail Creek, Turkey Creek, Wigwam Creek and others burned. Many intermittent and ephemeral drainages were completely burned. Many creeks experienced a loss of riparian vegetation, streamside habitat, and buffering ability. It is anticipated that ground vegetation will recover over a two to five-year period. Re-growth has already begun in many riparian corridors. During the BAER assessment, five "emergency issues" were identified and addressed with BAER treatments and summarized below:

Increased flood flows – Fires can cause increased magnitude and frequency of floods due to a combination of the loss of ground cover, decreased infiltration, a reduction in evapotranspiration, reduced water storage within the soil, and snowmelt modification

(Robichaud *et.al*., 2000). Magnitude of increase varies with moderate to high severity burn areas producing the greatest increases in runoff. The BAER team used the WILDCAT flow prediction model (Hawkins and Greenberg, 1990) to predict changes in peak flow events from the Hayman Burn area. The modelled design storm was a 25-year 1-hour storm and represents the maximum storm that BAER treatments could withstand. Predicted increases were greatest for watersheds where a high percentage of the area was moderately to severely burned. According to the model, 13% of the affected watersheds would have flows exceeding 500 cfs/square mile (csm) and 4% exceeding 600 csm. The average pre-fire predicted runoff was 75 csm and post-fire was 290 csm.

Ponds/dams – Several private ponds exist in the West Creek and Trout Creek drainages. Both in-channel and within floodplain ponds exist. Post-fire flows may be a combination of water and debris in which jams form and break, causing surges or slugs of material down the stream channels.

Debris flow potential – Increased stream flows may be combined with debris of floatable and transportable material. Recent experiences from the Cerro Grande, East Fork Bitterroot, Clover-Mist, and Buffalo Creek Fires demonstrate that debris flows have greater potential of occurrence after high severity burns.

Water quality – Trout Creek and the South Platte River above Cheesman Reservoir are on the 2002 State 303(d) list for sediment. Horse Creek, Trail Creek, Taryall Creek, and Goose Creek are on the 2002 State Monitoring and Evaluation list for sediment. The South Platte River is the conveyance system for the public water supply of Denver. Changes in water quality might include increases in organic carbon, ash, and inorganic sediment. These increases will likely be measurable within several smaller drainage basins as well as within the South Platte River above and below Cheesman Reservoir.

Threats to aquatic life – Ash, sediment, and other water quality impacts may impair aquatic resources through the deposition of fine material in the substrate and suspension within the water column. Alteration of the nutrient levels may also be detrimental.

Potential Post-Fire Erosion and Sediment Delivery Rates

A large amount of sediment will likely become mobile during storm events due to the soil type and steep slopes within the burn. The hillslope erosion potential is predicted to be high, averaging approximately 43 tons/acre/year. However, due to storage and buffering, actual sediment delivery to streams is predicted to be less. The sediment delivery potential is based on post-fire monitoring of the Buffalo Creek Fire (Moody and Martin, 2001), which demonstrated that approximately 15 acre-feet of sediment was delivered to Strontia Springs Reservoir for each square mile of burn over five years following the fire. This value of 15 acre-ft/mi^2 (approximately 35-50 tons/acre) over the five-year recovery period provides an upper bound for sediment export because Buffalo Creek runoff and sediment transport were influenced by an extreme precipitation event immediately after the fire. In other words, 15 acre-ft/mi^2 is a high-end estimate of the potential sediment delivery and includes storms of greater intensity than the

design storm discussed below. Given the Hayman Fire area of approximately 215 mi^2, the potential volume of sediment delivered to streams may be as great as 3,500 acre-feet over the five-year recovery period

Erosion data from Big Turkey and Buffalo Creek fires were used for the post-fire erosion rate in the moderate and high severity part of the Hayman fire, and the Water Erosion Prediction Project (WEPP) model was used to adjust the erosion rates for the low severity and unburned parts of the fire (Elliott et al. 2000). Field review of the burned area was used to verify conditions and assumptions used in the modeling. Table 4 shows the erosion rates for the different severity classes.

TABLE 4: EROSION RATES BY BURN SEVERITY ON THE HAYMAN FIRE

Burn Severity	Acres of Burn	% of Burn	Erosion Rate (Tons/acre/year)
Unburned	21,000	(15)	1*
Low	46,500	(34)	22*
Moderate	21,700	(16)	70
Severe	47,865	(35)	70

*See Analysis of Action Alternatives discussion in Environmental Consequences section

The average erosion rate for the Hayman Fire is 43 tons per acre/year based on a weighted average of the erosion rate by severity class and acreage in each group. The potential sediment delivery rate is 15 ac-feet/mi^2/5 years (approximately 35-50 tons/acre/5 years) (Moody and Martin, 2002). Table 5 shows the expected sediment delivery rates after the Hayman Fire.

TABLE 5: SEDIMENT DELIVERY SUMMARY, HAYMAN FIRE

General Area Description	Area[1] (acres)	Area[1] (mi^2)	Potential Sediment Delivery to Streams[2] (ac-ft/mi^2/5 yrs)
Upstream of Cheesman Reservoir	82,974	130	1,950
Below Cheesman Reservoir (west)	21,699	34	510
Below Cheesman Reservoir (east)	43,655	68	1,020

[1] Approximate area, includes some unburned area outside of fire perimeter.
[2] Based on post-fire monitoring of the Buffalo Creek Fire (Moody & Martin, 2001) – The potential rate of 15 acre-ft/mi^2 during the 5- year recovery period includes storms of higher intensity than the design storm.

BAER Treatments

In order to mitigate some of the potential impacts, BAER treatments within the Hayman Fire area included: 1) Hydro-mulching and seeding from roads and the air; 2) Ground cover with straw mulch and seeding; and 3) Ground scarification (hand or mechanical) with seeding (see Table 6).

TABLE 6: BAER TREATMENTS AS OF NOVEMBER, 2002

BAER Treatment	Acres
Aerial hydro-mulch	1,500
Aerial seeding	7,800
Aerial straw mulching	7,700
Ground hydro-mulch	1,300
Seeding and scarification	13,000
TOTAL	**31,300**

Straw mulching and hydro-mulching with seeding on slopes 20-60% helps provide ground cover to the burn area until native vegetation is established. These slopes were selected to concentrate mulching efforts on because lower gradient slopes have a lower erosion risk. Most of the higher gradient slopes were predominantly rock outcrop on which BAER treatments were considered to be ineffective and were therefore left untreated.

Scarification has aided in the breaking up of hydrophobic surface soils and improving infiltration; it has also created a seed bed for the annual grasses seeded with the intent to quickly establish ground cover. Groundcover is helpful in improving infiltration, thereby decreasing erosion and sediment delivery from burned slopes.

Extensive road surveys were completed within the burn area and many road/stream crossings need to be upgraded or at least maintained. Many roads with safety risks were kept closed in 2002 and may need to be closed in 2003, especially following large storm events.

Additional acres will be assessed for treatment in the spring and summer of 2003. The initial five emergency BAER issues will continue to be concerns this year. The 2002 BAER treatments, along with natural recovery, will help to mitigate the effects in high burn severity areas, but risk will remain high.

After the BAER treatments were completed, the WILDCAT model was run again for each of the sub-watersheds (7^{th} order watershed) that had some portion treated. The average runoff rate was reduced from 290 to 175 csm.

Existing Stream Data and Monitoring

Prior to the Hayman Fire, several streams within what became the fire area had monitoring reaches established. Several of these were studied in conjunction with the Upper South Platte Watershed Restoration Project, others with the Forests TMDL monitoring program. These sites include: Saloon Gulch, Brush Creek, Horse Creek, Trout Creek, Goose Creek, and Trail Creek. New sites were added after the fire to monitor any changes due to the fire. These include Wigwam Creek, Fourmile Creek, and West Creek. Monitoring at all sites includes cross sections, pebble counts, bank stability surveys, monthly discharge measurements, and monthly water quality grab samples (water chemistry and suspended solids).

VEGETATION

Before the fire occurred, the forest cover type within the analysis area was predominantly ponderosa pine with co-dominant or an understory of Douglas-fir. Aspen stands were also present, although generally small because of conifer encroachment. Additionally, Engelmann and blue spruce occurred, but were largely limited to riparian areas.

Post-fire Conditions

The Hayman Fire radically changed the vegetative landscape of the analysis area. The fire burned in a mosaic pattern with intensities varying from low-intensity underburning to high-intensity stand replacement changing ecosystem functions. There are areas where the fire consumed the organic soil and the vegetation growing in it. The loss of vegetation in those areas lessened the potential for moisture being held in the soil. In the moderate and high intensity areas, 100 percent tree mortality occurred. Many of these stands are likely to be replaced by early seral species of grasses, forbs, and woody species. Although the forest cover types before the fire are still present in the vicinity, there has been a shift in species composition within stands.

The primary vegetative component affected by the proposed action is dead or dying trees. Fire-injured standing trees within the Hayman Fire perimeter are vulnerable to forest insects and pathogens. Fire-damaged trees may encounter deterioration of sapwood and heartwood from insects (e.g., bark beetle and woodborers), along with fungal deterioration. In low and moderate fire severity areas, post-fire tree survivability depends on the extent of damage to the crown, stem, and root system. Additionally, the amount of damage individual trees can sustain is dependent on the characteristics of its particular species (root depth, needle length, bark thickness), and size (diameter and height). In general, mortality can be predicted as a function of crown scorch and bark thickness. Mortality increases with percentage of crown scorch and decreases as bark thinness increases. Exceptions would include tree species with thin bark (i.e. Engelmann spruce and subalpine fir), where mortality will not vary by diameter. Table 7 displays the extent of damage that major tree species in the analysis area can sustain before mortality can be expected.

TABLE 7: FIRE DAMAGE/MORTALITY RELATIONSHIP

Species	% Crown Scorch	% Cambium Damage	Root Damage
Ponderosa Pine	>60-65	40-60	Deep, Extensive
Douglas-fir	>55-60	30-50	Deep to Shallow, Extensive

Once a tree dies, it begins to deteriorate via weathering, insects, and fungi. The most common results of these agents are blue stain, decay, and weather checking (splitting or cracking). The rate of deterioration is affected by growth ring widths, size and ages of trees, sapwood thickness, bark thickness, and environmental factors at the site.

Post-fire Revegetation

BAER treatments involved seeding, hydromulching, and dead tree felling to trap eroding soil within high-risk areas inside the perimeter. Straw-mulching, hydro-mulching, and seeding were done on 20 to 60 percent slopes (lower gradient slopes have lower risk of erosion) to provide some ground cover in the burned areas until native vegetation is re-established. Additional areas will be assessed for treatment in the spring and summer of 2003.

The reforestation seed source for Douglas-fir and ponderosa pine may be present at varying levels on areas of low burn intensity. These areas were generally an underburn and may reforest naturally without additional seeding or planting. Most areas where moderate and high intensity

burning occurred (the areas covered by this analysis), resulted in 100% tree mortality replacement burn and the seed source for natural regeneration has been lost. Arno and others (1985) suggest that ponderosa pine seldom regenerates adequately without planting after a stand-replacement fire. Most of the younger seed producing trees are dead and the old live survivors produce less viable seed. Ponderosa pine produces the most viable seed between the ages of 60 and 160 years (Burns, 1990).

The most critical factor for establishing a new forested stand in stand-replacement burns is the available seed source. In these areas we must rely on seed from adjacent stands, seed from the surviving large trees, and/or dissemination by other means such as wind, birds or animals, artificial seeding, or planting. Ponderosa pine seed is not easily disseminated over a large area due to its large size and heavy weight (Burns, 1990). Douglas-fir seed is lighter and disperse better from adjacent stands. There is a small amount of lodgepole pine within the analysis area and because this species is fire adapted with serotinous cones, natural regeneration will probably occur in the small lodgepole inclusions. In general, in the stand replacement burn areas, without seed from adjacent stands or without planting, the only plants established for 100 years or more may be shrubs and grass species.

Endangered, Threatened, and Sensitive Plant Species

There are no known occurrences of any federally endangered, threatened, or proposed plant species within the proposed project area. There are no known occurrences of any Regional Forester sensitive plant species within the proposed project area. The proposed salvage units were designed to avoid known Regional Forester sensitive species (RFSS) plant sites.

Noxious Weeds

Weedy species typically require soil surface disturbance to gain entry into an area. The fire converted several thousand acres of a variety of forest types in the area to potential habitat for non-native invasive plants, including identified noxious weeds. Fire-fighting and subsequent emergency rehabilitation efforts may have inadvertently introduced some of these plants. Vehicles and other equipment are frequent vectors of weed seeds. Noxious weed species observed in the area of the Hayman fire include orange hawkweed (*Hieraceum aurantiacum*), leafy spurge (*Euphorbia esula*), yellow toadflax (*Linaria vulgaris*), spotted knapweed (*Centaurea maculosa*), Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), diffuse knapweed (*Centaurea diffusa*), and Dalmatian toadflax (*Linaria genistifolia* ssp. *dalmatica*). Numerous recommendations based on field observation were made by Burkhart (2002).

WILDLIFE

The proposed treatment area was dominated by stands of ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*). Typically, this ecosystem is adapted to a mixed fire regime with frequent low-intensity fires and infrequent stand replacing fires of relatively small size. Other community types in the treatment area include aspen, lodgepole pine, spruce/fir, limber pine, and montane grasslands and shrublands. Rock outcrops and previously disturbed sites (past mining, timber sales, burned areas) are scattered throughout the treatment area.

Fire Severity - Fire creates different vegetation composition and structure depending on the intensity of fire. In forested communities, fire can change vegetation species composition and structure, creating early seral conditions, even under low to moderate burning intensities. The recovering vegetation succession may include grass-forb, shrubs, aspen, lodgepole pine and ponderosa pine. The burn severity within the Hayman fire boundary varies greatly depending upon topography, location and community type.

Low fire severity occurred on 34% of the fire; 15% was unburned. It is possible wildlife species were able to survive during the fire within these areas. These areas have now become important refuges for species as well as important reservoirs of seed sources for plant re-colonization during plant establishment. The Hayman fire may have benefited these areas by creating a mosaic of effects on the landscape, increasing nutrient cycling, and reducing ground fuels.

High/Moderate fire severity occurred on 51% of the burn area. The intense heat killed all above-ground vegetation and 100% tree scorching occurred. The vast majority of the high/moderate fire severity sites occurred in ponderosa pine and Douglas-fir stands. Seed survival for these species is not anticipated in the interior of the burn area.

Snags and Woody Debris - Existing ponderosa pine/Douglas-fir forests of the Colorado Front Range are overly dense, have a preponderance of small trees, a large component of shade-tolerant and fire-intolerant species, and little spatial heterogeneity across the landscape (Kaufman et al. 1999). As a result of the high severity fire in this heavily stocked forest, the fire area contains an abundance of snags and potential woody debris. In the project area, there are estimated to be 75 snags (8”dbh and larger)/acre (Thinnes 2002, Post 2003). This equates to approximately 4,700,000 snags. Prior to the fire, the same area contained approximately 128,000 snags.

Reports - A Biological Evaluation (BE) for Threatened, Endangered, Proposed and Sensitive Species (Howard and Ryke 2003) and a Wildlife, Fisheries and Management Indicator Species (MIS) Report (Howard and Elson 2003) were completed for this proposed project (see Table 8). These reports determined the wildlife species that are known to occur or may occur in the project area, and provided a detailed analysis of the effects of the project on these species. These reports are incorporated by reference. Summaries are provided here. Suitable habitat may exist in the project area for the species identified in Table 8.

TABLE 8: WILDLIFE SPECIES WITH SUITABLE HABITAT IN PROJECT AREA

Species	Status[1]	Present?	Suitable Habitat Present?
THREATENED, ENDANGERED, & PROPOSED SPECIES			
Bald eagle *Haliaeetus leucocephalus*	T	No	Nearby
Mexican spotted owl *Strix occidentalis lucida*	T	No	Project area is within critical habitat boundaries. Constituent elements not present in treatment areas.
Preble's meadow jumping mouse *Zapus hudsonius preblei*	T	No	Proposed critical habitat is within project area, not treatment areas.
Pawnee montane skipper *Hesperia leonardus Montana*	T	No	Nearby
SENSITIVE SPECIES			
AMPHIBIANS			
Tiger salamander *Ambystoma tigrinum*	S	Yes, suspected	Yes -non-breeding
BIRDS			
Boreal owl *Aegolius funereus*	S	No	Yes -winter
Flammulated owl *Otus flammeolus*	S	Yes, suspected	Yes
Golden-crowned kinglet *Regulus satrapa*	S	Yes, suspected	Yes (winter)
Lewis' woodpecker *Melanerpes lewis*	S & MIS	Yes, suspected	Yes
Northern goshawk *Accipiter gentilis*	S	No	Yes
Olive-sided flycatcher *Contopus cooperi*	S	Yes	Yes
Merlin *Falco columbarius*	S	No	Yes (winter)
Pygmy nuthatch *Sitta pygmaea*	S	Yes	Yes
Three-toed woodpecker *Picoides tridactylus*	S & MIS	Yes, suspected	Yes
MAMMALS			
Dwarf shrew *Sorex nanus*	S	No	Yes
Fringed-tailed myotis *Myotis thysanodes pahasapensis*	S	No	Yes
Townsend's big-eared bat *Plecotus townsendii*	S	No	Yes
MANAGEMENT INDICATOR SPECIES			
Elk *Cervus elaphus*	MIS	Yes	Yes
Mule Deer *Odocoileus hemionus*	MIS	Yes	Yes
Wild Turkey *Melegris gallopavo*	MIS	Yes	Yes
Mountain Bluebird *Sialia currucoides*	MIS	Yes	Yes

[1]T= Threatened, S = Sensitive, MIS = Management Indicator Species

FISHERIES

The riparian and wetland communities within the streamside corridors are not well suited to handle moderate/high intensity fires because they have been degraded by almost 200 years of human occupation and use. Given the severity and extent of the fires, the effects on the streams vary from mild to severe. Approximately 190 miles of perennial streams and 186 miles of intermittent creeks have been mapped within the Hayman and Schoonover fire perimeters. Most of the riparian corridor along the mainstem of the South Platte River was not burned during the Hayman fire. On the other hand, several of the drainages in the burn area (Turkey Creek, Goose Creek, Horse Creek and Wigwam Creek) were burned, resulting in 100% riparian cover lost.

Brook trout were selected as a Management Indicator Species (MIS) because of public concerns and interest for fishing. Brown trout, rainbow trout and Snake River cutthroat have also been stocked throughout the South Platte River resulting in self-sustaining populations of non-native trout in the South Platte River and tributaries. Native species that occur in the area include longnose dace, and white and longnose suckers. Greenback cutthroat trout, also a native fish species, are located near the burn along an upper reach of Wigwam Creek (untested, origin unknown, but potentially a pure population of native trout). This section of stream reach is upstream of all the proposed treatment areas.

HERITAGE RESOURCES

Approximately 7,160 acres in the project area (48% or project area) have been previously inventoried for cultural sites. Seventy-three (73) cultural properties were identified, recorded and evaluated within the Hayman Fire area.

In 2003, the Forest Service initiated a cultural investigation of the proposed Hayman Fire Timber Salvage areas in compliance with Section 106 of the National Historic Preservation Act (NHPA) as amended. A field survey sampling plan and methodology prospectus would be submitted to the Colorado State Historic Preservation Officer (SHPO) for review, concurrence or comment. After SHPO approval, field studies would start in the spring of 2003 and completed in early summer of 2003. Any newly identified and recorded sites within the Project Area, without SHPO review and comment on National Register of Historic Places eligibility will be considered eligible and flagged for avoidance by proposed project activities. Also, twenty of the properties previously recorded, specifically those needing additional information to determine National Register of Historic Places eligibility, would be reevaluated or considered eligible and avoided by the proposed timber salvage.

Tribal governments and other officials of tribes with possible traditional ties to the area, or those tribes that have previously indicated interests, were contacted regarding the Proposed Action. The Northern Arapahoe, Southern Arapahoe and Southern Cheyenne communicated that they were interested in the results of the cultural resource survey, reviewing Hayman Fire documents, and that prehistoric sites, rock shelters / crevices, and culturally scared trees would be avoided by the proposed timber salvage activities.

LOCAL AND REGIONAL ECONOMY

The Hayman Fire timber salvage project area includes acreage in Douglas, Teller, Jefferson, and Park Counties. There are many long-term local residents, however an ever-growing percentage of the residents, full or part time, are transplants from a suburban or urban setting. Residents in the area surrounding the project area consider the forest resources and forest health as an important part of their quality of life.

People's perception of and desires for National Forest lands management varies greatly. Generally, though, especially locally, people have concerns over outbreaks of diseases or fires that could affect their homes and property; and expect the Forest Service to play an active role in dealing with those situations. The counties surrounding the Pike National Forest continue to be attractive places for people to live. Changes in flexible work place, transportation, and communications have allowed people to continue working for city-based companies while living in rural or mountain communities. Many of the seasonal and permanent homes are being built in close proximity to the National Forest. Some of these homes were lost in the Hayman Fire. Communities affected by the project include Woodland Park and Divide in Teller County. Florissant, Trumbull, and Palmer Lake are other nearby communities. Population by Colorado County is displayed in Table 9.

TABLE 9: POPULATION BY COLORADO COUNTY, 1990-1999

County	1990 Population	1999 Population	% Change 1990-1999
Douglas	60,391	164,495	172.4
Park	7,174	14,218	98.2
Teller	12,468	21,303	70.9
Jefferson	438,430	520,810	84.2

From Trout-West Fuels Reduction Project DEIS

Douglas and Teller Counties are two of the 10 fastest growing counties in Colorado, based on percentage change between 1990 and 1999. Population within El Paso County grew by 25 percent in the same period. Population is projected to have grown between 3 and 14 percent in the three counties. Douglas County has grown the most of the three counties; all are at least growing as fast as the state average. Income within Teller and El Paso Counties in the analysis area is similar to the average for the state. Douglas County has exceptionally high income and has the highest average income of any county in the state (Table 10). Income associated with logging activity is difficult to estimate.

TABLE 10: ESTIMATE MEDIAN HOUSEHOLD INCOME BY COUNTY, COLORADO, 1998

State and County	Median Household Income
Colorado	$43,402
- Douglas County	$84,645
- El Paso County	$43,755
- Jefferson	$57,339
- Park	$51,899
- Teller County	$48,476

From Trout-West Fuels Reduction Project DEIS

In May 2002, a survey was conducted in Region 2 to determine logging labor rates. In Colorado, wage rates ranged from $11.00 per hour for clerical staff to approximately $28.00 for a faller. Large equipment operators make anywhere from $22 to $27 per hour. The average range for a mill worker is $10.30. Overall, wages related to the logging industry are fairly high.

RECREATION

All three ranger districts (South Platte, South Park, and Pike Peak) of the Pike National Forest were affected by the Hayman Fire. The Forest is a very popular recreation destination for the estimated 2 million people living along the Front Range urban corridor between Ft. Collins and Pueblo. The Pike National Forest is one of fourteen National Forests that are classified as an "Urban National Forest".

The project area receives high levels of dispersed recreational use compared to other areas on the Forest, with an estimated 70% of forest visitors engaged in a dispersed recreation activity such as rock climbing, fishing and trail riding. The project area includes important recreation resources such as Gill Trail, Matukat Road (FDR 211), upper South Platte River, and Wildcat Canyon, Wigwam and Goose Creek area, trailhead access to Lost Creek Wilderness, Cedar Mountain Road (FDR360), Turkey Rocks and Sheep Nose, Signal Butte Multi-Use Trail (FDT717), and portions of the Manitou Park Recreation Area and Rampart Range Motorized Recreation Area.

The project area also contains a small part of the 120,700-acre Lost Creek Wilderness. From the Project Area, the Wilderness is accessed by the Wigwam and Goose Creek Trailheads.

Popular dispersed recreational activities in and near the project area include: motorcycle and ATV trail riding, 4WD riding, sightseeing, driving for pleasure, camping, picnicking, hunting and fishing, hiking and backpacking, horseback riding, mountain biking, rock climbing, tubing, Christmas tree cutting, and gold-panning. Summer and fall are the greatest time of use. Winter recreation, such as cross-country skiing and snowmobiling, are popular when snow depth is adequate.

There are about 165 miles of project area trails currently closed due to the Hayman Fire. These trails and associated trailheads will remain closed until hazard trees can be removed and trail rehabilitation is completed. In addition, some popular campgrounds affected by the Hayman Fire are currently closed until hazard trees are removed and resource impacts are mitigated. These campgrounds include Molly Gulch, Goose Creek, Wildhorn, Trail Creek and Big Turkey.

In terms of recreation use, the 258 miles of road in the Project Area provide access to the forest and may function as a recreational opportunity themselves. FDR 211 (Matukat), FDR 360 (Cedar Mt.), FDR 560 (Stoney Pass), FDR 350 (Rainbow Falls), and FDR 200 (Trail Creek) are popular routes traveled by recreationists to arrive at developed recreation sites, dispersed recreation areas, and trailheads. Some people drive these roads for pleasure and/or sightseeing purposes, including four-wheel drive motorized users, mountain bikers, and horseback riders.

There are 18 commercial outfitters permitted by the Forest Service to operate in the project area. The permitted activities include hiking, backpacking, horseback riding, tubing, fishing, hunting/horsepacking, and rock climbing. In 2001, service days allocated to commercial outfitters in this area was approximately 18,365 days. Most of these days are permitted to private land-based operations located in the project area such as Lost Valley Ranch, Flying G Girl Scout Camp, Lutheran Valley Retreat, Golden Bell, and YMCA Shady Brook Camp. At least seven outfitters provide rock climbing opportunities almost exclusively at Turkey Rocks.

The project area occurs primarily in the Colorado Division of Wildlife Game Management Unit (GMU) 51, 501 and 511. Big game hunting and small game hunting are popular dispersed recreational activities within the burn area. In 2001, the total number of deer and elk hunters in these GMUs totaled 3,366. The Hayman Fire resulted in closure order restricting access to portions of GMUs 51, 501 and 511 greatly reducing hunter numbers during 2002.

VISUAL RESOURCES

The Hayman Fire occurred in a very popular and scenic area of the Pike National Forest. Visitors are drawn to this area for its spectacular beauty and many recreation opportunities, and for relief from the congestion of urban life. Aspen, an early seral plant will dominate the re-forestation. In Colorado, aspen viewing in the fall is an important recreation activity. The increase in aspen will add to the vegetative diversity in the area.

Topography helps hide the affected area by limiting views to the foreground and middle ground viewing distance. However, most of the burn area and salvage units are visible from the Matukat Road due to its location in the landscape.

Within the fire perimeter there was also a loss of scenic integrity and visual absorption capability (VAC) resulting from the loss of vegetation. VAC is a measure of the landscape's ability to absorb or hide impacts and activities. Any screening benefit of the vegetation was lost. Scenic integrity is a measure of the naturalness or level of disturbance. Within the Hayman Fire area, scenic integrity is now identified as very-low to low, meaning that alterations dominate or strongly dominate the landscape.

TRANSPORTATION

The existing road system within the Forest was largely funded and constructed to develop areas for recreation, timber harvesting, and other resource development. Most state, county and forest roads within the Hayman Fire perimeter are arterial roads. Tables 11 lists approximate road miles by ownership or jurisdiction and by burn severity in the Hayman Fire area.

TABLE 11: ROAD MILES AFFECTED BY THE HAYMAN FIRE

Jurisdiction	Total Miles	Road Miles by Burn Serverity		
		High/Moderate	Low	Unburned
Primary Roads				
Forest	225	97	95	34
County	48	8	28	12
State	21	13	8	12
Private	25	8	11	6
Total	**319**	**125**	**142**	**63**
Secondary Roads				
Closed Forest	70			
4WD Forest	354			
Total	424			
Grand Total	**743**			

Almost all of these open system roads have been affected by increased runoffs from the Hayman Burn area. These roads need additional repair and maintenance to control erosion and drainage to meet Forest Service road standards.

FUELS

Pre-Fire

Before the fire occurred, the forest cover type within the analysis area was predominantly ponderosa pine with co-dominant or an understory of Douglas-fir. Aspen stands were also present, although generally small because of conifer encroachment. Additionally, Engelmann and blue spruce occurred, but were largely limited to riparian areas.

Although no forest-wide dead fuel loading data is available, ten sample plots in the area yielded an average of 18 tons per acre with a range from 11 tons per acre up to 34 tons per acre (Pike-San Isabel National Forest 2002).

The pre-fire live vegetation and dead fuel loading were influenced by long-term fire exclusion, which allowed for increased encroachment of conifers into aspen stands, proliferation of Douglas-fir onto hotter aspects and accumulation of dead fuels on the forest floor (USDA Forest Service 1984, Kaufmann et al. 1999). Historically, a mixed severity fire regime would have maintained a more heterogeneous forest with numerous openings (Kaufmann et al. 1999).

Post-Fire

Little research exists regarding post-fire logging and fuel loading (McIver and Starr 2000). The analysis area currently has very little surface dead fuel loading as most of it was consumed when the fire passed. However, a large amount of standing fire-killed timber exists. Approximately 75% of fire-killed ponderosa pine snags can be expected to fall within the next 10 years (Harrington 1996). These fallen snags would then become large woody fuels. Although not a significant factor in fire spread, large woody fuels (3 inches or larger diameter) have been shown to contribute to fire severity, residence time, resistance to control and development of large fires. Standing fire-killed timber also presents a hazard to firefighters as these snags can fall with little or no warning.